2023

Connecticut Natural Hazard Mitigation Plan

Department of Emergency Services and Public Protection
(Division of Emergency Management and Homeland Security)
Department of Energy and Environmental Protection



Prepared by:

Dewberry

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Abbreviations

ADRP	Bureau of Agricultural Development & Resource Preservation (within DoAg)
AR5	Intergovernmental Panel on Climate Change Fifth Assessment Report
AR6	Intergovernmental Panel on Climate Change Sixth Assessment Report
BAM	Bureau of Air Management (within DEEP)
BETP	Bureau of Energy and Technology Policy (within DEEP)
BRIC	Building Resilient Infrastructure and Communities
CAFM	Connecticut Association of Flood Managers
CAP-SSSE	Community Assistance Program – State Support Services Element
CCMA	Connecticut Coastal Management Act
CCVI	Climate Change Vulnerability Index
CDBG	Community Development Block Grant
CERT	Community Emergency Response Team
CFPC	Commission on Fire Prevention and Control
CHAMP	Coastal Hazards and Management Planning (within DEEP)
CID	Connecticut Insurance Department
CIHMC	Connecticut Interagency Hazard Mitigation Committee
CIRCA	Connecticut Institute for Resilience and Climate Adaptation (within UCONN)
CLEAR	Center for Land Use Education and Research
COG	Council of Governments
CRS	Community Rating System
CTDOT	Connecticut Department of Transportation
DAS	Connecticut Department of Administrative Services
DECD	Connecticut Department of Economic Community Development
DEEP	Connecticut Department of Energy & Environmental Protection

DEMHS	Division of Emergency Management and Homeland Security (within DESPP)
DESPP	Connecticut Department of Emergency Services and Public Protection
DMA	Disaster Mitigation Act
DoAg	Connecticut Department of Agriculture
DOH	Connecticut Department of Housing
DPH	Connecticut Department of Public Health
DSS	Connecticut Department of Social Services
EOP	Emergency Operations Plan
EPA	Environmental Protection Agency
FEMA	Federal Emergency Management Agency
FMA	Flood Mitigation Assistance
FMAG	Fire Mitigation Assistance Grants
GC3	Governor's Council on Climate Change
GHG	Greenhouse Gas
HMA	Hazard Mitigation Assistance
HMGP	Hazard Mitigation Grant Program
HUD	U.S. Department of Housing and Urban Development
IPCC	Intergovernmental Panel on Climate Change
LHMP	Local Hazard Mitigation Plan
LISFF	Long Island Sound Future Fund
LWRD	Land and Water Resource Division (within DEEP)
NCA4	Fourth National Climate Assessment
NCRF	National Coastal Resilience Fund
NDC	Nationally Determined Contributions
NEHRP	National Earthquake Hazards Reduction Program
NFIP	National Flood Insurance Program

NFWF	National Fish and Wildlife Foundation
NHMP	Natural Hazard Mitigation Plan
NLCD	National Land Cover Database
NRDC	Natural Resources Defense Council
NWS	National Weather Service
OCP	Office of Climate Planning (within DEEP)
OLISP	Office of Long Island Sound Programs
OPM	Connecticut Office of Policy and Management
PA	Public Assistance
PCSAR	Physical Climate Science Assessment Report
PDM	Pre-Disaster Mitigation
RCP	Representative Concentration Pathways
ROAR	Resilience Opportunity Areas
SAFR	State Agencies Fostering Resilience Council (GC3 Subcommittee)
SDE	State Department of Education
SHMO	State Hazard Mitigation Officer
SHMPT	State Hazard Mitigation Planning Team
SHPO	State Historic Preservation Office (within DECD)
SSP	Shared Socio-Economic Pathways
TOD	Transit-oriented development
UCONN	University of Connecticut
WARN	Water/Wastewater Agency Response Network
WPLR	Bureau of Water Protection and Land Reuse (within DEEP)
ZSR	Zones of Shared Risk

1 | Introduction

The Natural Hazard Mitigation Plan (NHMP) is a guiding document meant to proactively inform actions that Connecticut will take to reduce risk from disasters over the next five years and beyond. This Plan includes an assessment of the natural hazards that can impact the state and specific actions that the state should take to manage risks.

1.1 Purpose of the Plan & Update

The 2023 Connecticut NHMP Update serves as guidance for hazard mitigation actions in the State of Connecticut. It is intended to support state and local governments' efforts to articulate accurate and prioritized needs for hazard mitigation that will reduce exposure to natural hazards. This planning effort will result in timely allocation of funding and more effective risk reduction strategies and projects. The NHMP was first approved by FEMA Region I during late 2004 and had subsequent updates approved in 2007, 2011, 2014, and 2018.[1]

Hazard Mitigation

Any sustained action taken to reduce or eliminate the long-term risk to human life and property from hazards

The areas of focus for the 2023 NHMP Update were:

- Expand upon and improve the 2019 **Risk Assessment Chapter**, including the addition of analysis using updated state owned and critical facility data.
- Expand the discussion on potential impacts due to climate change with regards to natural hazard mitigation in applicable hazard risk assessment sections.
- Inclusion of updated information within all chapters of the NHMP.
- Reassessment of the goals, objectives, and activities presented in the 2019 Plan.
- Increase state agency and other stakeholder participation and coordination.

[1] The 2019 Connecticut State Natural Hazard Mitigation Plan was published with "2019" as the plan's date, but It was approved on December 18, 2018. The plan is referred to as the "2019 Plan" throughout this document to correspond with the published title.

1.1.1 Federal Authorities

Section 322 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act (Stafford Act), 42 U.S.C. 5165, was enacted under § 104 of the Disaster Mitigation Act of 2000 (DMA 2000), Public Law 106-390. DMA 2000 was intended to facilitate cooperation between state and local authorities. It encourages and rewards local and state disaster planning for disasters to promote sustainability of communities and services as a strategy to improve disaster resistance.

Through the NHMP and meeting the requirements and criteria of Section 322 of the Stafford Act, Connecticut will remain eligible for all disaster-related assistance, including categories C through G of Federal Emergency Management Agency's (FEMA's) Public Assistance (PA) Program. This is an essential component of disaster recovery. In addition, eligibility is maintained for FEMA's Hazard Mitigation Assistance (HMA) programs: HMGP, HMGP Post Fire, Flood Mitigation Assistance (FMA), Pre-Disaster Mitigation Program (PDM), Building Resilient Infrastructure and Communities (BRIC), High Hazard Potential Dam (HHPD) Grants, and Fire Mitigation Assistance Grants (FMAG).

The State of Connecticut is also in compliance with other related federal authorities including:

- FEMA regulations - 44 CFR, Part 13, Uniform Administrative Requirements of Grants and Cooperative Agreements to State and Local Governments.
- FEMA regulations - 44 CFR, Part 14.
- Executive Order 12612, Federalism.
- Executive Order 11990, Protection of Wetlands.
- Executive Order 11988, Floodplain Management.
- 2 CFR 200, Uniform Administrative principles, and Audit Requirements for Federal Awards.
- 44 CFR, Part 201.4 (c) (7) § 13.11 (c) and § 13.11 (d).

The State of Connecticut will continue to comply with all applicable federal statutes and regulations during periods for which it receives grant funding, in compliance with 44 CFR 13.11(c), and will amend the NHMP whenever necessary to reflect changes in the state or federal laws and statutes, as required in 44 CFR 13.11(d).

1.1.1.1 Code of Federal Regulations Part 201

44 CFR § 201.1 et seq. addresses state mitigation planning, specifically in 44 CFR § 201.3 (c), identifies the states' mitigation planning responsibilities, which include:

1. Prepare a Standard State Mitigation Plan following the criteria in §201.4 as a condition of receiving non-emergency Stafford Act assistance and FEMA mitigation grants. The plan may address severe repetitive loss properties in their plan (§201.4 (c)(3)(v)) to receive the reduced cost share for the FMA and severe repetitive loss programs.
2. Review and update the Standard State Mitigation Plan every five years from the date of the approval of the previous plan to continue program eligibility.
3. Make available the use of up to seven (7) percent of HMGP funding for planning in accordance with §206.434. Prepare and submit to FEMA a Standard Hazard Mitigation Plan following criteria established in 44 CFR § 201.4 as a condition of receiving Stafford Act assistance (except emergency assistance).
4. Provide technical assistance and training to local governments to assist them in applying for HMGP planning grants and in developing local mitigation plans.

44 CFR § 201.4, Standard State Mitigation Plans, lists the required elements of state hazard mitigation plans. Under 44 CFR § 201.4 (a), by November 1, 2004, states must have an approved Standard State Hazard Mitigation Plan that meets the requirements of the regulation to receive Stafford Act assistance. The planning process, detailed by 44 CFR § 201.4 (b), must include coordination with other state agencies, appropriate federal agencies and interested groups. Guidance for state standard and enhanced plans and local and multi-jurisdictional plans has been updated several times to incorporate changes from the Katrina Reform Act, Unified Hazard Mitigation Assistance Grant Programs, and "lessons learned" through the first cycle of state and local mitigation planning. Current state standard plan guidance and the state plan cross walk were used to inform the 2023 Connecticut NHMP Update.

44 CFR § 201.4 (c), *Plan Content*, identifies the following elements that must be included in a state hazard mitigation plan:

1. Describe the current process used to update the plan, including how other state and federal agencies and other stakeholders were involved in the process in multiple sectors.
2. Prepare a risk assessment that describes natural hazards and makes a connection between vulnerability and proposed hazard mitigation actions, focusing on areas most at risk by evaluating where populations, infrastructure, and critical facilities are vulnerable to hazards; and identifying to what extent injuries or damage may occur. The risk assessment should also consider the probability of future hazard events associated with climate change.

3. Develop mitigation strategies to guide long-term reduction of the potential losses identified in the risk assessment, describe the process of evaluating and prioritizing actions, and identify funding sources.
4. Describe existing State pre- and post-disaster hazard management policies, programs, and capabilities for mitigating hazards, and how the State supports developing local and Tribal mitigation plans.
5. Identify criteria for prioritizing jurisdictions to receive planning and project grants under federal and non-federal programs.
6. Describe the process to keep the NHMP current through monitoring, evaluating, and updating the plan, as well as the process to monitor implementation of the mitigation strategies.
7. Document how the NHMP is formally adopted.
8. Include assurances that the State will comply with all applicable federal statutes and regulations.
9. Develop a strategy to reduce the number of repetitive loss properties, including severe repetitive loss properties. 44 CFR Part 206

1.1.2 State Authority

The Connecticut Department of Emergency Services and Public Protection (DESPP) was established by PA 11-51—HB 6650 Emergency Certification, *An Act Implementing the Provisions of the Budget Concerning the Judicial Branch, Child Protection, Criminal Justice, Weigh Stations And Certain State Agency Consolidations*, and given jurisdiction over emergency management previously held by the Department of Emergency Management and the Department of Public Safety. Other related programs and authorities are addressed in detail in the **Capability Assessment Chapter**.

1.2 Assurances and Adoption

The 2023 Connecticut NHMP was adopted by Governor Ned Lamont on December 13, 2023, as required by 44 CFR Section § 201.4(c)(6). A signed adoption letter from the governor is included in Appendix 6.

The State of Connecticut complies, and assures it will continue to comply, with all applicable federal statutes and regulations in effect with respect to the periods for which it receives grant funding, in compliance with 44 CFR 13.11 (c). The state will update or amend its plan whenever necessary to reflect changes in state or federal laws and statutes, as required in 44 CFR 13.11 (d).

1.3 Planning Team

This plan was completed with planning assistance and support by the hazard mitigation staff at the Division of Emergency Management and Homeland Security (DEMHS) and the Department of Energy and Environmental Protection (DEEP). Consulting support was provided by Dewberry Engineers Inc. and its subcontractors. The Connecticut State Hazard Mitigation Planning Team (SHMPT) and a large group of stakeholders that included Connecticut state agencies, federal government collaborators, non-governmental organizations, and Councils of Governments (COG) attended plan development meetings and provided comments on the NHMP draft. Staff from FEMA Region I provided additional technical assistance and plan review.

1.4 Plan Overview

For the 2023 update, each chapter was reviewed and reinvigorated to highlight progress since the 2019 plan adoption. Some chapters of the NHMP were restructured for efficiency. All of the chapters had new data integrated and the overall plan was organized to better meet the needs of the state.

Each chapter begins with a brief introduction followed by relevant information, charts, tables, and maps, which fulfill regulation requirements. The main chapters of the NHMP follow primary requirements of the hazard mitigation planning law, as summarized below.

- **Chapter 1. Introduction** provides an introduction of the natural hazard mitigation plan. Includes an overview of the purpose, authority, assurances, and plan organization.
- **Chapter 2. Planning Process** overviews plan coordination, SHMPT participants, stakeholders, and outreach efforts.
- **Chapter 3. Planning Context** provides an overview of key considerations for hazard mitigation planning in Connecticut, including a description of the state, history of natural disasters, and climate change considerations. Local planning coordination is also covered here.
- **Chapter 4. Risk Assessment** identifies and examines the natural hazards that have the potential to impact the state. Describes the hazards, identifies past occurrences and vulnerable locations, populations, state-owned facilities, infrastructure, and natural resources. It also explores the interaction between climate change and each of the hazards.
- **Chapter 5. Capability Assessment** includes an evaluation of existing state capabilities for enabling hazard mitigation, and adaptive capacity analysis for specific state agencies.

- **Chapter 6. Mitigation Strategy** presents the mitigation goals associated actions identified to reduce the risk from hazards across the state. The section presents the program strategies and projects with complete rankings for importance to reduce exposure to hazards.
- **Chapter 7. Plan Implementation** details progress reviews and provides a schedule for monitoring maintenance, implementation, and revision of the NHMP.

Appendices are found in an accompanying document. They provide detailed listings and agendas from each plan update meeting that was held, results from the surveys and other outreach, Hazus reports, and other relevant documents supporting the NHMP or its production.



1.5 Acknowledgements

The 2023 HMP was supported by a FEMA HMA BRIC grant. The planning process was led by Kevin Dumais (CT DEMHS), Scott Choquette (Dewberry), and Jade Payne (Dewberry). The Connecticut public provided valuable opinions and feedback that were used throughout the planning process to inform the risk assessment and guide the mitigation strategy development.

PHOTO BY TOM WALSH, COURTESY OF THE CONNECTICUT RIVER MUSEUM

2 | Planning Process

This chapter provides a summary of the process used to develop the NHMP, including how it was prepared and who was involved. It also provides an overview of the stakeholder and public outreach and engagement strategy that was implemented throughout the planning process.

2.1 Overview of the Planning Process

The planning process for the 2023 Connecticut NHMP Update was initiated by Connecticut DEMHS and supported by Dewberry and three subcontractors, SLR Consulting, Punchard Consulting, and Jamie Caplan Consulting (referred to as the Dewberry Consulting Team), who provided technical and administrative support.

The state's planning process included the completion of six key tasks, as illustrated in Figure 1. Several of these tasks are summarized and included in separate chapters of the NHMP.



Figure 1. Planning process graphics

Many of the planning steps were completed concurrently throughout the spring and summer of 2023. Datasets from Connecticut and national open sources were gathered and developed to support risk and capability analyses. Continued development of an inventory

of state facilities, analysis of the recorded history of damage impacts due to natural hazards, and synthesis of GIS layers for hazards led to the prediction of probability for incurred damages to state facilities from identified natural hazards. The planning process continued to evolve to ensure comprehensive agency responses as data were developed and analyzed.

The Dewberry Consulting Team worked closely with Connecticut state agencies to prepare an NHMP that is fully compliant with current FEMA planning requirements, per the following rules, regulations, and guidance:

- Robert T. Stafford Disaster Relief and Emergency Assistance Act (Public Law 93-288), as amended by the Disaster Mitigation Act of 2000
- Code of Federal Regulations – Title 44, Part 201 (§201.4 Standard State Mitigation Plans)
- FEMA State Mitigation Planning Policy Guide (FP 302-094-2; Effective April 19, 2023)

The NHMP was developed to be compliant with Executive Order 21-3, *Actions That Reduce Carbon Emissions and Adapt to the Climate Crisis,* issued by Governor Ned Lamont on December 16, 2021. The Executive Order calls for 23 actions, supporting 30+ recommendations proposed by the Governor's Council on Climate Change (GC3) and directs State executive branch state agencies to take significant actions within their authority to reduce carbon emissions. This plan supports Action 11 and Action 13, which call for an assessment of the vulnerability of state government and operations to the impacts of climate change and the creation of a list of priority assets and infrastructure for climate resilience projects for each agency, as well as the maintenance of a list of state and local critical facilities, respectively.

2.2 Core Planning Team

A Core Planning Team was created at the onset of the planning process to help guide and inform the NHMP throughout its development. The Team was led by the State Hazard Mitigation Officer and included representatives from multiple state agencies to allow for the representation of a variety of state interests and perspectives on hazard mitigation. Throughout the process, the Core Planning Team was asked to contribute their input and expertise, including resources or information that would contribute to the NHMP's effectiveness. Throughout the planning process, the Core Planning Team was invited to attend multiple planning meetings (in person and virtual), support stakeholder outreach and engagement efforts, identify opportunities to integrate the NHMP into other state planning efforts, provide supporting data, assist in the evaluation and prioritization of hazard mitigation and climate adaptation actions, review and comment on draft plan deliverables, and endorse the final draft plan. Table 1 identifies the Core Planning Team

that led data collection, coordination, stakeholder facilitation, analysis, and drafting of the plan.

Table 1. Core Planning Team participants

Name	Position	Affiliation
Kenneth Dumais	State Hazard Mitigation Officer	CT DEMHS; Interagency Drought Workgroup
Douglas Glowacki	Emergency Management Program Specialist	CT DEMHS; Interagency Drought Workgroup
Brenda Bergeron	Deputy Commissioner, DEMHS/DEMHS	CT DEMHS
Gemma Fabris	Emergency Management Program Specialist	CT DEMHS
Danielle (Dani) Moyer	Emergency Management Program Specialist, Hazard Mitigation	CT DEMHS
Ian Alexander	Supervisor, Strategic Planning, Community Preparedness, and Grants Unit	CT DEMHS
Kendall Bobula	Manager, Strategic Planning, Community Preparedness, and Grants Unit	CT DEMHS
Kimberly (Kim) Zigich	State Hazard Mitigation Officer	CT DEMHS
William Turner	State Emergency Management Director	CT DEMHS
Karen Michaels	Environmental Analyst III	CT DEEP
Scott Choquette	Project Manager; Associate Vice President, Branch Manager	Dewberry
Jade Payne	Deputy Project Manager	Dewberry
Hanna Rush	Lead Resilience Planner	Dewberry
Ashley Gordon	Resilience Planner II	Dewberry
Emily Mills	Resilience Planner	Dewberry
Jamie Caplan	Emergency Management Professional (Principal)	Jamie Caplan Consulting
Darrin Punchard	Emergency Management Professional (Principal)	Punchard Consulting
Noah Slovin	Resilience Planner	SLR

2.3 State Hazard Mitigation Planning Team

The SHMPT is a standing committee that advises the Connecticut Hazard Mitigation Program as participants in mitigation plan updates and other ad hoc program and policy issues. The committee members served as the key technical advisors on mitigation program matters during this update. The SHMPT is made up of representatives of key state agencies whose programs and interests are integral to implementation of the state's hazard mitigation program, including agencies and organizations that support FEMA's Community Lifelines.

The Committee met on several occasions to discuss the NHMP development process and guide the overall update of the 2023 plan document. Every member of the SHMPT attended at least one SHMPT meeting and many members provided data, specific plan section reviews, and other technical support throughout the planning process. The members of the SHMPT and their position, and agency affiliation are listed in Table 2.

Table 2. State Hazard Mitigation Planning Team

Team Member	Position	Affiliation(s)
Douglas Glowacki	Emergency Management Program Specialist	CT DEMHS; Interagency Drought Workgroup
Brenda Bergeron	Deputy Commissioner, DEMHS/DEMHS	CT DEMHS
Gemma Fabris	Emergency Management Program Specialist	CT DEMHS
Danielle (Dani) Moyer	Emergency Management Program Specialist, Hazard Mitigation	CT DEMHS
Ian Alexander	Supervisor, Strategic Planning, Community Preparedness, and Grants Unit	CT DEMHS
Kendall Bobula	Manager, Strategic Planning, Community Preparedness, and Grants Unit	CT DEMHS
Kenneth (Ken) Dumais	State Hazard Mitigation Officer	CT DEMHS; Interagency Drought Workgroup
Kimberly (Kim) Zigich	State Hazard Mitigation Officer	CT DEMHS
Stephanie Zessos	Emergency Management Program Specialist	CT DEMHS
William Turner	State Emergency Management Director	CT DEMHS
Karen Michaels	Environmental Analyst III	CT DEEP
Henry Paszczuk	Region 5 Planner/EMPS	CT DEMHS

Team Member	Position	Affiliation(s)
John Field	Region 5 Coordinator	CT DEMHS
Meghan M Seremet, PG	Connecticut State Geologist	CT DEEP
Sarah Watson	Senior Environmental Analyst	CT DEEP
Rebecca French	Director of Office of Climate Planning	CT DEEP
Diane Ifkovic	NFIP State Coordinator	CT DEEP
Jeff Semancik	Radiation Division Director	CT DEEP
Peter Francis	Boating Division Director	CT DEEP
Peggy Diaz	Legal Counsel	CT DEEP
Alfredo Herrera	CT State Geographic Information Officer	CT OPM
Emily Pysh	Transportation Supervising Planner	CTDOT
Zachary (Zach) Giron	Transportation Planner 1	CTDOT
Jonathan Kinney	Director of Historic Preservation and Museums	CT DECD
Eric Lindquist	Planning Specialist	CT DPH
Francesca Provenzano	Section Chief	CT DPH
George Bradner	Chair of Long-Term Recovery Committee	CT Insurance Department; Governor's Council on Climate Change
John "Jack" Betkoski	Vice Chairman	CT DEEP; Water Planning Council
James "Jim" O'Donnell	CIRCA Executive Director	UCONN/CIRCA; Governor's Council on Climate Change
John Truscinski	Director of Resilience Planning	UCONN/CIRCA
Dave Murphy	Director of Resilience Engineering	UCONN/CIRCA
Joanna Wozniak Brown	Climate and Infrastructure Policy Coordinator	CT OPM
Bruce Wittchen	Environmental Analyst	CT OPM
Lori Mathieu	Branch Chief	CT DPH; Governor's Council on Climate Change; Water Planning Council; Interagency Drought Workgroup
Sean Loughlin	Community Planner	FEMA Region 1
Charles (Chuck) Lee	Assistant Director, Planning and Management Division (Dam Safety Representative)	CT DEEP

Team Member	Position	Affiliation(s)
Nisha Patel	Assistant Director of Municipal Wastewater Program	CT DEEP
Eric Runowicz	Transportation Planner	CTDOT
Louise Zakrzewski	Administrative Assistant	CT DEMHS
Ashley Benitez	Environmental Analyst 2	CT DEEP
Michael Mozzer	Planning Specialist	CT DPH
Jim Vannoy	Section Chief	CT DPH
Eric Mcphee	Supervising Environmental Analyst	CT DPH
Scott Choquette	Project Manager; Associate Vice President, Branch Manager	Dewberry
Jade Payne	Deputy Project Manager; Lead Resilience Planner	Dewberry
Hanna Rush	Geospatial Analyst II	Dewberry
Ashley Gordon	Resilience Planner II	Dewberry
Emily Mills	Resilience Planner	Dewberry
Jamie Caplan	Mitigation Strategy Consultant (Principal)	Jamie Caplan Consulting
Darrin Punchard	Mitigation Strategy Consultant (Principal)	Punchard Consulting
Noah Slovin	Resilience Planner	SLR

2.3.1 State Hazard Mitigation Planning Team Survey Results

A hazard mitigation survey was developed as a part of the NHMP development process to help identify vulnerabilities to natural hazards from the stakeholder perspective. Three versions of this survey were created, all with the goal of collecting information about natural hazards within the state, but with slight variations due to the different audiences. One version was sent to members of the SHMPT, one was sent to stakeholders, and one was for the public to respond to. This section describes the SHMPT survey results. The stakeholder survey results are described in **section 2.4.1** and the public survey results are described in **section 2.6.1**.

The SHMPT survey collected 12 responses. The survey was conducted from July 2023 to September 2023, and was publicized at each project meeting, as well as through emails sent to the SHMPT.

Survey questions were grouped into sections, including:

- Hazard experience
- Current community resilience
- Mitigation strategy
- Additional comments or concerns

Survey responses were presented during the Mitigation Strategy Workshop to help develop mitigation strategies that represented the hazard mitigation priorities of state agency representatives. All SHMPT survey questions and responses can be found in **Appendix 1**.

Survey respondents represented a multitude of Connecticut State Agencies, including DEEP, Department of Public Health, DEMHS, and DEEP Geological Survey. When asked which hazards are the most concerning, flood, hurricane/tropical cyclone, and extreme heat were ranked as the highest concern. Similarly, respondents stated that flood and hurricane/tropical storm have had the most significant negative impact on Connecticut in the past, as shown in **Figure 2**.

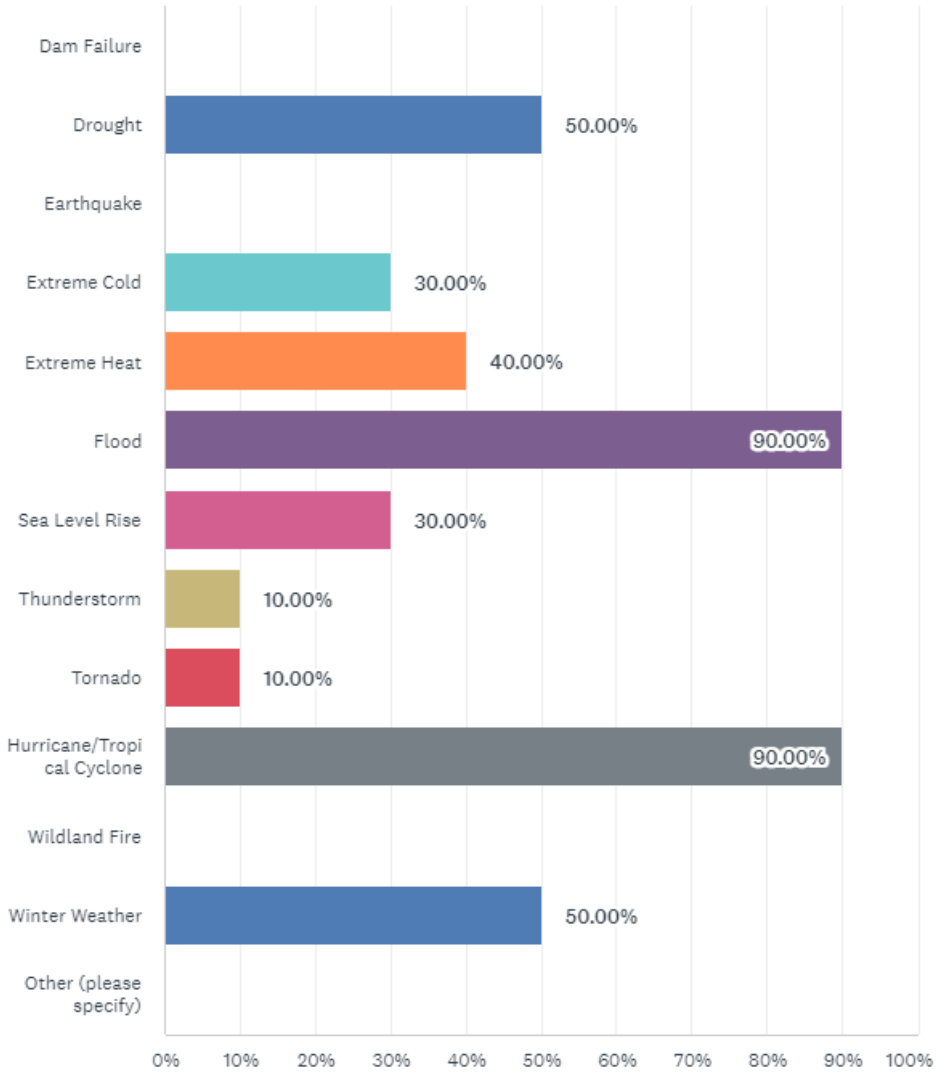


Figure 2. Hazards with the Largest Impact on the State

The majority of respondents agreed that the highest concern for climate-related impacts affecting Connecticut is more extreme or frequent storm events (including thunderstorms, hurricanes, tropical storms, and tornadoes), followed by more extreme or frequent rainfall events. When asked if they feel that Connecticut is adequately resilient, 60% of survey respondents stated that Connecticut is "somewhat" resilient, 30% stated that the state is not resilient, and 10% stated that it is resilient. To reduce the risk from natural hazards, survey respondents ranked large community structural projects, such as stormwater infrastructure and flood control projects, as the most important and social cohesion projects, such as resilience hubs and community services as the least important.

For outcomes from the plan, respondents ranked prioritizing investment in projects that protect life and property as the most important outcome, followed by building proactive strategies for taking action to reduce long-term risk to life and property.

2.4 Stakeholder Involvement

The planning process included a stakeholder outreach and engagement strategy that was designed to generate project interest and input from a variety of stakeholders, including Councils of Governments, private sector representatives, academia, and federal agencies. The stakeholders represented various sectors across Connecticut, including emergency management, land use and development, infrastructure and utilities, and natural and cultural resources.

The involvement of a large array of stakeholders during the planning process was considered a vital element to the success in developing a FEMA-compliant plan. Several state agencies were considered stakeholders, while specific office representatives from key state agencies (e.g., CT DEMHS, CT DEEP, CT OPM) were included as members of the SHMPT.[2] Local governments (e.g., COGs), non-governmental organizations, and federal agencies (e.g., USACE, HUD, USGS, FEMA) were invited to the planning process meetings, invited to participate in the stakeholder survey, and sent draft sections of the NHMP.

By including several state agencies in the SHMPT or as a stakeholder, the 2023 NHMP planning process was integrated to the maximum extent possible with other state planning efforts. The most significant integration being with the Governor's Council on Climate Change. Multiple participants serve or have served on the Council, and the *GC3 Phase 1 Report on Near Term Actions* (January 2021) and recommendations document, which improved upon the 2011 *Connecticut Climate Change Preparedness Plan*. These efforts were also linked with several Connecticut Executive Orders, which served as a foundation for the 2023 NHMP Mitigation Strategy and were further discussed in **section 2.1**.

A list of participating stakeholders is shown in Table 3.

Table 3. Participating stakeholders

Stakeholder	Position (If Available)	Affiliation
Matt Hart	Executive Director	COG - Capitol Region
Bill Perkins	Consultant – Trainer & Homeland Security Project Coordinator	COG - Capitol Region
Matt Fulda	Executive Director	COG - Connecticut Metropolitan
Patrick Carleton	Deputy Director	COG - Connecticut Metropolitan
Sam Gold	Executive Director	COG - Lower Connecticut River Valley; Governor's Council on Climate Change

[2] Requests for participation were made throughout the planning process to all hazard mitigation-related sectors, but some were not able to participate. This included stakeholders from the following sectors: state agency or department that regulates building codes; social services.

Stakeholder	Position (If Available)	Affiliation
Margot Burns	Senior Environmental Planner	COG - Lower Connecticut River Valley
Rick Dunne	Executive Director	COG - Naugatuck Valley
John Filchak	Executive Director	COG - Northeastern Connecticut
Robert Phillips	Executive Director	COG - Northwest Hills
Carl Amento	Executive Director	COG - South Central Region
Laura Francis	Deputy Director	COG - South Central Region
Amanda Kennedy	Executive Director	COG - Southeastern Connecticut
Francis Pickering	Executive Director	COG - Western Connecticut
Todd Fontanella	Senior Planner	COG - Western Connecticut
Eric Scoville	Director of Office of Communications and Community Partnerships	CT SDE
Connie Mendolia	Environmental Analyst – Pollution Prevention Programs	CT DEEP
Kathleen Knight	Environmental Analyst - Bureau of Air Management	CT DEEP
Kiernan Wholean		CT DEEP
Susan Quincy	Education Outreach	CT DEEP
Binu Chandy	Director of the Office of Brownfield Remediation & Development	CT DECD
David Kallander	Toxicology	CT DPH
Natalie Braswell	Governor's General Counsel	State of Connecticut
Jeff Morrissette	State Fire Administrator	CT CFPC
Michael Barnett		CT DECD
Mike Santoro	CD Specialist	CT DoH
Martin Heft	Undersecretary	CT OPM: Water Planning Council: Interagency Drought Workgroup
LTC Vincent O'Neill	Director of Military Support	CT National Guard
J. Warren	Emergency Management Director	Connecticut Energy Marketers Association
Scott Gaul	Chief Data Officer	CT OPM
Dr Thomas Layton	Sr. Manager Operational Readiness	United Illuminating
Steven Bonafonte		Metropolitan District Commission

Stakeholder	Position (If Available)	Affiliation
Lisa Park Boush	Professor	UCONN
Bryan Gran	Protective Security Advisor - Connecticut District	CISA CT District
Lissette Andino	Emergency Preparedness Manager	Eversource Energy
Richard Branigan	Chief Program Officer	American Red Cross
Neil Brockway	Director, Disaster Risk Reduction	American Red Cross
Phyllis Detwiler		American Red Cross
Alanna Kabel	Director, Development	HUD
Elizabeth Ahearn	Hydrologist	USGS
Sheila Warren	Silver Jackets Coordinator/Project Planner	USACE Silver Jackets – New England Division
Edith Pestana	Environmental Justice Administrator	CT DEEP
Lauren Savidge	Director of Energy Supply	CT DEEP
Keith Hedrick	Mayor	City of Groton
Mithila Chakraborty	Environmental Analyst	CT DoH
Cora K. Barber	Sustainability and Resilience Trainee	CTDOT
Meghan Sloan	Planning Director	COG - Connecticut Metropolitan
Diane Duva	Director, Emergency Response Planning	CT DEEP
Victoria Fedak	Emergency Preparedness Specialist	Eversource Energy
Joshua White	Emergency Manager	Eversource Energy
Dean Desautels	Director, Emergency Preparedness	Eversource Energy
Steven (Steve) Harkey	Supervising Environmental Analyst	CT DPH
Jim Larkin	Associate Director	COG - Northeastern Connecticut
Delia P Fey	Senior Regional Planner	COG - Northeastern Connecticut
Cassandra Massano	Senior Specialist, Emergency Preparedness	Eversource Energy
Maureen Goulet	Principal Program Manager	COG - Capitol Region
Rebecca Andreucci	Senior Transportation Planner / Finance Manager	COG - South Central Region
Drew Baklik	Director of Municipal Affairs	COG - Naugatuck Valley
Joseph Godwin	Manager, Emergency Preparedness	Eversource Energy
Kyle Shiel	Principal Planner	COG - Capitol Region

Stakeholder	Position (If Available)	Affiliation
Sabrina Xie	CT Careers Trainee: Research Analyst	CT DEEP

Engagement of stakeholders in the planning process of the 2023 plan update has been an ongoing effort. Stakeholders were encouraged to provide input through the community hazard mapping activity in the 2023 NHMP virtual story map and a stakeholder survey. They also attended multiple meetings throughout the planning process (such as the risk assessment results meeting and mitigation strategy development workshop). These meetings provided a forum for discussion on hazard identification and assessment methods for a variety of hazards, and the refinement and development of the NHMP goals and actions.

In addition, many stakeholders chose to participate through phone and email. The following agencies and organizations provided information and feedback outside of meetings and surveys: Capitol Region COG, CSDE, DEEP, Water Planning Council, OPM, DESPP, DEMHS, Interagency Drought Working Group, DOT, DPH, Governor's Council on Climate Change, CID, Eversource Energy, FEMA Region 1, and UCONN/CIRCA. Additionally, the Mashantucket (Western) Pequot Tribal Nation and the Mohegan Tribe were invited to participate in the planning process as stakeholders via multiple emails and telephone calls to multiple parties from each tribe.

Dewberry reached out to Resilient Land & Water (RLW), the consultant completing the Southeastern Connecticut Council of Government (SECCOG) hazard mitigation plan update, in which both tribes participated. RLW indicated that the tribes were non-responsive to their outreach as well. To date, the tribes have not adopted the approved SECCOG plan. Requests for participation were made throughout the planning process to all hazard mitigation-related sectors, but some were not able to participate. This included stakeholders from the following sectors: state agency or department that regulates building codes; and social services.

The plan update process was compressed. Changes in staffing at DAS, the agency charged with administering the state building code, left the department shorthanded. Newer staff were not as familiar with the importance of participating in the update of this plan. Since that time, those staff have been working with the State Hazard Mitigation Officer on a BRIC Capability and Capacity Building grant application and have become familiar with the FEMA HMA programs and the process of implementing and maintaining a state hazard mitigation plan. During subsequent plan updates, DEMHS will reach out to critical non-participating agencies and sector members at the Commissioner level, to encourage participation.

2.4.1 Stakeholder Survey Results

A hazard mitigation survey was developed as a part of the NHMP development process to help identify vulnerabilities to natural hazards from the stakeholder perspective. Three versions of this survey were created, all with the goal of collecting information about

natural hazards within the state, but with slight variations due to the different audiences. One version was sent to members of the SHMPT, one was sent to stakeholders, and one was for the public to respond to. This section describes the stakeholder survey results.

The stakeholder survey collected 68 responses. The survey was conducted from July 2023 to September 2023, and was publicized at each project meeting, as well as through emails sent to the stakeholder members of the planning team.

Survey questions were grouped into sections, including:

- Hazard experience
- Current community resilience
- Mitigation strategy
- Additional comments or concerns

Survey responses were presented during the Mitigation Strategy Workshop to help develop mitigation strategies that represented the hazard mitigation priorities of stakeholders. All stakeholder survey questions and responses can be found in **Appendix 1**.

Nearly 50% of all stakeholder survey respondents represented Councils of Government or jurisdictions within Connecticut, with the remaining 50% representing volunteer organizations, non-profits, tribes, and utility companies. When asked if they were aware that Connecticut has a Natural Hazard Mitigation Plan, 65% were aware, but 35% were not aware. Stakeholders ranked hurricane/tropical storm, flood, and extreme heat as the hazards of highest concern, like the SHMPT survey results. Also like the SHMPT results, stakeholder survey respondents had the highest concern for more extreme or frequent storm events and more extreme or frequent rainfall events in the future.

When asked which community activities they considered the most important in reducing the risk from natural hazards, stakeholders ranked emergency services and preparedness, such as generators and safe rooms, were ranked the highest importance, followed by large community structural projects. Stakeholders were also asked to rank assistance options from the State that could help them further their hazard mitigation goals. Respondents ranked the identification of funding sources as the most helpful, followed by technical assistance. Similar to the SHMPT survey responses when asked about the most important outcomes of the plan, respondents ranked prioritizing investment in projects that protect life and property as the most important outcome, followed by building proactive strategies for taking action to reduce long-term risk to life and property.

2.4.2 Dam Safety Coordination

Dam operators and dam safety experts were both asked to provide input into the NHMP as well as provide general feedback. A Sam Safety Representative from the State was

consulted from the outset of the planning process and was included in the SHMPT. Mapped dam inundation zones, Emergency Action Plans, location and size of the population at risk, and potential impacts to structures were all integrated into the plan. The Dam Safety Representative reviewed the draft **Dam Failure** section in the **Risk Assessment Chapter**, dam-related mitigation actions, and appendices for accuracy and completeness.

2.5 Planning Process Meetings

A summary of the meetings conducted throughout the planning process is shown below. Table 4 shows the meeting attendance and survey completion of all participating agencies and Connecticut-affiliated groups. Please refer to Appendix 1 for documentation on all meetings and individual meeting participant attendance records.

Table 4. Plan participants attendance and survey completion

Affiliation	Meetings Attended & Surveys Completed
CT DEMHS	All meetings (Kick-Off Meeting; Hazard Mitigation Planning Team: Kick-Off Meeting; Risk Assessment Results Presentation; Mitigation Strategy Workshop; Mitigation Strategy Workshop - DEMHS Follow-Up #1; Mitigation Strategy Workshop - DEMHS Follow-Up #2; Mitigation Strategy Workshop - DEMHS Follow-Up #3); Connecticut Hazard Mitigation Planning Team Survey
CT DEEP	Kick-Off Meeting; Risk Assessment Results Presentation; Mitigation Strategy Workshop; Connecticut Hazard Mitigation Planning Team Survey
CT CFPC	Mitigation Strategy Workshop
CT DECD	Kick-Off Meeting; Mitigation Strategy Workshop; Stakeholder Survey
CT DOH	Risk Assessment Results Presentation; Mitigation Strategy Workshop
CTDOT	Kick-Off Meeting; Risk Assessment Results Presentation
CT DPH	Risk Assessment Results Presentation; Mitigation Strategy Workshop; Connecticut Hazard Mitigation Planning Team Survey
CT OPM	Kick-Off Meeting; Risk Assessment Results Presentation; Mitigation Strategy Workshop
CT Insurance Department	Kick-Off Meeting; Risk Assessment Results Presentation; Mitigation Strategy Workshop
CT Governor's Council on Climate Change	Kick-Off Meeting; Risk Assessment Results Presentation; Mitigation Strategy Workshop
CT Interagency Drought Group	All meetings (Kick-Off Meeting; Hazard Mitigation Planning Team: Kick-Off Meeting; Risk Assessment Results Presentation; Mitigation Strategy Workshop; Mitigation Strategy Workshop - DEMHS Follow-Up #1; Mitigation Strategy Workshop - DEMHS Follow-Up #2; Mitigation Strategy Workshop - DEMHS Follow-Up #3)

Affiliation	Meetings Attended & Surveys Completed
UCONN/CIRCA	Kick-Off Meeting; Risk Assessment Results Presentation; Mitigation Strategy Workshop
USACE Silver Jackets – New England Division	Mitigation Strategy Workshop
COG - Capitol Region	Mitigation Strategy Workshop; Stakeholder Survey
COG - Metropolitan	Risk Assessment Results Presentation; Mitigation Strategy Workshop
COG - Lower Connecticut River Valley	Mitigation Strategy Workshop
COG - Naugatuck Valley	Mitigation Strategy Workshop; Stakeholder Survey
COG - Northeastern Connecticut	Mitigation Strategy Workshop; Stakeholder Survey
COG - South Central Region	Mitigation Strategy Workshop; Stakeholder Survey
COG - Southeastern Connecticut	Risk Assessment Results Presentation; Stakeholder Survey; Stakeholder Survey
COG - Western Connecticut	Risk Assessment Results Presentation; Mitigation Strategy Workshop; Stakeholder Survey
Eversource Energy	Mitigation Strategy Workshop
FEMA Region 1	Kick-Off Meeting; Risk Assessment Results Presentation; Mitigation Strategy Workshop
Mohegan Tribe	Stakeholder Survey

2.5.1 Core Team Kickoff Meeting

March 7, 2023 – 13 Attendees

The Core Team held a kick-off meeting on Microsoft Teams. During this meeting, each of the members of the Core Planning Team introduced themselves and discussed any data contributions their agency could provide for the NHMP update. The project timeline was reviewed, and revised, and tentative dates were established for the team meetings. The group revised previous plan participant lists to account for any new staff. A working session was held to discuss anticipated major changes to include in the NHMP update,

including the core hazards, increased emphasis on climate change and adaptation, and changes in and availability of datasets.

2.5.2 SHMPT Project Kick-Off Meeting

March 28, 2023 – 32 Attendees

The kick-off meeting of the SHMPT was hosted at DEMHS offices in Middletown Connecticut and virtually on Microsoft Teams. The purpose of this meeting was to introduce the NHMP update process, review roles and responsibilities, and begin collecting information and input on hazards, mitigation strategies, and other necessary information for the NHMP update. Participants present for the in-person meeting at DEMHS offices were provided with a worksheet to respond to various questions and requests throughout the meeting, and virtual participants received a link to a virtual version of the same worksheet to collect their information. These worksheets and other meeting materials can be found in Appendix 1.

The meeting began with an overview of the NHMP update process, including project milestones, FEMA requirements, and integration of the Executive Orders. The Risk Assessment was then reviewed, and participants were asked to provide information on available data from their state agencies that could be integrated into the NHMP and discuss any changes in hazard ranking priority or addition of new hazards to the 2023 plan update. Participants were then asked to discuss the 2019 hazard mitigation plan, and any improvements or changes they would like to see in the NHMP update. Finally, next steps in the project were presented and participants were asked to provide updates to the 2019 mitigation actions.

2.5.3 Risk Assessment Results Meeting

July 19, 2023 – 39 Attendees

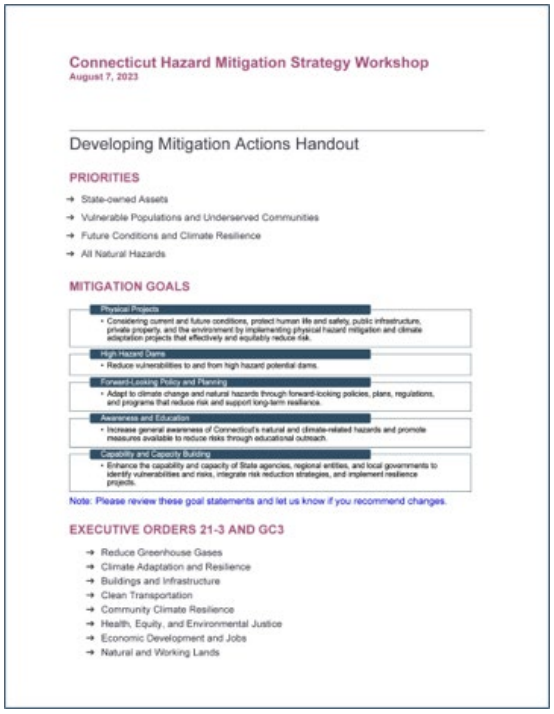
Results of the Risk Assessment and resultant Vulnerability Analysis were presented. The meeting began with an overview of the progress of the NHMP update, along with a check in on project milestones. For the Risk Assessment process overview, 2023 improvements to the Risk Assessment, data highlights, and methods of incorporating local hazard mitigation plans were presented. Risk assessment and vulnerability analysis results for each of the hazards and preliminary hazard rankings were also presented. The meeting concluded with a discussion of any questions or comments on the Risk Assessment from participants and a summary of next steps for the planning process.

2.5.4 Mitigation Strategy Workshop

August 7, 2023 – 62 Attendees

The primary goal of the mitigation strategy workshop was to review the State's 2023 mitigation goals and identify new mitigation actions to be included in the 2023 plan update. The workshop was conducted virtually and began with a presentation on the updated 2023 mitigation goals and a brief overview of the natural hazards to guide participants in creating new mitigation actions. Participants were also provided with a mitigation considerations handout (Figure 3) with the following information on it to use as a reference when creating new mitigation actions:

1. Priorities
2. Mitigation goals
3. Executive Orders 21-3 and GC3
4. Risk Assessment findings
5. Challenges identified in local Hazard Mitigation Plans
6. Types of mitigation actions
7. Action prioritization criteria


Connecticut Hazard Mitigation Strategy Workshop
August 7, 2023

Developing Mitigation Actions Handout

PRIORITIES

- State-owned Assets
- Vulnerable Populations and Underserved Communities
- Future Conditions and Climate Resilience
- All Natural Hazards

MITIGATION GOALS

Physical Projects
- Considering current and future conditions, protect human life and safety, public infrastructure, private property, and the environment by implementing physical hazard mitigation and climate adaptation projects that effectively and equitably reduce risk.

High Hazard Dams
- Reduce vulnerabilities to and from high hazard potential dams.

Forward-Looking Policy and Planning
- Adapt to climate change and natural hazards through forward-looking policies, plans, regulations, and programs that reduce risk and support long-term resilience.

Awareness and Education
- Increase general awareness of Connecticut's natural and climate-related hazards and promote measures available to reduce risks through educational outreach.

Capability and Capacity Building
- Enhance the capability and capacity of State agencies, regional entities, and local governments to identify vulnerabilities and risks, integrate risk reduction strategies, and implement resilience projects.

Note: Please review these goal statements and let us know if you recommend changes.

EXECUTIVE ORDERS 21-3 AND GC3

- Reduce Greenhouse Gases
- Climate Adaptation and Resilience
- Buildings and Infrastructure
- Clean Transportation
- Community Climate Resilience
- Health, Equity, and Environmental Justice
- Economic Development and Jobs
- Natural and Working Lands

Figure 3. Mitigation Strategy Handout

After an initial presentation, meeting participants were divided into five breakout rooms to discuss additional mitigation actions. Participants were organized into five groups, aligned with groupings of the main state agencies assigned to 2019 mitigation actions.

Each breakout group was led by an experienced mitigation planner from the consulting team. These individuals facilitated and recorded the group as they began to develop mitigation actions to address the natural hazard vulnerabilities presented at the meeting. Facilitators used an excel sheet with 2019 mitigation actions to record status updates and add additional mitigation actions that were brainstormed during the breakout rooms with meeting participants. Additionally, CT DEMHS met for three virtual follow up meetings to brainstorm and finalize mitigation actions that were not fully resolved during the Mitigation Strategy Workshop.

2.5.5 Plan Review Survey

October - November, 2023 – 9 Responses

The draft NHMP was sent to the SHMPT, stakeholders, and the public that signed up to receive draft plan review notifications on the NHMP update's webpage in October 2023. A link to a plan feedback survey was sent as well. The survey received nine (9) responses, which are provided in Appendix 1.

2.6 Public Participation and Outreach

2.6.1 Online Survey

A hazard mitigation survey was developed as a part of the NHMP development process to help identify vulnerabilities to natural hazards from the stakeholder perspective. Three versions of this survey were created, all with the goal of collecting information about natural hazards within the state, but with slight variations due to the different audiences. One version was sent to members of the SHMPT, one was sent to stakeholders, and one was for the public to respond to. This section describes the public survey results.

For the 2023 plan update, a survey was developed to solicit input from the public on mitigation activities and strategies. The survey was conducted from July 2023 to September 2023. Links to the survey were available on the CT DEMHS website, shared in public social media groups, and publicized in local news outlets (**Appendix 1**). The survey was shared through the following local community channels:

1. County and State Facebook groups.
2. County and State Reddit pages.
3. CT DEMHS Facebook and Twitter pages.
4. NHMP project meetings and emails sent to the SHMPT and stakeholder members of the planning team.

Survey answers were reviewed for consideration in updating all sections of the plan, in particular the hazard rankings and **Mitigation Strategy Chapter**. Survey responses were presented during the Mitigation Strategy Workshop to help develop mitigation strategies that represented the hazard mitigation priorities of the public.

Survey questions were grouped into sections, including:

- Hazard experience
- Current community resilience
- Mitigation strategy
- Additional comments or concerns

In all, 287 people responded to the survey. Nearly 50% of survey respondents were unaware that Connecticut had a hazard mitigation plan prior to taking the survey. When asked about their concern of natural hazards impacting their community, respondents were the most concerned about hurricane/tropical cyclones and flooding. When asked which hazards they have been negatively impacted by in Connecticut, winter weather and

hurricane/tropical cyclone were reported to have had the most negative impact, followed by thunderstorm and flood, as shown in **Figure 4**.

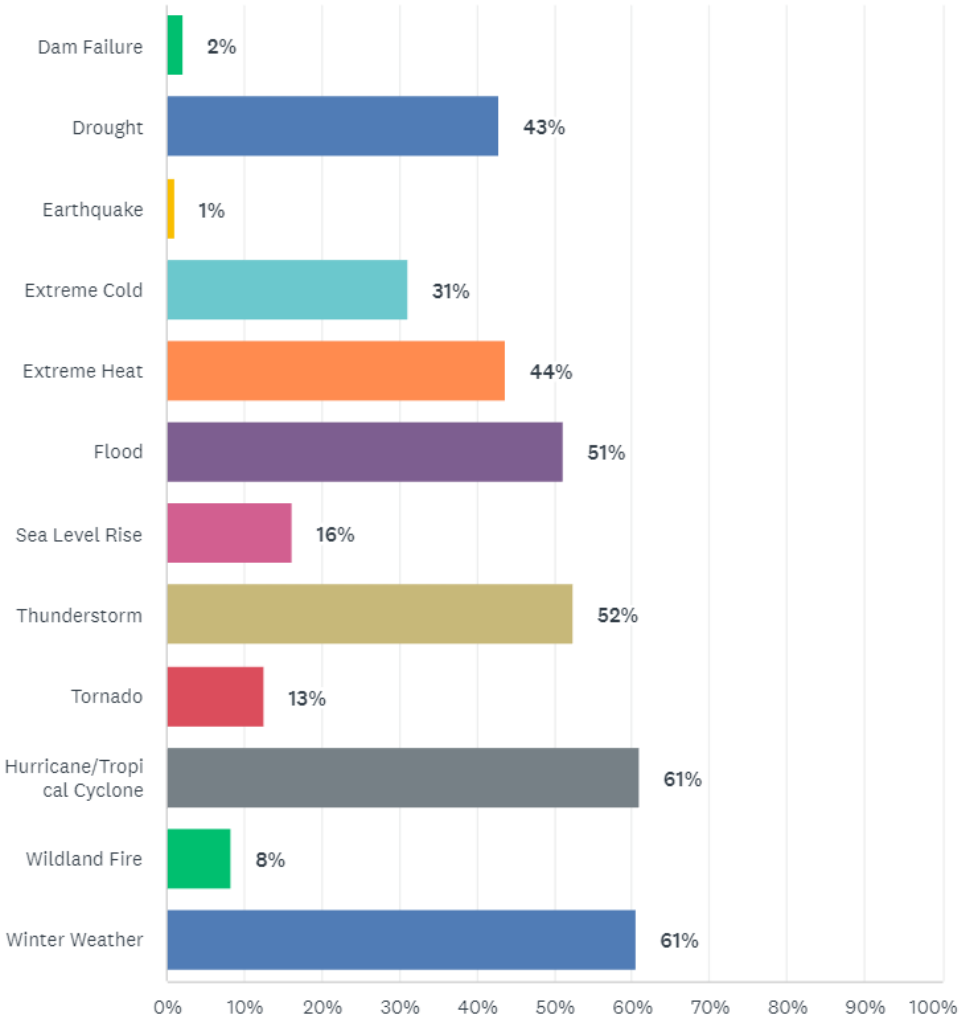


Figure 4. Hazards with the Most Negative Impact on Connecticut

Most public survey respondents do not feel confident that their community is adequately resilient, with only 11% responding that they do feel that the community is adequately resilient, 40% feeling somewhat resilient, 36% not feeling resilient, and 12% responding that they don't know if their community is resilient. To reduce the risk from natural hazards, respondents ranked large community structural projects and natural resource protection as the most important, and social cohesion projects as the least important.

To stay up to date on hazard information, the majority of the public receive alerts and information through text messages and websites. Half of survey respondents have signed up for CT Alert to receive hazard emergency alert notifications, but 31% had never heard of CT Alert before taking the survey.

Finally, survey respondents were prompted to provide hazard mitigation actions or projects for local governments to reduce or eliminate the risk of natural hazard damages. Common responses included suggestions for tree removal to reduce risk from wind associated with thunderstorms, extreme heat mitigation projects, microgrid projects, and acquisition projects to reduce flood risk.

2.6.2 Project Webpage

At the beginning of the planning process, a 2023 State Natural Hazard Mitigation Plan Update page was added to the CT DEMHS website. The page was added to the Hazard Mitigation section of the CT DEMHS website, and included information for the public on hazard mitigation, the planning process, and opportunities to get involved in the planning process. The public survey link was posted on this webpage, as well as a link to a survey to sign up for additional notifications on the NHMP progress. Additionally, a copy of the PowerPoint and meeting notes from the Kickoff meeting was included on the website for the public to view. **Figure 5** shows the introduction text of the 2023 State Natural Hazard Mitigation Plan Update webpage. Additional images of the webpage can be found in Appendix 1.



Figure 5. 2023 State Natural Hazard Mitigation Plan Update Webpage Content

2.6.3 Connecticut Natural Hazard Mitigation Plan Experience

As an additional public outreach strategy, an ArcGIS Online Experience was created and published on the project webpage at the beginning of the planning process to provide

further opportunity for the public to affect the plan's content. The Experience included an introduction section on the 2023 mitigation plan update, a plan overview, opportunities to get involved, and hazard maps of Connecticut, as shown in **Figure 6**. The Experience is documented in Appendix 1.



Figure 6. Connecticut Natural Hazard Mitigation Plan Experience Home Page

In the "Get Involved" section of the Experience, the public could identify community hazard problem areas by filling out a brief survey. The survey asked the hazard type, a description of the problem caused by the hazard and allowed respondents to place a point on a map of Connecticut to identify the location of the hazard problem area. These problem areas then populated on a map of the state and were incorporated into the plan. Community problem areas identified by survey respondents are shown in **Figure 7**.

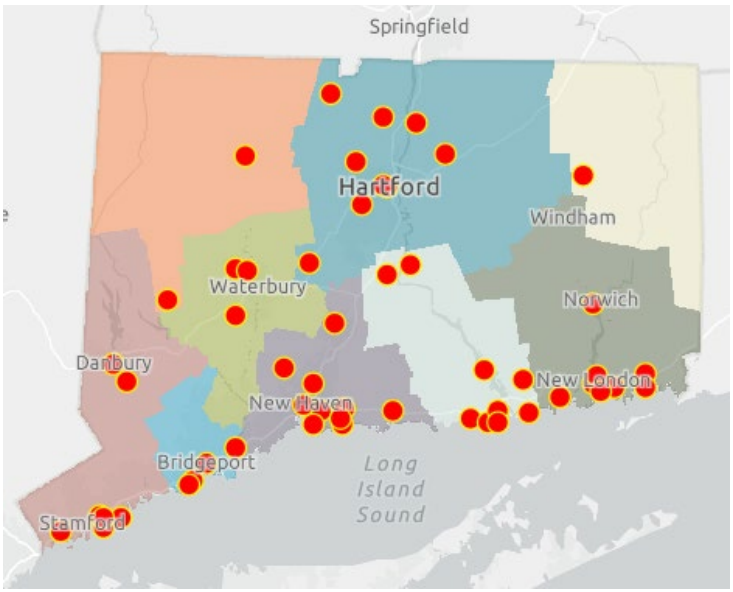


Figure 7. Community Hazard Problem Areas

3 | Planning Context

This chapter provides an overview of key considerations for hazard mitigation planning in Connecticut, including a description of the state, history of natural disasters, and climate change considerations.

3.1 General Description of Connecticut

Connecticut is a "home rule" state where nearly all decisions are made at the municipal level, so the planning and implementation of actions to reduce the impacts of hazards must happen locally. The State provides significant guidance and assistance. The SHMPT made a committee decision during 2012 to complete vulnerability analyses and show results at a county level. This methodology has been maintained for the 2023 Plan. For the 2023 update, vulnerability analyses and results are also shown at the Councils of Governments (COG) level in addition to the county level, when applicable. The Plan results from the best available datasets for historical hazards and spatial hazard extents being compiled at the county level.

Within Connecticut, there are 169 municipalities, the Mashantucket Pequot and Mohegan tribal governments, and the political subdivisions of Groton and Stonington totaling 173 local political entities. Connecticut also has 9 regional COGs which are illustrated on Figure 8 below. COGs are recognized as "county-equivalents" for the purpose of applying for federal grants that are open to counties.

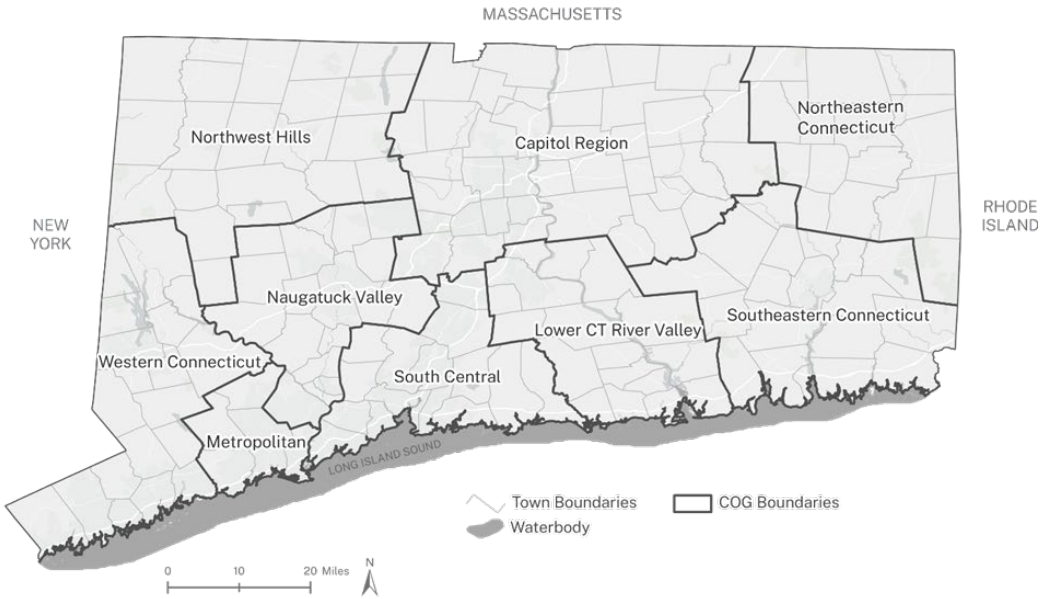


Figure 8. COG Regions

There are 153 regional plans that provide community-specific information related to risk, capabilities, and mitigation strategies. A summary table with the status of each municipality's mitigation plan can be found in Appendix 2. For the most up-to-date status of each municipality's mitigation plan, the FEMA Hazard Mitigation Plan Status website can also be used. Connecticut continues to work with local municipalities to update and revise their local mitigation plans and address the gaps in their vulnerability assessments and loss estimates. This state plan presents the general findings from the local plans and summarizes them at a county-wide and state-wide level in each of the hazard specific sub-sections, as well as later in this chapter. When available, municipality-specific data have been provided in this update.

3.1.1 Geography

Connecticut contains a wide variety of landscapes. From the shores of Long Island Sound in southern Connecticut, the land gently slopes upward to rolling hills across the southern half of the State. More rugged terrain covers the northwestern and northeastern areas of Connecticut with forested hills and mountains climbing to elevations of over 2,000 feet. The Connecticut River Valley cuts through the center of the State, and several deep river valleys cut through the eastern and western sections of the State. All of these rivers generally flow from north to south and empty into Long Island Sound.

Within the State's borders there are approximately 450,000 acres of wetlands, 6,000 miles of streams and rivers, over 2,000 lakes and reservoirs, over 4,000 dams and 600 square miles of estuarine water in Long Island Sound. Connecticut's shoreline and riverine areas were heavily developed for commercial, residential, and industrial uses during the past 200 years, since these areas are relatively flat, highly desirable for construction purposes, and have the ability to provide an ample supply of hydropower, a major power source of early 19th Century industrialization.

The climate of Connecticut is moderate with median annual precipitation ranges from 42 to 52 inches, and snowfall averaging between 30 inches on the coast of Long Island Sound up to 50 inches in the northwest hills. Temperatures range from highs in the 80's and 90's during the summer months, down to lows in the teens and single digits during the winter months.

Transcontinental storms (low pressure systems), and storms that form near the Gulf of Mexico and along the East Coast deliver most of the annual rain and snowfall to the State. Heavy short-duration rains are also caused by thunderstorm activity in all but the winter season. Occasional hurricanes, which typically occur between June 1st and December 1st, deliver heavy rains of longer duration. Less frequent in Connecticut are droughts, forest fires and earthquakes. Large-scale forest fires are rare in Connecticut. Fires are typically small underbrush and ground fires that rarely damage large numbers of buildings.

3.1.2 Demographics

Connecticut's demographics are a major factor in the risk posed by natural hazards. The U.S. Census Bureau estimates that the population of Connecticut was 3,588,184 in 2017, with and 3,605,944 as of the 2020 census. Connecticut's population is expected to grow a modest 1.33% by 2040. Fairfield, Hartford, and New Haven have the greatest density of people per square mile.

Connecticut has eight counties and two-thirds of the State's population and housing units are within Fairfield, Hartford, and New Haven counties. Table 5 shows the 2017-2020 population by county. Bridgeport, Hartford, New Haven, Norwalk, Waterbury, and Stamford have the largest populations of all municipalities in Connecticut.

Table 5. Census data for the State of Connecticut

County	Population (2017)	Population (2020)	Housing Units (2020)	Land Area In Square Miles (2020)	Population Per Square Mile (2020)
Fairfield	949,921	957,419	378,479	625	1531.87
Hartford	895,388	899,498	385,307	735.1	1223.64
Litchfield	182,177	185,186	87,615	920.5	201.18
Middlesex	163,410	164,245	76,289	369.3	444.75
New Haven	860,435	864,835	369,178	604.5	1430.66
New London	269,033	268,555	122,863	665.1	403.78
Tolland	151,461	149,788	60,876	410.4	364.98
Windham	116,359	116,418	49,590	512.8	227.02
Total	3,588,184	3,605,944	1,530,197	4,842.40	744.66

Source: 2020 US Census

Figure 9 shows the total population of Connecticut municipalities. Notable population centers include Hartford, New Haven, Waterbury, Bridgeport, Norwalk, and Stamford. Connecticut's densest communities are Hartford, New Haven, and Fairfield Counties.

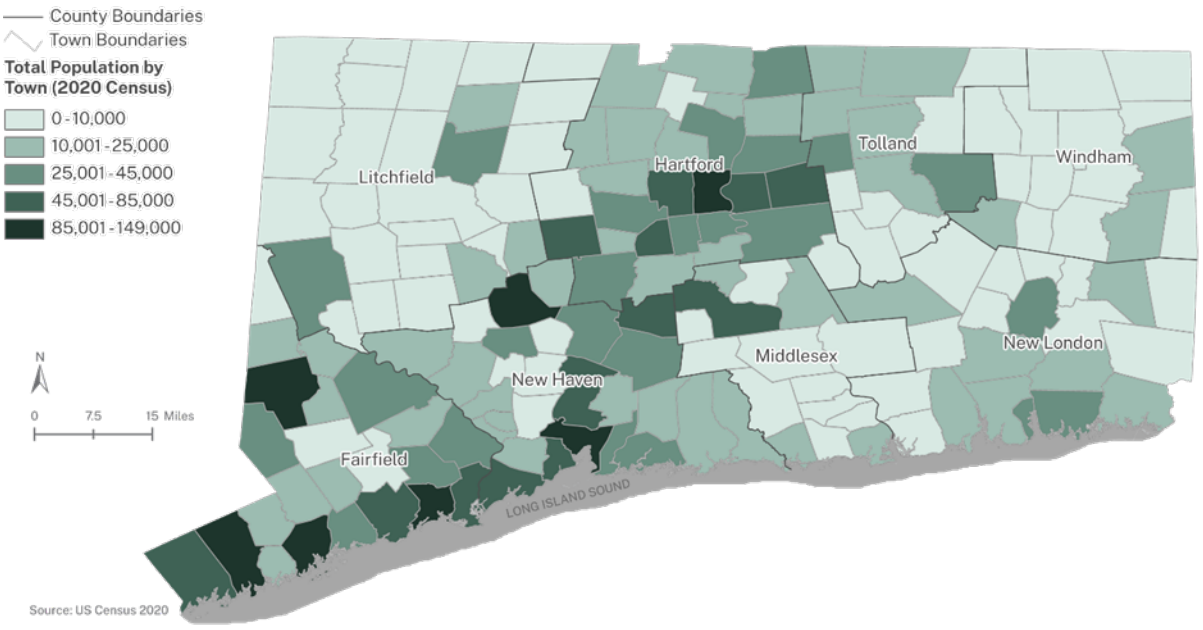


Figure 9. 2020 Population values for CT towns

Table 6 displays population projection data for Connecticut from 2020 through 2040. It is anticipated that both population and housing will continue to increase slowly in some communities.

Table 6. CT population projection (2020 - 2040)

Population 2020	Population Projection 2025	Population Projection 2030	Population Projection 2035	Population Projection 2040	% Change (2020 to 2040)
3,605,944	3,618,763	3,633,994	3,645,370	3,654,015	1.33%

3.1.2.1 Social Vulnerability

Connecticut's social vulnerability was evaluated using Connecticut Institute for Resilience and Climate Adaptation's (CIRCA) Climate Change Vulnerability Index (CCVI). The CCVI combines exposure, sensitivity, and adaptive capacity to evaluate a community's vulnerability to flood and heat-related impacts of climate change. Social sensitivity scores are determined by contributors such as household median income, percent of the population over 65, non-white population, and population density. A complete table of the social sensitivity factors can be found in Table 7 below:

Table 7. CCVI Social Sensitivity Factors

Component	Indicator	Flood CCVI Factor
Sensitivity	Social	Household Median Income

Component	Indicator	Flood CCVI Factor
		Over 5 with a Disability
		Percent Living Below 185% Federal Poverty Level
		Percent Over 25 without a high school diploma
		Percent Over 65
		Percent Population Under 5
		Percent Population Unemployed
		Population Density
		Non-White Population
		Speaks English Less Than Well/Not At All
		Over 65 Living Alone (Households)
		Single Parent Households

In Connecticut, the areas with higher social sensitivity are primarily in cities. New Haven, Hartford, and Fairfield Counties contain some of the areas with the highest social sensitivity scores. The map in Figure 10 below depicts social sensitivity scores across the state by town.

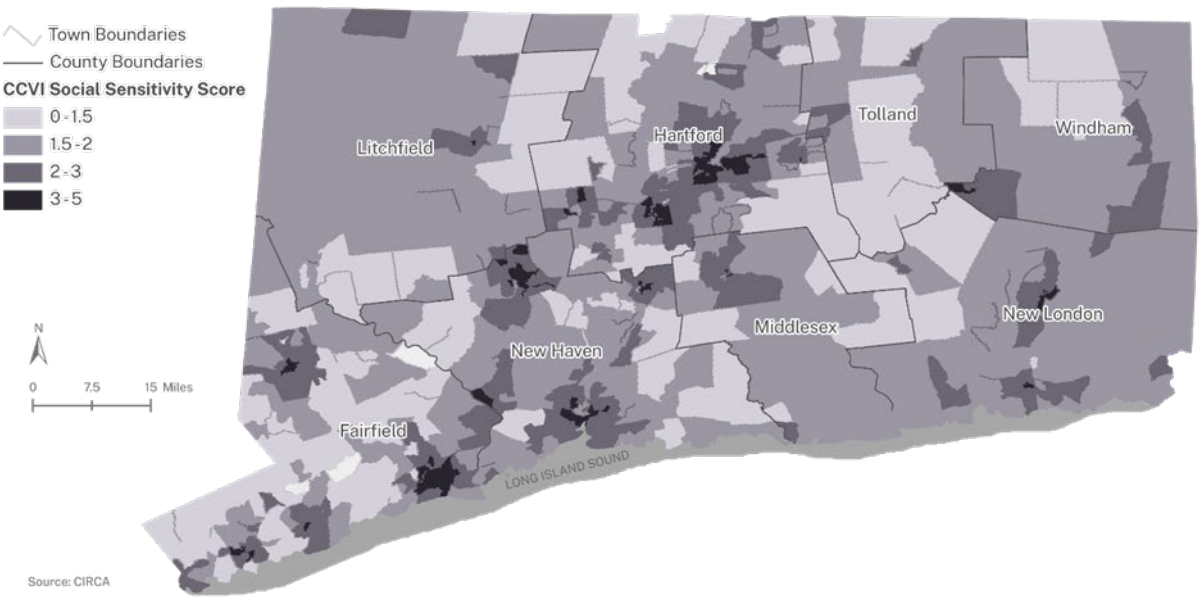


Figure 10. CCVI Social Sensitivity Scores

Sensitivity scores are used to calculate an area's vulnerability score by multiplying them by final exposure and dividing by the adaptive capacity which is the ability of a system to adjust to changes. Table 8 and Table 9 outline the indicators that were factored into the vulnerability scoring methodology.

Table 8. Heat Vulnerability Index Indicators and Components

Indicator	Component	
Built	Sensitivity	Heat Vulnerability Index
Social		
Climate	Exposure	
Physical		
Ecological	Adaptive Capacity	
Social		

Table 9. Flood Vulnerability Index Indicators and Components

Indicator	Component	
Community Assets	Sensitivity	Flood Vulnerability Index
Social		
Climate	Exposure	
Physical		
Community Assets	Adaptive Capacity	
Social		

3.1.3 Land Use and Development

Effective land use planning is a central component of any hazard mitigation strategy, as existing and planned land use patterns greatly influence a community's hazard vulnerability. Thus, future land use decisions should consider a community's potential hazards and vulnerability, and direct development towards those areas that are least vulnerable, creating a more disaster-resistant environment. FEMA requires evaluation of land use and development trends in state and multi-jurisdictional mitigation plans so that mitigation options can be considered in future land use decisions.

Most local hazard mitigation plans include a general overview of land uses and development trends. Connecticut local hazard mitigation plans were reviewed for land use trends. Detailed information from each local plan is available in Appendix 2.

Many communities in Fairfield County are projecting that limited growth will continue to occur near Metro-North rail stations including Darien, Greenwich, New Canaan, Norwalk, Stamford, Weston and Westport. Outside of Fairfield County, most growth over the last three years has been very limited.

The Multi-Resolution Land Characteristics Consortium is comprised of the United States Geological Survey in partnership with several federal agencies that coordinate to produce land cover data across the nation. Since 1992, the Multi-Resolution Land Characteristics has released five National Land Cover Database (NLCD) products with the latest version having been released in 2016. A mapped version of the NLCD is shown in Figure 11 below.

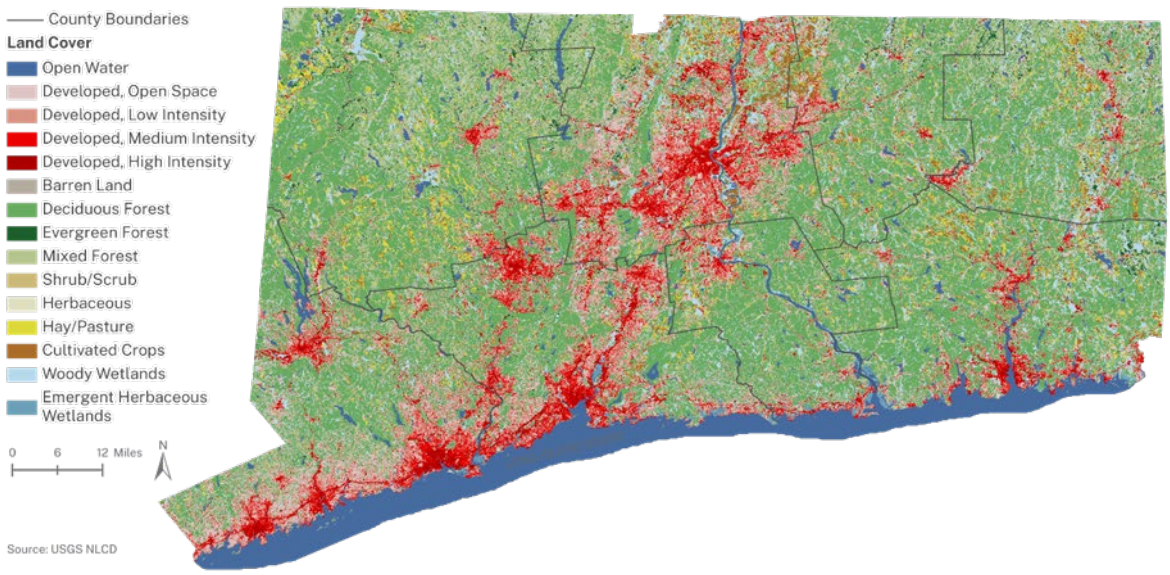


Figure 11. Connecticut land cover

There are 15 land cover types:

- Open Water- areas of open water, generally with less than 25% cover of vegetation or soil.
- Perennial Ice/Snow- areas characterized by a perennial cover of ice and/or snow generally greater than 25% of total cover.
- Developed, Open Space- areas with a mixture of some constructed materials, but mostly vegetation in the form of lawn grasses. Impervious surfaces account for less than 20% of total cover. These areas most commonly include large-lot single-family housing units, parks, golf courses, and vegetation planted in developed settings for recreation, erosion control, or aesthetic purposes.
- Developed, Low Intensity- areas with a mixture of constructed materials and vegetation. Impervious surfaces account for 20% to 49% percent of total cover. These areas most commonly include single-family housing units.
- Developed, Medium Intensity -areas with a mixture of constructed materials and vegetation. Impervious surfaces account for 50% to 79% of the total cover. These areas most commonly include single-family housing units

- Developed High Intensity-highly developed areas where people reside or work in high numbers. Examples include apartment complexes, row houses and commercial/industrial. Impervious surfaces account for 80% to 100% of the total cover
- Barren Land (Rock/Sand/Clay) - areas of bedrock, desert pavement, scarps, talus, slides, volcanic material, glacial debris, sand dunes, strip mines, gravel pits and other accumulations of earthen material. Generally, vegetation accounts for less than 15% of total cover.
- Deciduous Forest- areas dominated by trees generally greater than 5 meters tall, and greater than 20% of total vegetation cover. More than 75% of the tree species shed foliage simultaneously in response to seasonal change.
- Evergreen Forest- areas dominated by trees generally greater than 5 meters tall, and greater than 20% of total vegetation cover. More than 75% of the tree species maintain their leaves all year. Canopy is never without green foliage.
- Evergreen Forest- areas dominated by trees generally greater than 5 meters tall, and greater than 20% of total vegetation cover. More than 75% of the tree species maintain their leaves all year. Canopy is never without green foliage.
- Evergreen Forest- areas dominated by trees generally greater than 5 meters tall, and greater than 20% of total vegetation cover. More than 75% of the tree species maintain their leaves all year. Canopy is never without green foliage.
- Shrub/Scrub- areas dominated by shrubs; less than 5 meters tall with shrub canopy typically greater than 20% of total vegetation. This class includes true shrubs, young trees in an early successional stage or trees stunted from environmental conditions.
- Grassland/Herbaceous- areas dominated by gramanoid or herbaceous vegetation, generally greater than 80% of total vegetation. These areas are not subject to intensive management such as tilling but can be utilized for grazing.
- Grassland/Herbaceous- areas dominated by gramanoid or herbaceous vegetation, generally greater than 80% of total vegetation. These areas are not subject to intensive management such as tilling but can be utilized for grazing.
- Grassland/Herbaceous- areas dominated by gramanoid or herbaceous vegetation, generally greater than 80% of total vegetation. These areas are not subject to intensive management such as tilling but can be utilized for grazing.
- Moss- Alaska only areas dominated by mosses, generally greater than 80% of total vegetation.

- Pasture/Hay-areas of grasses, legumes, or grass-legume mixtures planted for livestock grazing or the production of seed or hay crops, typically on a perennial cycle. Pasture/hay vegetation accounts for greater than 20% of total vegetation.
- Cultivated Crops- areas used for the production of annual crops, such as corn, soybeans, vegetables, tobacco, and cotton, and also perennial woody crops such as orchards and vineyards. Crop vegetation accounts for greater than 20% of total vegetation. This class also includes all land being actively tilled.
- Woody Wetlands- areas where forest or shrubland vegetation accounts for greater than 20% of vegetative cover and the soil or substrate is periodically saturated with or covered with water.
- Emergent Herbaceous Wetlands- Areas where perennial herbaceous vegetation accounts for greater than 80% of vegetative cover and the soil or substrate is periodically saturated with or covered with water.

Figure 12 shows Connecticut development trends from 2006 to 2022. Data was provided by the Connecticut Department of Economic and Community Development. Building permits have increased since the 2007 – 2011 recession, hitting a peak in 2015, but have remained below the 2006 development peak. New permits decreased from 2016 to 2017, rebounded slightly in 2019, before decreasing again in 2020 and 2021, likely due to COVID-19. Building permits in 2022 totaled 5,244 – just under the total permits of 5,322 in 2015.

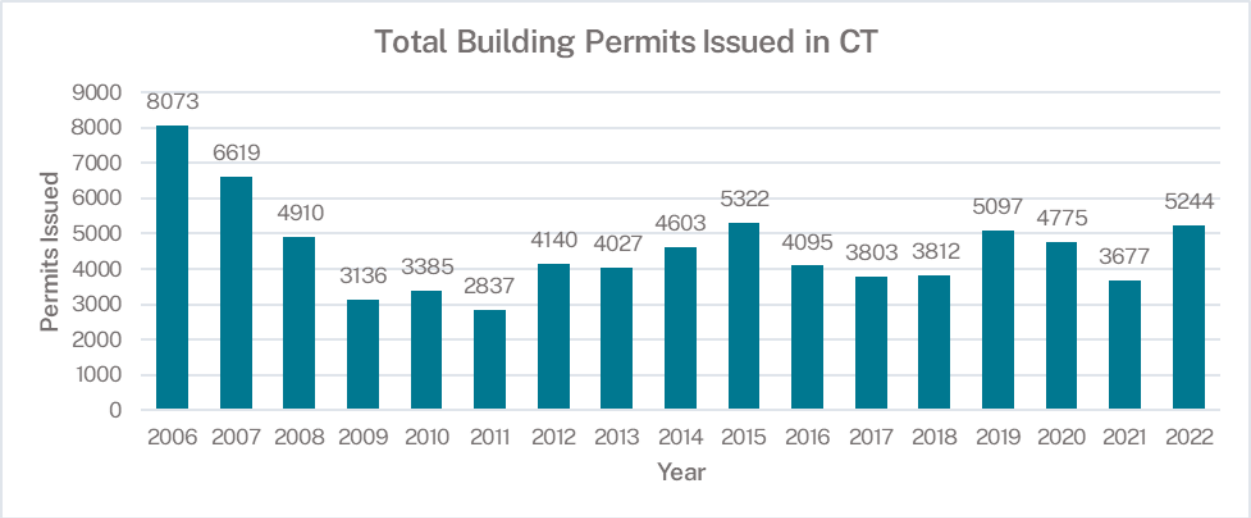


Figure 12. Total building permits by year, 2006 – 2022

Table 10 provides total building permits issued for 2018-2022 by county. Fairfield, New Haven, and Hartford continue to see the majority of development in the state. Fairfield County is popular because of its proximity to New York City for commuters with available transportation options. New Haven sees similar commuter benefits, with both Amtrak and MetroNorth rail connections. The City of Hartford is the state capitol, and many large

companies are located in either the city or Hartford County. Thus, housing demands in this region of Connecticut have increased due to improved job markets.

Table 11 shows total building permits organized by COG. Capitol Region COG and Western Connecticut COG have the highest number of building permits issued, indicating high amounts of development. While building permits decreased in 2020 and 2021, permit applications rebounded in 2022.

Table 10. Building permits by county

County	2018	2019	2020	2021	2022	Total 2018 - 2022
Fairfield	1,145	2,361	1,851	1,289	1,669	8,315
Hartford	1,154	937	922	801	872	4,686
Litchfield	13	6	31	22	227	299
Middlesex	198	142	211	244	195	990
New Haven	796	1,105	1,141	705	1,298	5,045
New London	190	179	305	188	433	1,295
Tolland	295	342	287	411	416	1,751
Windham	21	25	27	17	134	224
Total	**3,812**	**5,097**	**4,775**	**3,677**	**5,244**	**22,605**

Table 11. Building permits by COG

COG	2018	2019	2020	2021	2022	Total 2018 - 2022
Capitol Region	1,387	1,208	1,066	1,089	1,232	5,982
Metropolitan	165	366	293	314	806	1,944
Naugatuck Valley	229	309	573	328	471	1,910
Northeastern Connecticut	22	26	24	25	141	238
Northwest Hills	26	28	57	36	147	294
Lower Connecticut River Valley	201	143	216	258	214	1,032
South Central Regional	674	940	1,002	575	975	4,166

COG	2018	2019	2020	2021	2022	Total 2018 - 2022
Southeastern Connecticut	188	182	303	169	409	1,251
Western Connecticut	920	1,895	1,241	883	849	5,788
State Total	3,812	5,097	4,775	3,677	5,244	22,605

Building permit counts are an industry accepted measure of growth. However, tracked building permit information contains data for all building activity requiring a building permit (e.g., new construction, remodeling/additions, demolitions, reconstruction, etc.) so does not accurately represent new construction. Therefore, a review of changes in housing inventory was also conducted. Table 12 shows housing inventory between 2015 and 2021. As of 2021, Hartford County maintained the largest inventory of housing units in the state followed by Fairfield and then New Haven County.

Table 12. Housing inventory by county (2015 – 2021)

County	2015	2016	2017	2018	2019	2020	2021
Fairfield	368,775	370,058	371,239	371,635	373,582	374,329	375,394
Hartford	377,143	378,508	378,956	380,004	380,654	380,383	381,140
Litchfield	88,082	88,206	88,316	88,405	88,517	88,362	88,597
Middlesex	75,788	75,981	76,193	76,273	76,351	76,449	76,669
New Haven	365,471	366,124	366,672	367,616	368,949	367,990	368,855
New London	122,717	122,988	123,248	123,865	124,332	123,849	124,241
Tolland	59,177	59,532	59,809	60,069	60,384	59,997	60,401
Windham	49,440	49,524	49,632	49,788	49,912	49,840	49,987
Total	**1,506,593**	**1,510,921**	**1,514,065**	**1,517,655**	**1,522,681**	**1,521,199**	**1,525,284**

As the State reviews local mitigation plans in higher growth regions, increased emphasis will be placed on defining the impacts of growth on hazard exposure and risk. Improved data will be collected for incorporation into the next State plan update.

3.1.4 Community Lifelines

Community lifelines are the most fundamental services in the community. They are essential systems that allow critical government and essential business operations to

continue. The planning process included individuals on the Core Planning Team, SHMPT, and stakeholder group that represented community lifelines to strengthen the NHMP and enhance the state's response to hazards. Community lifelines are represented in Figure 13.



Figure 13. FEMA Community Lifelines

3.2 Connecticut's History of Natural Disasters

Recent disasters have focused the attention of citizens and government officials on hazard impacts to people, humans, the environment, critical facilities and the economy. Since the beginning of 2013, Connecticut has experienced seven major disaster declarations and another seven during the previous decade. There have been 25 State disaster declarations and 14 emergency declarations since 1954.

These disasters have had significant impacts on Connecticut and its residents, such as loss of homes, property and possessions, loss of life and injury, lost wages and business revenue, in addition to psychological and sociological costs to disaster survivors. Following Hurricane Sandy, more than 12,380 Connecticut residents in five counties and two tribal nations registered for federal disaster assistance. More than $11.5 million was approved for housing assistance, including short-term rental assistance and home repair costs. More than $32 million in low-interest disaster loans for homeowners, renters, businesses and private nonprofit organizations was approved by the U.S. Small Business Administration in addition to other aid such as medical and dental assistance. Financial support for lost personal possessions, Disaster Unemployment Assistance, and Public Assistance grants was also provided.[3]

Historically, flooding has caused the most damage to the State and its citizens, along with recent wind and winter storm disaster events. Many figures throughout this plan address the distribution of hazard events and other data by county, as decided by the SHMPT.

[3] FEMA, February 15, 2013

3.2.1 Disaster Declarations and Emergency Declarations in Connecticut

Local and State governments share the responsibility for protecting their citizens from disaster impacts and supporting recovery. When a disaster is beyond the capabilities of the state and local government to respond, federal support may be available. In 1988, the Robert T. Stafford Disaster Relief and Emergency Assistance Act was enacted to support state and local governments and their citizens when disasters overwhelm them and exhaust their resources. This law, as amended, established a process for requesting and obtaining a Presidential disaster declaration, defines the type and scope of assistance available from the Federal government, and sets the conditions for obtaining that assistance. Federal disasters and emergencies are:

A Major Disaster can be declared by the President for any natural event, including any hurricane, tornado, storm, high water, wind-driven water, tidal wave, tsunami, earthquake, volcanic eruption, landslide, mudslide, snowstorm, or drought, or, regardless of cause, fire, flood, or explosion, that the President determines has caused damage of such severity that it is beyond the combined capabilities of state and local governments to respond. A major disaster declaration provides a wide range of federal assistance programs for individuals, families, households, and public infrastructure, including funds for both emergency and permanent work.

An Emergency Declaration is more limited in scope and without the long-term federal recovery programs of a Major Disaster Declaration. The President can declare an emergency for any occasion or instance when the President determines federal assistance is needed. Emergency declarations supplement State and local or Indian tribal government efforts in providing emergency services, such as the protection of lives, property, public health, and safety, or to lessen or avert the threat of a catastrophe in any part of the United States. The total amount of assistance provided for in a single emergency may not exceed $5 million.

Four major disasters occurred in Connecticut since the previous plan was updated in May 2018 including one severe storm and flooding event, the Covid-19 Pandemic, Tropical Storm Isaias, and the Remnants of Hurricane Ida.

Table 13 provides details of federally declared disasters from 2018 through July 2023. Additional information on declared disasters is available in the hazard-specific sections as well as in Appendix 3.

Table 13. Federally Declared Disasters (1954 – July 2023) and Emergency Declarations (1978 – July 2023)

Disaster	Year	Incident Period	Disaster Types	Counties	Individual Assistance $	Public Assistance $
DR-4629-CT	2021	Sept 1 – Sep 2	Hurricane	Fairfield, Litchfield, New Haven, Middlesex, New London	$8.9M	$3.3M
EM-3564-CT	2021	Aug 21 – Aug 24	Hurricane	All		$211K
DR-4580-CT EM-3535-CT	2020	Aug 4	Tropical Storm	All		$35.1M
DR-4500-CT EM-3439-CT	2020	Jan 20, 2020 – May 11, 2023	Covid-19 Pandemic	All	$33.5M	$862.5M
DR-4410-CT	2018	Sept 25 – Sept 26	Severe Storms and Flooding	Middlesex, New London		$3M
DR-4385	2018	May 15	Severe Storm, Tornado, Straight Line Winds	Fairfield, New Haven	$18.8M	

3.3 Local Planning Coordination

In response to the planning requirements of the Disaster Mitigation Act of 2000 (DMA 2000), the State of Connecticut has encouraged and facilitated local planning efforts to ensure that local and multi-jurisdiction hazard mitigation plans are in place. Unlike many states in the country, Connecticut does not have county governments, and local governments are the primary decision-makers for land use. In Connecticut, the unit of local government is the town. Some towns are also incorporated as cities, but all local municipalities are towns. Table 14 identifies the local jurisdictions that reside within each County and COG boundary.

Table 14. Jurisdictions within each County and COG boundary

County or COG	Jurisdictions Residing Within
Counties	

County or COG	Jurisdictions Residing Within
Litchfield	Barkhamsted, Bethlehem, Bridgewater, Canaan, Colebrook, Cornwall, Goshen, Harwinton, Kent, Litchfield, Morris, New Hartford, New Milford, Norfolk, North Canaan, Plymouth, Roxbury, Salisbury, Sharon, Thomaston, Torrington, Warren, Washington, Watertown, Winchester, Winsted, Woodbury
Fairfield	Bethel, Bridgeport, Brookfield, Danbury, Darien, Easton, Fairfield, Greenwich, Monroe, New Canaan, New Fairfield, Newtown, Norwalk, Redding, Ridgefield, Sherman, Shelton, Stratford, Stamford, Trumbull, Weston, Westport, Wilton
New Haven	Ansonia, Beacon Falls, Bethany, Branford, Cheshire, Derby, East Haven, Guilford, Hamden, Madison, Meriden, Middlebury, Milford, Naugatuck, New Haven, North Branford, North Haven, Orange, Oxford, Prospect, Seymour, Southbury, Wallingford, Waterbury, West Haven, Wolcott, Woodbridge
Hartford	Avon, Berlin, Bloomfield, Bristol, Burlington, Canton, East Granby, East Hartford, East Windsor, Enfield, Farmington, Glastonbury, Granby, Hartford, Hartland, Manchester, Marlborough, New Britain, Newington, Plainville, Rocky Hill, Simsbury, South Windsor, Southington, Suffield, West Hartford, Wethersfield, Windsor, Windsor Locks
Tolland	Andover, Bolton, Columbia, Coventry, Ellington, Hebron, Mansfield, Somers, Stafford, Tolland, Union, Vernon, Willington
Middlesex	Chester, Clinton, Cromwell, Deep River, Durham, East Haddam, East Hampton, Essex, Fenwick, Haddam, Killingworth, Middlefield, Middletown, Old Saybrook, Portland, Westbrook
Windham	Ashford, Brooklyn, Canterbury, Chaplin, Eastford, Hampton, Killingly, Plainfield, Pomfret, Putnam, Scotland, Sterling, Thompson, Windham, Woodsock
New London	Bozrah, Colchester, Easy Lyme, Franklin, Griswold, Groton, Lebanon, Ledyard, Lisbon, Lyme, Montville, New London, North Stonginton, Norwich, Old Lyme, Preston, Salem, Sprague, Stonington, Voluntown, Waterford
COGs	
Capital Region Council of Governments (CRCOG)	Andover, Avon, Berlin, Bloomfield, Bolton, Canton, Columbia, Coventry, East Granby, East Hartford, East Windsor, Ellington, Enfield, Farmington, Glastonbury, Granby, Hartford, Hebron, Manchester, Mansfield, Marlborough, New Britain, Newington, Plainville, Rocky Hill, Simsbury, Somers, South Windsor, Southington, Stafford, Suffield, Tolland, Vernon, West Hartford, Wethersfield, Willington, Windsor, Windsor Locks,
Connecticut Metropolitan Council of Governments (MetroCOG)	Bridgeport, Easton, Fairfield, Monroe, Stratford, Trumbull

County or COG	Jurisdictions Residing Within
Lower Connecticut River Valley Council of Governments (RiverCOG)	Chester, Clinton, Cromwell, Deep River, Durham, East Haddam, East Hampton, Essex, Haddam, Killingworth, Lyme, Middlefield, Middletown, Old Lyme, Old Saybrook, Portland, Westbrook
Naugatuck Valley Council of Governments (NVCOG)	Ansonia, Beacon Falls, Bethlehem, Bristol, Cheshire, Derby, Middlebury, Naugatuck, Oxford, Plymouth, Prospect, Seymour, Eltonon, Southbury, Thomaston, Waterbury, Watertown, Wolcott, Woodbury
Northeastern Connecticut Council of Governments (NECOG)	Ashford, Brooklyn, Canterbury, Chaplin, Eastford, Hampton, Killingly, Plainfield, Pomfret, Putnam, Scotland, Sterling, Thompson, Union, Voluntown, Woodstock
Northwest Hills Council of Governments (NHCOG)	Barkhamsted, Burlington, Canaan, Colebrook, Cornwall, Goshen, Hartland, Harwinton, Kent, Litchfield, Morris, New Hartford, Norfolk, North Canaan, Roxbury, Salisbury, Sharon, Torrington, Warren, Washington, Winchester
South Central Regional Council of Governments (SCRCOG)	Bethany, Branford, East Haven, Guilford, Hamden, Madison, Meriden, Milford, New Haven, North Branford, North Haven, Orange, Wallingford, West Haven, Woodbridge
Southeastern Connecticut Council of Governments (SECCOG)	Bozrah, Colchester, East Lyme, Franklin, Griswold, City of Groton, Town of Groton, Borough of Jewett City, Lebanon, Ledyard, Lisbon, Montville, New London, North Stonington, Norwich, Preston, Salem, Sprague, Stonington, Borough of Stonington, Waterford, Windham
Western Connecticut Council of Governments (WestCOG)	Bethel, Bridgewater, Brookfield, Danbury, Darien, Greenwich, New Canaan, New Fairfield, New Milford, Newtown, Redding, Ridgefield, Sherman, Stamford, Weston, Westport, Wilton

The multi-jurisdictional hazard mitigation plans developed by each COG do not rank communities based on vulnerability and risk, but information related to damage and loss due to natural hazards was provided. Table 15 displays the most vulnerable municipalities in each COG based on total annualized loss estimates, where available.

Table 15. Local Jurisdiction, by Total Annualized Loss Estimate

COG	Town	Total Annualized Loss Estimate
CRCOG	Hartford	$11,093,000
WestCOG	Stamford	$5,748,000
MetroCOG	Bridgeport	$4,771,000
NVCOG	Waterbury	$3,469,000
NHCOG	Torrington	$893,000
RiverCOG	N/A	-
SCRCOG	N/A	-
SECCOG	N/A	-

COG	Town	Total Annualized Loss Estimate
NECOG	N/A	-

Connecticut began assisting communities in the drafting of local hazard mitigation plans in 1997, utilizing Flood Mitigation Assistance (FMA) planning grant funds. The town of Westport was the first community to complete a local hazard mitigation plan in 1998. The State of Connecticut's current approach is to work with Councils of Government (COGs) as frequently as possible to prepare multi-jurisdiction hazard mitigation plans. Connecticut COGs currently include:

1. Capital Region Council of Governments (CRCOG)
2. Connecticut Metropolitan Council of Governments (MetroCOG)
3. Lower Connecticut River Valley Council of Governments (RiverCOG)
4. Naugatuck Valley Council of Governments (NVCOG)
5. Northeastern Connecticut Council of Governments (NECOG)
6. Northwest Hills Council of Governments (NHCOG)
7. South Central Regional Council of Governments (SCRCOG)
8. Southeastern Connecticut Council of Governments (SECCOG)
9. Western Connecticut Council of Governments (WestCOG)

Figure 14 below shows the status of the multi-jurisdictional hazard mitigation plans of each of Connecticut's COGs as of November 10, 2023.

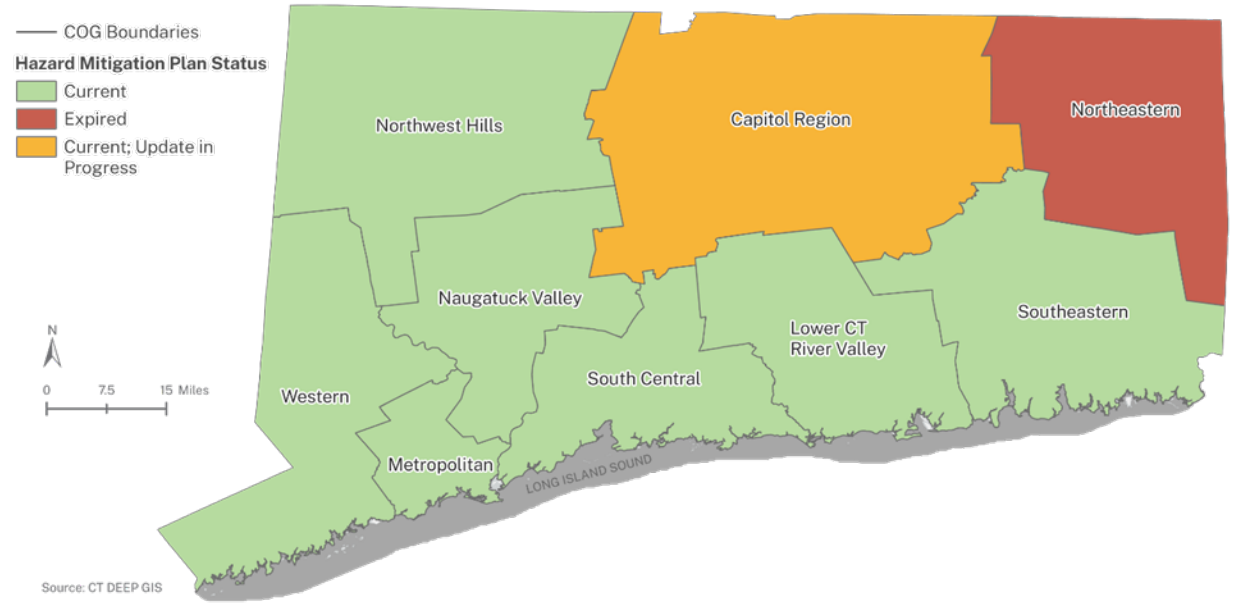


Figure 14. Status of Multi-Jurisdictional Hazard Mitigation Plans for Connecticut Council of Governments

When FEMA BRIC or Hazard Mitigation Grant Program (HMGP) planning grant funds are made available, the State solicits grant sub-applications from eligible sub-applicants such as municipalities or COGs. The sub-applications are reviewed for eligibility and completeness by the Connecticut Division of Emergency Management and Homeland Security (DEMHS) and are then evaluated and ranked by the Connecticut Interagency Hazard Mitigation Committee (CIHMC). All municipalities and COGs can apply for local assistance to update their hazard mitigation plans. Further details on FEMA programs are available in **Section 5.2.2** of the **Capability Assessment Chapter**.

Table 16 provides a list of planning projects funded in part by FEMA grants from Federal Fiscal Years 2018 - 2022. Status of activities reflects information from FEMA as of this plan update. A full table of Connecticut's hazard mitigation activities is available in the **Capability Assessment Chapter**.

Table 16. List of past and current activities funded by FEMA (FFY18 – FFY22)

Federal Fiscal Year	Program	Description	Status	Federal Funding	Local Funding
FFY18	PDM	NW Hill NHMP Update	Obligated	$65,879.67	$22,093.23
FFY18	PDM	RiverCOG Multi-Jurisdictional NHMP	Obligated	$187,500.00	$62,500.00

Federal Fiscal Year	Program	Description	Status	Federal Funding	Local Funding
FFY18	PDM	WestCOG Local Multi-Jurisdictional Multi HMP	Obligated	$186,197.93	$32,496.57
FFY18	PDM	NVCOG PDM-8	Obligated	$300,000.00	$100,000.00
FFY19	FMA	Stratford Elevation of Private Structures	Obligated	$278,750.00	-
FFY19	HMGP	Darien Acquisition of Private Real Property	Approved	$506,131.00	$192,270.66
FFY19	PDM	Resilient Infrastructure: Coastal Flood Protection for Bridgeport	Identified for Further Review	$10,000,000.00	-
FFY20	BRIC	Hartford: FEMA BRIC Subapplication	Identified for Further Review	$8,100.00	$2,700.00
FFY20	BRIC	Project Scoping for Hazard Mitigation	Identified for Further Review	$112,500.00	$37,500.00
FFY20	BRIC	Tree Hazard Mitigation Program	Identified for Further Review	$111,999.30	$35,000.70
FFY20	BRIC	SCCOG Multi-Jurisdiction HMP Update	Awarded	$149,963.25	$49,987.75
FFY20	BRIC	SCRCOG Multi-Jurisdiction HMP Update	Awarded	$132,000.00	$41,250.00
FFY20	BRIC	Norwich, Upper Falls Dam Removal Scoping and Concept Design	Awarded	$44,100.00	$14,700.00
FFY20	HMGP	State Multi HMP Update	Approved	$225,000.00	$25,000.00
FFY21	BRIC	Windham Water Works Reservoir Infrastructure Project Scoping, Concept Design, and Hazard Mitigation	Identified for Further Review	$100,800.00	-

Federal Fiscal Year	Program	Description	Status	Federal Funding	Local Funding
FFY21	BRIC	Bridgeport Flood Mitigation – Project Scoping	Identified for Further Review	$675,000.00	-
FFY21	BRIC	Harbor Brook Flood Control/100 Hanover Street Demolition Project in Meriden	Identified for Further Review	$303,187.50	-
FFY21	BRIC	City of New Haven Inland and Coastal Flood Resiliency Project	Awarded	$25,094,886.00	-
FFY21	BRIC	Meriden Harbor Brook Flood Resilience	Awarded	$11,165,250.00	-
FFY21	HMGP	New Haven Retrofitting Public Structures – Wind	Approved	$1,002,600.00	$111,400.00
FFY21	HMGP	Stratford Planning Related Activities	Approved	$108,156.15	$12,017.35
FFY22	PDM	Capitol Region NHMP Update	Obligated	$189,000.00	$63,000.00
FFY22	PDM	CIRCA	Obligated	$2,300,000.00	$803,682.00
FFY22	BRIC	North and South Meadows Stormwater Pumping Station – Non-Localized Flood Risk Reduction	Identified for Further Review	$176,250.00	-
FFY22	HMGP	Hartford Advanced Assistance	Approved	$211,500.00	$23,500.00

3.3.1 Summary of Planning Efforts

As noted above, hazard mitigation planning is typically performed at the community level; this is true even when COGs coordinate the planning efforts. Connecticut has 169 municipalities, the Mashantucket Pequot and Mohegan tribal governments, and the political subdivisions of Groton and Stonington for a total of 173 local political entities. Most of the individual community plans are multi-jurisdictional plans developed by COGs, with the remainder being developed by and for individual communities.

Appendix 2 of this plan contains details on the local plans for each jurisdiction, including the FEMA approval date, the expiration date, and the status of the plan. At the time of the NHMP update, all multi- and single-jurisdictional plans were current or in the process of being updated, except the NECCOG, which was expired. All established local plans and draft plans submitted to the State were used as a source to inform the 2023 Connecticut NHMP Update.

3.3.2 Local Planning Process

Development of a natural hazard mitigation plan at the community level is vital if the community seeks to comprehensively address natural hazards. Communities cannot prevent disasters from occurring; however, they can lessen the impacts and associated damages from these disasters. An effective plan will improve a community's ability to deal with natural disasters and will document valuable local knowledge on the most efficient and effective ways to reduce losses. Preparing a plan to lessen the impact of a disaster before it happens will provide the following benefits to a community:

- Reduce public and private damage costs.
- Reduce social, emotional, and economic disruption.
- Provide better access to funding sources for natural hazard mitigation projects.
- Improve implementation of post-disaster recovery projects.

DEMHS provides technical assistance to sub-applicants for planning efforts and projects. Technical assistance includes meeting with local officials and COGs to facilitate the planning process, providing available planning guides and tools to support plan development, and reviewing and providing feedback on draft plans submitted for FEMA approval.

DEMHS reviews and analyzes all single-jurisdictional and multi-jurisdictional plans when they are submitted to the agency prior to being forwarded to FEMA. DEMHS plays an active role in the coordination of these reviews. DEMHS is knowledgeable in the contents of each plan and through its review verifies that all plans are consistent with the CT NHMP and DEMHS's mission. DEMHS also provides comments to the community or COG to assure the single- or multi-jurisdictional plan is complete and consistent with all State and FEMA requirements. The 201 Local Mitigation Plan Review Tool during 2013 was formerly used to provide comments to local officials; it was replaced by the 2023 Local Hazard Mitigation Plan (LHMP) Review Tool in 2023.

The steps established for this process are shown in Figure 15 and are as follows:

- Receipt of draft plan – Day 1.
- Initial plan review and submission of draft comments to community – within 30 days of receipt of draft plan.

- Comprehensive review, including time for community to revise plan based on initial comments – 60 to 120 days from submission of draft comments to community.
- CT DEMHS submits plan and its comments to FEMA – within 30 days of receipt of final draft from community for the comprehensive review.
- Incorporate new data from FEMA approved local plan into the state's NHMP by the next update of the NHMP.

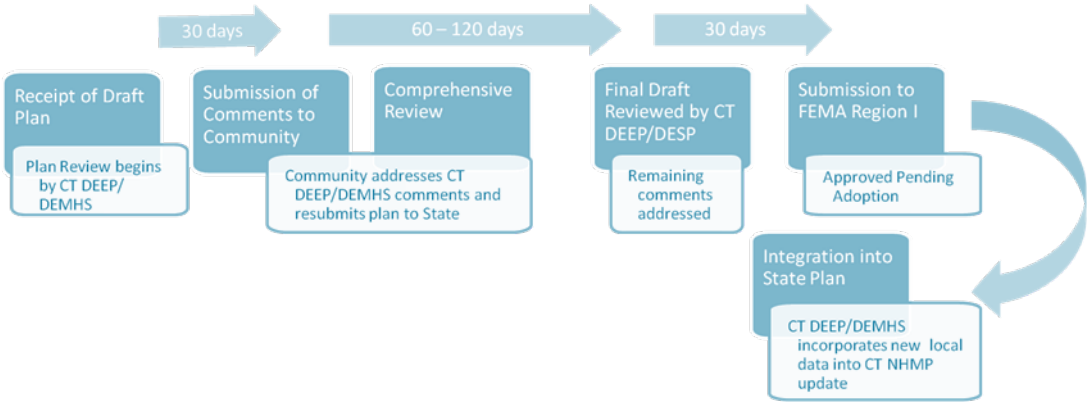


Figure 15. Local plan submittal process and integration into State NHMP

Once the initial state review is completed, DEMHS will forward the LHMP to FEMA for its initial review. If the LHMP meets all the requirements to receive conditional approval, FEMA will send the COG or the community an Approval Pending Adoption. If the LHMP requires revisions, FEMA will forward comments to DEMHS. DEMHS will then send the COG or community a letter with comments from both FEMA and the State and will provide additional technical assistance to the community as it revises the plan. Once the revisions are made to the plan, the COG or community will submit a final draft plan to DEMHS. DEMHS then will forward the final draft plan to FEMA for Conditional Approval. FEMA will then send a letter of Approval Pending Adoption to the COG or the community when it is approvable.

At this point, the community will hold a public hearing and formally adopt the mitigation plan. A signed resolution of adoption will then be sent to DEMHS. DEMHS will then forward the adoption documentation to FEMA who will review and then issue a letter of approval to the community with a copy to the COG and DEMHS.

3.3.2.1 Additional State Technical Assistance

In addition to the assistance provided as outlined above, DEMHS provides technical assistance in the form of training, individual meetings with COGs, and ad-hoc technical assistance via telephone or meetings, as requested. It is the responsibility of the local community to update its LHMP at least once before expiration in five years, although the community may choose to update the LHMP more frequently. Risk assessments from the local plans will be used periodically to enhance Connecticut's hazard identification and risk

assessment where applicable. Furthermore, DEEP considers actions common to all plans to target resources for mitigation outreach, technical assistance and grant offerings.

As an important tool to inform local hazard mitigation planning, DEMHS distributes the most recently approved State hazard mitigation plan to local municipalities and to the COGs both upon completion of the State plan, and upon initiation of the local plan update process. DEMHS encourages communities to incorporate loss estimates, risk assessment results, and hazard mitigation goals, objectives, and actions into local plans. For the 2023 plan update, when able, DEMHS passed out hazard data by both county and GOG boundaries. This change will significantly aid COGs and local governments during updates to their plans.

In recent years, state agencies such as DEMHS and DEEP have taken an active role recommending local adoption of specific hazard mitigation strategies across all municipalities, in pursuit of specific state goals. These agencies help develop recommended strategies, work with the COGS and consultants to refine and incorporate those strategies, and participate in local planning workshops and meetings to help secure buy-in and support.

Additional State capabilities in support of hazard mitigation planning is provided and described in the **Capability Assessment Chapter** of this plan.

3.3.3 Tribal Planning Process

The Tribal Hazard Mitigation Plans in Connecticut have historically been included in the multi-jurisdictional plans, by choice of the tribes. Both the Mashantucket Pequot Tribal Nation and Mohegan Tribe are included in the most recent Southeastern Connecticut Council of Government's Multi-Jurisdictional HMP. The tribal mitigation planning requirements under 44 CFR § 201.7(a)(4) specifically allow tribal governments to participate in multi-jurisdictional mitigation plans, including Participating in a Local/Tribal Multi-Jurisdictional Plan, where the tribal government participates in a planning process with local governments. In this case, the tribe must meet the requirements for tribal mitigation planning specified in 44 CFR § 201.7.

Generally, for tribal plans, the state follows the same process and timeframe that are outlined in Section 3.3.2. However, the multi-jurisdictional mitigation plan review tool and guidance are supplemented with the tribal mitigation plan review guide and tool, and both are submitted to FEMA. The twelve specific steps followed by the state and FEMA in the tribal plan review process are outlined in the FEMA 2017 Tribal Mitigation Plan Review Guide.

3.3.4 Local Challenges and Needs

Municipalities and tribal governments can face numerous challenges in effectively managing risks and mitigating hazards. Table 17 presents some of the challenges mentioned by Connecticut municipalities, along with descriptions and relevant notes.

Table 17. Representative challenges faced by Connecticut Municipalities

Challenge	Notes
Municipal Staff Capacity	Municipalities mentioned budget for tree maintenance or winter operations is sufficient and noted that the constraint is staffing related. There is limited staff to operate the vehicles, especially during extreme storm events. Few communities explicitly stated the training opportunities and the status of municipal staff. Often mentioned that the Emergency Management Department was responsible for training and emergency exercises; however, specific hazards addressed, or training certifications were not included. Select towns included goals for staff to attend Computer-aided facility management trainings.
Budget Constraints	Limited funding to upgrade culverts and address undersized drainage systems. Municipalities mentioned that tree trimming budget was insufficient to properly manage dangerous, dead, or diseased trees. No capacity to proactively manage trees. May be able to remove tree debris from the roads but did not have proper equipment to trim trees. Ability to implement mitigation activities is tied to financial limitations.
Operational	Limited storage areas for snow. Sand and salt mixtures used to treat ice on roads create drainage concerns by clogging systems. Power disruption damaging operations and communications. Challenge maintaining emergency vehicle access through numerous towns, especially within discussions around wildfire risk and high hazard areas with limited access. Road blockages due to downed power lines and trees were a concern in local plans. These conditions combined with one-way roads may create isolated areas in town during extreme weather events.
Internal Coordination	May be difficult to have different local agencies agree on the drainage maintenance required to reduce flooding and other approaches to hazard mitigation. Some communities did not have a defined schedule for culvert and drainage cleaning or maintenance. It is conducted “as needed’ or stated that no schedule is followed.

Challenge	Notes
External Coordination	Municipalities may face risks due to influences and hazards located in other communities. Coordination between municipal staff, local utility companies, and property owners to properly manage trees to reduce potential for power disruption. Some communities share equipment or rely on shared contractors for tree maintenance and winter operations so hazard response equipment is not readily available. Even communities with their own staff and equipment may need to fire contractors for larger events. A limited number of contractors may result in delays while a community waits for workers to become available. Contractors are shared between communities, municipalities, and the state. Utility is responsible for trimming near power lines. The State is responsible for trimming on State Roads. Improved coordination between parties is needed to enhance tree maintenance. Preparation may rely on resident "buy-in" and participation, including but not limited to educating private communities about road and tree maintenance to ensure emergency access, encouraging residents to cut trees that may be dangerous to power lines, outreach about fire safety, reducing pesticide use, and implementation of flood mitigation practices on private property.
Shelter Space	Communities mentioned towns' sheltering capacity was limited or insufficient for town's population.
Communication	Municipalities referenced language barriers within discussions around emergency communications and public education efforts, specifically, Branford mentioned challenges reaching those with limited English proficiency in the emergency alert notifications. Concern around power outages during extreme weather and impacts on communication capabilities in town. Warren can send email blast notifications, but this action is not helpful when power is out across the community. Some towns subscribe to the CT Alert system, but do not use it. Few municipalities mentioned that residents do not utilize or subscribe to the CT Alert system, often marking notifications as spam. Most communities have their own emergency communication protocols, but these are often limited and easily affected by power outages. Regional systems such as the Litchfield County Dispatch have been effective. Support from such regional systems may be beneficial.

Challenge	Notes
High Hazard Potential Dam Management	Municipalities may face risks due to influences and hazards located in other communities. This includes local mitigation policies, programs, and capabilities to reduce vulnerabilities to high hazard potential dams located in neighboring municipalities. Addressing the separation between hazard location and the extent of impact relies on increased communication between communities and shared mitigation programs. There is a lack of funding within municipalities to address vulnerabilities effectively and quickly from dams and implement mitigation strategies to overcome challenges. Municipal staff often lack technical expertise to properly assess risk and address vulnerabilities, requiring reliance on external partners and contractors. Ownership and access challenges exist as some dams are privately-owned. Private owners may not allow municipal officials to access and conduct inspections as needed. Jurisdiction over these dams can be unclear and challenging. CT has addressed some of these challenges by consolidating responsibilities and authorities within the CT DEEP Dam Safety Regulatory Program. The program requires that all dams be inspected periodically by a qualified engineer. It also requires that owners of high hazard dams and significant hazard dams to submit Emergency Action Plans (EAP) every two years. The DEEP Dam Safety Regulatory Program maintains an inventory of dams in the state to show the location, hazard class, owner type, and dam status. The goals of these efforts are to streamline dam safety methods across the state, enhance technical capacity, and share knowledge around hazardous dams. Ongoing challenges that exist, beyond funding and technical limitations, relate to coordinating with and reporting to CT DEEP.
Local Hazard Mitigation Planning	Challenges to updating, developing, and implementing FEMA-approved local government mitigation plans include limited municipal staff capacity, funding, technical experience, institutional knowledge and awareness of hazard risk and mitigation opportunities. The state of Connecticut has been working to address these barriers through the following steps: • Develop LHMP at the COG level so that regional entities can take on grant application management and increase capacity to carry out updates. • Maintain climate hazard data and projections to inform future updates. • Facilitate partnerships and knowledge sharing through coordination with COGs. Statewide programs like Sustainable CT, Resilient Connecticut, and CIRCA, provide resource for green infrastructure, suite of actions to address hazards, and identification of vulnerabilities. • Providing the State Natural Hazard Mitigation Plan and Risk MAP data to local/regional plan developers. The plan is provided after each update and at the initiation of a local plan update.

3.3.4.1 State Grant Priorities

Identifying these challenges provides the state with a better understanding of how to assist municipalities with targeted hazard mitigation actions, including through the development of specific recommendations. . The state, when considering distribution of funding for planning and project grants under federal and non-federal programs, is able to consider the impact of grant monies in addressing the challenges outlined above and work to maximize benefits to communities. Agencies responsible for grant programs, like CTDEEP, consider environmental justice benefits, integration of nature-based solutions, co-benefit creation, and regional collaboration and partnerships.

The Connecticut Interagency Hazard Mitigation Committee (CIHMC) helps DEMHS to prioritize grant funded activities for FEMA HMA programs. While Benefit Cost Ratio of received applications is a top screening tool, consideration of social vulnerability, underserved communities and preferences for green infrastructure. Projects that have monetary benefits the largest number of people, property and assets are given priority, as are similar projects with co-benefits. (e.g., a flood mitigation project that also includes green infrastructure that provides extreme heat adaptation components).

See Appendix 2.3 (Connecticut HMGP Administrative Plan) for project prioritization criteria for jurisdictions to receive planning and project grants.

3.3.4.2 Steps to Address Local Challenges

Connecticut institutions and organizations (refer to Sections 5.3 and 5.6) have taken and continue to pursue steps to address challenges for local governments to implement mitigation policies, programs, and capabilities. These challenges are highlighted in Table 17, and the following are actions taken by the state to address barriers to effective mitigation of hazards.

- Connecticut COGs support local governments with LHMP updates.
- State agencies such as DEEP and DEMHS, as well as UConn CIRCA, providing training and technical assistance.
- CT has established state grant opportunities to fund resilience and sustainability efforts such as Resilient Connecticut and Sustainable CT.
- State agencies have taken on the responsibility of certain activities to relieve strain on municipal resources and capacity including dam inspections, maintenance, enforcement, and planning processes.
- DEEP's Dam Safety Program provides enforcement support and technical assistance to municipalities and dam owners and state bond funds are often used for dam repairs for dams on government property.

- State agencies complete studies and reports to inform local planning efforts and hazard identification, such as CIRCA hazard information and GC3 sustainability goals.
- Encourage regional cooperation and partnerships through incentivizing funding opportunities and approach to mitigation planning. This includes mutual aid agreements and shared services and equipment.
- Provides model regulatory language (e.g., stormwater best management practices, floodplain management).
- Provides technical assistance through DEEP and DEMHS including assistance with BCA and FEMA GO.

3.4 Climate Change Assessment

Climate change is both a present threat and a slow-onset disaster. It acts as an amplifier of existing hazards and can create new hazards. The warmest 10 years on record in Connecticut have been reported since 1990 with half of these since 2010, capturing statewide warming and rising temperatures in recent decades. Extreme weather events have become more frequent as intense precipitation events are associated with increased temperatures; for example, Hurricane Irene, Superstorm Sandy, and several Nor'easters have resulted in significant damage along the coast and severe flooding.[4] The conditions in Connecticut align with the global climate trends. Current and projected elevations in sea level, coupled with potentially higher hurricane wind speeds, rainfall intensity, and storm surges are expected to significantly harm coastal communities. More intense heat waves may mean more heat-related illnesses, droughts, and wildfires. The Plan update includes a brief discussion of how climate change might impact the frequency, intensity, and distribution of specific hazards.

3.4.1 Climate Impacts: Global Trends

Global projected climate change is based on the Intergovernmental Panel on Climate Change (IPCC) Sixth Assessment Report (AR6), released in 2023. AR6 replaced the standards employed in previous reports with new scenarios called Shared Socio-Economic Pathways (SSPs). These are not directly comparable to the Representative Concentration Pathways (RCPs) used in the Fifth Assessment Report (AR5), which was released in 2014. The SSPs were combined with approximate additional radiative forcing levels resulting from climate change to develop final scenarios.

[4] CIRCA, *Connecticut Physical Climate Science Assessment Report (PCSAR) Observed trends and projections of temperature and precipitation*. August 2019.

There are five broad narratives for future socio-economic development as summarized by the SSPs. The pathways indicate a wide range of plausible societal and climatic futures, from below 1.5°C warming to over 4°C warming by 2100. Climate scenarios have a common baseline period of 1995-2014, updating the 1986-2005 baseline period that was used in the previous AR5. Each scenario is summarized below.[5]

- **SSP1-1.9**: Very low GHG emissions scenario. Holding warming to approximately 1.5°C above 1850-1900 with no or limited overshoot. Implied net-zero CO2 emissions around 2050.
- **SSP1-2.6**: Low GHG emissions scenario. Warming stays below 2°C with implied net-zero emissions around 2070.
- **SSP2-4.5**: Intermediate GHG emissions scenario. Scenario deviates mildly from "no additional climate policy" scenario and includes a slight reduction in CO2 emissions. Resulting in best-estimate warming of around 2.7°C by 2100.
- **SSP3-7.0**: High GHG emissions scenario. Resulting from no additional climate policy with high non-CO2 emissions, including high aerosol emissions. Limit warming to 4°C by 2100.
- **SSP5-8.5**: Very High GHG emissions scenario. Exceed warming of 4°C by 2100. Resulting from no climate policy with continued fossil fuel development pathways.

Based on the SSP scenarios outlined above and in-depth analysis of climate policy possibilities, AR6 predicts future changes in global temperature, precipitation, sea level rise, and overall climate risk. Particularly relevant to Connecticut are the following globally observed trends and projections and key findings identified in the AR6, select projections are specific to North America.[6]

- Global surface temperatures have reached 1.1°C above 1850-1900 in 2011-2020. Global GHG emissions have continued to increase.
- Adaptation gaps exist, despite planning and implementation of adaptation measures across sectors and regions. Adaptation options that are feasible today will become less effective with increasing warming temperatures.
- Global GHG emissions projected into 2030, based on Nationally Determined Contributions (NDCs) announced in 2021, make it likely that warming will exceed

[5] IPCC, 2022: *Climate Change 2022: Impacts, Adaptation, and Vulnerability*. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [H.-O. Pörtner, D.C. Roberts, M. Tignor, E.S. Poloczanska, K. Mintenbeck, A. Alegría, M. Craig, S. Langsdorf, S. Löschke, V. Möller, A. Okem, B. Rama (eds.)]. Cambridge University Press. Cambridge University Press, Cambridge, UK and New York, NY, USA, 3056 pp., doi:10.1017/9781009325844.
[6] IPCC, 2022

1.5°C during the 21st century and create challenges for limiting warming below 2.0°C.

- At 1.5°C of global warming, heavy precipitation and flooding events are projected to intensify and become more frequent in most regions of North America.
- At 2.0°C or above, more frequent and/or severe droughts are projected in North America.
- Projected increases in frequency and intensity of heavy precipitation will increase rain-generated local flooding.
- Extreme sea levels due to storm surge are projected to occur more frequently by 2100, increasing climate-related risks for coastal communities, including to people, infrastructure, and ecosystems.
- Hazards and associated risks expected in the near term include increased heat-related mortality; food-born, vector-born, and water-borne diseases; flooding in low-lying areas; biodiversity loss; decreases in food production.
- For any given scenario and warming level in the future, climate-related risks are higher than assessed in the previous AR5 and the projected long-term impacts are multiple times higher than currently observed.
- Green and blue infrastructure supports carbon storage and can reduce energy use and risk from extreme events such as heatwaves, flooding, droughts, and heavy precipitation, either on its own or combined with traditional grey infrastructure methods. Natural infrastructure provides co-benefits for health and well-being.

3.4.2 Climate Impacts: Local Trends

Three recent reports were referenced in the development of this HMP update, including the 2019 Connecticut Physical Climate Science Assessment Report (PCSAR) published by CIRCA, the 2022 Connecticut State Climate Summary produced by NOAA National Centers for Environmental Information, the 2018 Fourth National Climate Assessment (NCA4), and the Governor's Council on Climate Change (GC3) Phase 1 Report: Near-Term Actions (2021). All projections included in the 2019 PCSAR utilize the high CO_2 emissions scenario from the IPCC AR5 (RCP8.5).

The development of the CCVI under CIRCA and the Resilient CT, a program to evaluate flood, heat, and social vulnerabilities across the state and identify zones of shared risk and prioritize actions that build resilience, was also referenced.

3.4.2.1 Connecticut Climate

The climate of Connecticut is influenced by its geographic location, including its location on the coast of the Atlantic Ocean, as well as the effects of the hot and cold air masses from the interior of the continent. It is characterized by cold, snowy winters and warm, humid summers. The state is located near the jet stream, contributing to variable weather patterns and abundant annual precipitation. Coastal areas along the state experience warmer winters and longer frost-free seasons when compared to the inland portions of Connecticut. The average annual temperature is 49.9°F with average temperatures of 27.2°F in January and 72.4°F in July. Extreme temperatures are observed across the state with some variability by location.[7]

While heat and cold waves, heavy precipitation events, inland flooding, winter storms, nor'easters, and hurricanes have always occurred in Connecticut, the state has experienced numerous disaster declarations in the past decade and been impacted more intensely in recent years by such events.

3.4.2.2 Temperature Trends

Historical Temperature

Across the Northeastern United States temperatures have generally remained above the 1901-1960 average, both annually and especially during the winter.[8] According to the 2018 Fourth National Climate Assessment (NCA4), recent decades have been the warmest in at least the past 1,500 years. Annual average increases in temperatures in the region range from less than 1.0°F in West Virginia to 3.0°F or more in New England since 1901.[9] Average annual temperatures in Connecticut have risen almost 3.5°F since the beginning of the 20th century. The greatest number of hot days occurred during 2010-2014 and 2015-2020 and since 1995, the number of warm nights has been consistently above the long-term average from 1895-2020.[10]

Seasonal differences in Northeast temperatures have decreased recently as winters have been warming at three times the rate of summer temperatures.[11] Since 1895, increases in seasonal average temperatures have been observed in Connecticut, with the greatest

[7] Runkle, J., K.E. Kunkel, S.M. Champion, D.R. Easterling, B.C. Stewart, R. Frankson, W. Sweet, and J. Spaccio, 2022: Connecticut State Climate Summary 2022. NOAA Technical Report NESDIS 150-CT. NOAA/NESDIS, Silver Spring, MD, 6 pp.
[8] Kunkel, K.E. Stevens, L.E. Stevens, S.E. Sun, L. Janssen, E. Wuebbles, D. Rennells, J. DeGaetano, and A. Dobson, J.G. (2013). Regional Climate Trends and Scenarios for the U.S. National Climate Assessment: Part 1. Climate of the Northeast U.S. NOAA Technical Report NESDIS 142-1 (United States, National Oceanic and Atmospheric Administration, National Environmental Satellite, Data, and Information Service). Washington, D.C. https://www.nesdis.noaa.gov/sites/default/files/asset/document/NOAA_NESDIS_Tech_Report_142-1-Climate_of_the_Northeast_US.pdf
[9] Fourth National Climate Assessment. Climate Change Impacts in the United States. Chapter 18: Northeast.
[10] Runkle et al. (NOAA Report)
[11] Fourth National Climate Assessment. Climate Change Impacts in the United States. Chapter 18: Northeast.

increase experienced in winter months[12]. Analysis of observed temperatures in the Northeast region show a clear warming of the coldest day of the year by 2.83°F and a decrease in the number of frost days per year in recent decades.[13]

A 2013 NOAA technical report stated that fifteen of the winters from 1992-2011 were above average. There had been an increasing trend in the length of the freeze-free season since the mid-1980s, with the average season length during 1991-2010 being about 10 days longer than during 1961-1990. Overall warming was further evidenced by later ice-in dates on northeastern lakes, decreases in average snow depth, and an increase in the rate of sea-level rise along the coast.[14]

Temperature Projections

The Northeast will experience an increase in mean temperatures, with little spatial variation. By 2035, under both lower and higher emission scenarios (RCP4.5 and RCP8.5), the Northeast is projected to be more than 3.6°F warmer on average compared to temperatures during the preindustrial era. Such warming would be the largest projected increase in the contiguous United States. This would also occur as much as two decades before global average temperatures reach a similar warming point.[15]

Warming in the region will be associated with increases in heat wave intensity and decreases in cold wave intensity. In line with historic trends, winters are projected to be milder in the region with fewer cold extremes, particularly within inland and northern areas. Consequently, shorter cold seasons with fewer frost days will become the norm in the region. There will be a longer transition out of winter into the growing season.[16]

Large increases in annual temperature are projected in Connecticut, with estimates of 5°F to 8°F higher mean temperatures by mid and late century, respectively. The greatest increase by mid-century is expected in the summer months with June-August experiencing temperature increases of 6°F. By the end of the century, it is projected that the fall months of September-November will have the largest warming with an estimated 10°F increase in seasonal mean temperature. The extreme summer and fall increases are likely related to surface drying resulting from high evapotranspiration rates in the absence of increased precipitation quantities. Regarding extreme heat conditions, it is projected that warm spell days in the state will increase from the current count of four per year to an estimated 48 per year by 2050. Frost days, defined by days with a minimum temperature below 32°F, will decrease from 124 days under current conditions to 85 days per year in Connecticut at mid-century.[17]

[12] Runkle et al. (NOAA Report)
[13] CIRCA PCSAR 2019.
[14] Kunkel et al. (NOAA Report)
[15] Runkle et al. (NOAA Report)
[16] Fourth National Climate Assessment. Climate Change Impacts in the United States. Chapter 18: Northeast.
[17] CIRCA PCSAR 2019.

3.4.2.3 Precipitation Trends

Historical Precipitation

Precipitation has been highly variable over time but observed data from 1895-2020 shows annual precipitation has generally been above average since the 1970s. The driest periods were during the 1960s, which were characterized by a very severe, long-term drought particularly intense in New England.[18] The NCA4 reported that precipitation trends in the Northeast have been towards increases in rainfall intensity and further increases are expected to follow this historical trend.[19] This is in line with the previous NCA that stated, "The Northeast has experienced a greater recent increase in extreme precipitation than any other regions in the United States; between 1958 and 2010, the Northeast saw more than a 70% increase in the amount of precipitation falling in very heavy events (defined as the heaviest 15 of all daily events)."[20]

Annual precipitation in Connecticut has also been variable, though increasing over most areas. Since 1950, the largest increase in precipitation has been seen during the summer months. A slight decrease has been observed in precipitation quantities during the winter season. Overall, the intensity of rain events in Connecticut has increased while the number of wet days has decreased, based on observations of precipitation extremes since 1980.[21] Records from 1895-2020 indicate that the single driest year in Connecticut was 1965 with a statewide average of 30.7 inches of rainfall. The wettest year was 2011 with 62.7 inches. The highest number of two-inch extreme precipitation events occurred during 2005-2014. Summer precipitation was generally above average in the 2000s and early 2010s. Despite trends towards increasing precipitation quantities and intensities, Connecticut experienced extreme drought conditions in 2016-2017 and in 2020, straining water supplies.[22]

Precipitation Projections

Models indicate that precipitation will increase across the entire northeastern United States, consistent with recent precipitation trends in the region towards heavy and intense rainfall events. Under the high emissions scenario (RCP8.5), monthly precipitation in the Northeast is projected to be about one inch greater for December through April by 2100.[23] For heavy precipitation events, specifically those above the 99th percentile of daily values, changes for the Northeast average 55% when compared to baseline period from 1958. This trend is projected to continue in the region as models estimate additional increases above 40% by 2070-2099 relative to 1986-2015 values.[24] Overall, increases in the frequency and

[18] Runkle et. Al (NOAA Report)
[19] Fourth National Climate Assessment. Climate Change Impacts in the United States. Chapter 18: Northeast.
[20] Third National Climate Assessment. Climate Change Impacts in the United States. Chapter 16: Northeast.
[21] CIRCA PCSAR 2019.
[22] Runkle et al. (NOAA Report)
[23] Fourth National Climate Assessment. Climate Change Impacts in the United States. Chapter 18: Northeast.
[24] Fourth National Climate Assessment. Climate Change Impacts in the United States. Chapter 2: Our Changing Climate

intensity of extreme precipitation events are projected in the Northeast with higher amounts of rainfall in the winter and spring months.[25]

Precipitation projections are more variable, although consistently projecting a generally wetter future. Annual precipitation across Connecticut is projected to increase by 8.5% and 9.5% by mid and late century, respectively. Winter and spring precipitation changes are projected to be larger than summer and autumn changes.[26] Spring precipitation is projected to increase in Connecticut by 2050 with greater changes observed in the northwestern parts of the state. Increases in total annual precipitation and the number of extreme precipitation events has the potential to increase coastal and inland flood risks in the state; consequently, coastal communities in Connecticut are vulnerable to higher precipitation levels and heavy precipitation events because of climate change.[27]

The PCSAR explored changes to precipitation extremes under the high CO2 emissions scenario. Several of the extreme precipitation indices are projected to increase, including the number of days with more than one inch of precipitation, the number of heavy precipitation days, and the fraction of total precipitation accounted for by heavy precipitation events. Increases in these values suggest higher flood risk within the state in the future.

Results from PCSAR analysis suggest a strong increase of drought severity and frequency in the future, despite projected increase in precipitation quantities. Potential evapotranspiration resulting from significant future warming conditions will drive the projected increase in drought risk. Under the high CO_2 scenario analyzed in the PCSAR, the potential water availability, defined by the difference between precipitation and evapotranspiration, is projected to decrease by 22% by late-century. This reflects a significant increase in drought risk, especially in the summer months which are estimated to experience a greater decrease in potential water availability.[28]

3.4.2.4 Sea Level Rise Trends

Historical Sea Level Rise

The Northeast has experienced some of the highest rates of sea level rise and ocean warming in the country; consequently, the region has seen increases in coastal flooding because of the amplified impacts of storm events, contributing to higher surges that extend farther inland. The rate of sea level rise in the region exceeds the global average, due primarily to land subsidence. Sea level rise reflects the increase in ocean water volume as the ocean warms, as well as the melting of glaciers and ice sheets and changes in Atlantic Ocean circulation. Tide gauge data along the mid-Atlantic coast show that sea

[25] Runkle et al. (NOAA Report)
[26] CIRCA PCSAR 2019.
[27] Runkle et al. (NOAA Report)
[28] CIRCA PCSAR 2019.

level rise rates through 2009 were three to four times higher than the global average rate.[29]

In line with regional trends, the rate of sea level rise along the Connecticut coast has been faster than the global rate. Nuisance flood events are those in which water levels exceed the local threshold, which is set by NOAA NWS, for minor impacts. With rising sea levels, the number of tidal flood days exceeding the nuisance-level threshold has also climbed; in fact, 2011-2020 had the greatest number of any historically observed 10-year period with 43 recorded days.[30]

Sea Level Rise Projections

Global sea level rise is projected to rise in the future due to climate change and associated changes to temperature and precipitation patterns. A likely range of 1-4 feet globally is expected by 2100; however, even greater magnitudes of relative sea level rise (RSLR), consistent with historical trends in sea levels, are possible in the Northeastern Region of the United States, including Connecticut.[31] A recent NOAA Technical Report defined global sea level rise scenarios and the probable scenarios were Intermediate-Low and Intermediate. Based on the Intermediate-Low and Intermediate scenarios, sea level rise in the region is projected to be 2-4.5 feet on average by 2100, respectively. Sea level rise in the Northeast is expected to be greater than the global average by approximately 0.12 inches per year.[32]

Higher sea levels could increase tidal flooding associated with nuisance-level floods. Such events have the potential to cause damage to infrastructure, including stormwater drainage capacity and road closures. The 2022 NOAA technical report analyzes changes in annual number of tidal floods in New London, CT under two sea level rise scenarios, Intermediate and Intermediate-Low. By 2100, under the Intermediate scenario, tidal flooding is projected to occur every day of the year. Projected increases are large even under the Intermediate-Low scenario with an estimated 240 days per year with tidal floods occurring in New London, CT. Overall, rising sea levels will create consequences for coastal communities in high hazard areas and impact floodplain systems.[33]

3.4.2.5 Severe and Extreme Weather Trends

Historical Severe and Extreme Weather

Connecticut is susceptible to major storms for a significant portion of the year. Nor'easters are low-pressure extratropical cyclone systems that bring strong northeasterly winds blowing from the ocean over coastal areas; they typically occur between September and April. The Atlantic hurricane season between June and September brings tropical cyclones

[29] Fourth National Climate Assessment. Climate Change Impacts in the United States. Chapter 18: Northeast.
[30] Runkle et al. (NOAA Report)
[31] Runkle et al. (NOAA Report)
[32] Fourth National Climate Assessment. Climate Change Impacts in the United States. Chapter 18: Northeast.
[33] Runkle et al. (NOAA Report)

to the region[34]. Summer storms tend to be brief but severe, bringing high winds (including tornadoes and straight-line winds) and precipitation, often resulting in flash flooding and wind damage to isolated areas.

The Northeast has experienced the largest increase in total annual precipitation from 1900-2015, relative to other parts of the U.S. Historically, nearly half of all extreme precipitation events in the Northeast events have been nor'easters occurring in winter and spring. The number of days with extreme precipitation in the Northeast has significantly increased, as well as the number of extreme precipitation events from nor'easters; however, the total number of storms has decreased. This information suggests that extratropical cyclones have been increasing in intensity while decreasing in frequency.[35]

Most analysis shows that there has been no significant trend in tropical cyclone activity in the North Atlantic Basin; specifically, there has been no long-term increase in U.S. landfalling storms. However; conclusions that are not drawn from long-term trends and that are based on satellite observations suggest that North Atlantic tropical cyclone activity has statistically increased in recent decades.[36]

Severe and Extreme Weather Projections

Changes in precipitation associated with extreme weather events across the Northeast region will depend on several factors in the future, including storm frequency, storm intensity, storm trajectory, and precipitation quantities. Both mean and extreme precipitation is projected to increase within the western Atlantic storm track and over the eastern U.S. By the late 21st century under a high emissions scenario (RCPP8.5), global climate models project a 20% increase in precipitation per cyclone. [37]

Any potential increase in frequency or intensity of extreme weather events in the future may have associated impacts on coastal, riverine, and stormwater flooding risk within Connecticut, as well as risks from high winds. Certain coastal areas in particular are at an increased risk from storm surge and substantial disruption due to sea level rise and increasing storm frequency.[38]

3.4.3 Climate Effects

3.4.3.1 Regional Impacts

The NCA4 chapter on the Northeast Region identifies five key messages to be considered in future planning and opportunities for adaptation and mitigation:[39]

[34] Fourth National Climate Assessment. Climate Change Impacts in the United States. Chapter 18: Northeast.
[35] CIRCA PCSAR 2019.
[36] CIRCA PCSAR 2019.
[37] CIRCA PCSAR 2019.
[38] Fourth National Climate Assessment. Climate Change Impacts in the United States. Chapter 18: Northeast.
[39] Fourth National Climate Assessment. Climate Change Impacts in the United States. Chapter 18: Northeast.

1. **Changing seasons affect rural ecosystems, environments, and economies**. The seasonality of the Northeast is central to the region's sense of place and is an important driver of rural economies. Less distinct seasons with milder winter and earlier spring conditions are already altering ecosystems and environments in ways that adversely impact tourism, farming, and forestry. The region's rural industries and livelihoods are at risk from further changes to forests, wildlife, snowpack, and streamflow.
2. **Changing coastal and ocean habitats, ecosystem services, and livelihoods**. The Northeast's coast and ocean support commerce, tourism, and recreation that are important to the region's economy and way of life. Warmer ocean temperatures, sea level rise, and ocean acidification threaten these services. The adaptive capacity of marine ecosystems and coastal communities will influence ecological and socioeconomic outcomes as climate risks increase.
3. **Maintaining urban areas and communities and their interconnectedness**. The Northeast's urban centers and their interconnections are regional and national hubs for cultural and economic activity. Major negative impacts on critical infrastructure, urban economies, and nationally significant historic sites are already occurring and will become more common with a changing climate.
4. **Threats to human health**. Changing climate threatens the health and well-being of people in the Northeast through more extreme weather, warmer temperatures, degradation of air and water quality, and sea level rise. These environmental changes are expected to lead to health-related impacts and costs, including additional deaths, emergency room visits and hospitalizations, and a lower quality of life. Health impacts are expected to vary by location, age, current health, and other characteristics of individuals and communities.
5. **Adaptation to climate change is underway**. Communities are proactively planning and implementing actions to reduce risks posed by climate change. Using decision support tools to develop and apply adaptation strategies informs both the value of adopting solutions and the remaining challenges. Experience since the last assessment provides a foundation to advance future adaptation efforts."

Other notable findings from the NCA4 Northeast chapter are summarized below.[40]

- **Ecosystem Services**: Increasing temperatures and changing seasonality in the Northeast has affected ecosystems. Productive marshes, fisheries, ecosystems, and coastal infrastructure are extremely sensitive to changing environmental conditions such as storm surge, flooding, erosion, and temperature, all of which will be likely

[40] Fourth National Climate Assessment. Climate Change Impacts in the United States. Chapter 18: Northeast.

under future climate conditions. Warmer, later winters and early-spring temperatures have resulted in earlier blooming.

- **Flooding Risk**: Sea level rise, storm surge, and extreme precipitation events will create substantial flooding concerns in both coastal and inland areas. High tide flooding has increased and will continue to increase. Storm surges will be amplified by sea level rise and stronger, more frequent hurricane events.
- **Extreme Heat**: Heat-related illnesses and death are a significant public health concern in the region. During extreme heat events, nighttime temperatures in cities are generally several degrees higher than surrounding region's big cities, increasing risk of heat-related deaths.
- **Public Health**: Climate change impacts, ranging from intense storms, temperature extremes, overall warmer temperatures, sea level rises, and degraded water and air quality, are all associated with adverse health outcomes. Such impacts include heat exposure, poor air quality, increased transmission of vector-borne diseases, contaminated food and water, and disruption of critical health infrastructure and services.
- **Coastal Communities**: Observed and projected increases in temperature, ocean acidification, storm frequency and intensity, and sea levels are of concern for coastal and ocean ecosystems and local communities, threatening public health, infrastructure, and economic stability. Greater potential for coastal flooding, erosion, barrier island breaching, and marsh conversion to open water.
- **Urban Communities**: Residents in urban centers are at disproportionate risk and exposure to associated climate change impacts. Such communities face multiple challenges including exacerbated extreme temperature events due to urban heat islands, exposure to poor air quality, and intense precipitation events that can result in urban flooding and increased stormwater runoff because of large quantities of impervious surface cover.

3.4.3.2 Water Systems

There is potential for decreased water availability due to significantly higher temperatures and evapotranspiration losses. However, clearly this dynamic would be offset to a certain extent by increased rainfall. Changes in the distribution of rainfall on an event basis could affect flooding potential and the frequency and intensity of summer droughts. Typical climate forecasts tend to suggest that increased temperatures coupled with increased annual precipitation generally correspond to higher intensity storms (greater flood risk) and longer dry periods in the summer months (more frequent and/or intense droughts). Because Connecticut has so many small reservoir systems, these systems could be very sensitive to such changes, and case study examples may be advisable in the next phase of

work. The CT State Drought Plan, adopted in 2022, provides state and local decision-makers and public water suppliers with a set of operating procedures and guidance for proactive drought planning and response.[41] According to the State Water Planning Council (WPC), a few recommendations from the Drought plan were adopted by the Interagency Drought Workgroup (IDW) prior to the 2022 drought, enhancing the overall response to the extreme event. Additional recommendations from the NHMP are likely to be implemented in the future.

Demands could similarly be impacted, with increasing demands due to higher temperatures, but with changes tempered by increased rainfall. The timing of water availability and stream flows will also undoubtedly be impacted, with less snow pack and earlier melt. The combination of potential rapid snow melt and higher extreme precipitation events could translate to an increased flooding risk. Lastly, river water quality could be negatively impacted by the higher temperatures; higher water temperatures can lead to increased growth rates of both algae and bacteria, and lower dissolved oxygen saturation levels.[42]

3.4.3.3 Sea Level Rise and Coastal Flooding

Coastal cities and towns will become more vulnerable to storms in the coming century as sea level rises, shorelines erode, and storm surges become higher. Rising sea level erodes wetlands and beaches, reducing their mitigating effect on coastal storms. Infill and shoreline development further reduce the capacity of natural coastlines to reduce storm surges and impacts of sea level rise. With less natural protection, coastal communities are more vulnerable to the impacts of climate change.

Storms can destroy coastal homes, wash out highways and rail lines, and damage essential communication, energy, and wastewater management infrastructure."[43] The infrastructure planning areas determined to be the most impacted by climate change were coastal flood control and protection, dams and levees, stormwater, transportation and facilities and buildings. Damage to these assets could cause substantial structural and economic damage.[44] Connecticut is particularly vulnerable to these effects, as a large portion of transportation infrastructure and population centers are located in coastal areas.

3.4.3.4 Ecosystems

Ecological habitats at the highest risk from climate change are cold water streams, tidal marsh, open water marine, beaches and dunes, freshwater wetlands, offshore islands, major rivers, and forested swamps. While the degree of impact will vary, likely changes

[41] CT State Drought Preparedness and Response Plan 2022 (CT_State_Drought_Plan_2022-09-06.pdf)
[42] CT State Water Plan (http://www.ct.gov/water/site/default.asp)
[43] EPA 2016 Report: What Climate Change Means for Connecticut (https://19january2017snapshot.epa.gov/sites/production/files/2016-09/documents/climate-change-ct.pdf)
[44] Climate Change Connecticut Report: The Impacts of Climate Change on Connecticut Agriculture, Infrastructure, Natural Resources and Public Health (http://www.ct.gov/deep/lib/deep/climatechange/impactsofclimatechange.pdf)

include conversion of rare habitat types (e.g., cold water to warm water streams, tidal marsh and offshore islands to submerged lands), loss and/or replacement of critical species dependent on select habitats, and the increased susceptibility of habitats to other on-going threats (e.g., fragmentation, degradation and loss due to irresponsible land use management, establishment of invasive species).[45]

Tidal wetlands are particularly vulnerable to sea level rise because of their low elevations, and shoreline development prevents them from migrating inland onto higher ground. Human activities such as filling wetlands have damaged New England's coastal wetlands.[46] Wetlands provide habitat for many bird and fish species, regulate water flows and sediment discharge, and are important environments for nutrient cycling.

Climate change also threatens ecosystems by disrupting relationships between species. Wildflowers and woody perennials are blooming — and migratory birds are arriving — sooner in spring. Not all species adjust in the same way, however, so the food that one species needs may no longer be available when that species arrives on its migration. Warmer temperatures allow deer populations to increase, leading to a loss of forest underbrush, which makes some animals more vulnerable to predators. Rising temperatures also enable invasive species to move into areas that were previously too cold. [47]

3.4.3.5 Agriculture

Most of Connecticut's agricultural features are highly and negatively impacted by climate change. The top five most imperiled agricultural sectors are maple syrup, dairy, warm weather produce, shellfish and apple and pear production.[48] Warmer temperatures cause cows to eat less and produce less milk. This could reduce the output of Connecticut's dairy industry, which, according to a 2016 report, provided 13 percent of the state's farm revenue. Some farms may be harmed if more hot days and droughts reduce crop yields, or if more flooding and wetter springs delay their planting dates. While most climate change impacts are negative, some farms may benefit from a longer growing season and the fertilizing effect of carbon dioxide.[49] Climate change may also allow for production expansion opportunities, including biofuel crops, witch hazel, and grapes.[50]

[45] Climate Change Connecticut Report: The Impacts of Climate Change on Connecticut Agriculture, Infrastructure, Natural
Resources and Public Health
[46] EPA 2016 Report: What Climate Change Means for Connecticut
[47] EPA 2016 Report: What Climate Change Means for Connecticut
[48] Climate Change Connecticut Report: The Impacts of Climate Change on Connecticut Agriculture, Infrastructure, Natural
Resources and Public Health
[49] EPA 2016 Report: What Climate Change Means for Connecticut
[50] Climate Change Connecticut Report: The Impacts of Climate Change on Connecticut Agriculture, Infrastructure, Natural Resources and Public Health

3.4.3.6 Human Health

Changes in temperature and precipitation could increase the incidence of acute and chronic respiratory conditions such as asthma. Higher temperatures can increase the formation of ground-level ozone (smog), a pollutant that can contribute to respiratory problems. Extreme heat events will increase heat-induced ailments, especially in those populations who do not have the benefit of air conditioning. In recent years, the state has experienced an increase in extreme heat events, threatening public health and well-being. Exposure to extreme heat may result in heat exhaustion, heat edema, fainting, heat stroke, and potentially heat-related mortality. Heat events may also affect mental health and overall well-being. According to a 2020 DPH report, between 2014 and 2018, a total of 2,053 Emergency Department visits and 208 inpatient admissions for heat related illnesses occurred among Connecticut residents.[51] Rising temperatures may also increase the length and severity of the pollen season for plants such as ragweed — which has already been observed in other regions. Certain populations are especially vulnerable to these effects, including children, the elderly, the sick, and the poor.[52]

Climate change may increase the risk of some diseases carried by insects, by altering ecosystems in a way that favors increased vector survival, replication, biting frequency, and geographic range.[53] The ticks that transmit Lyme disease are active when temperatures are above 45°F, so warmer winters could lengthen the season during which ticks can become infected or people can be exposed to the ticks. Higher temperatures would also make more of New England warm enough for the Asian tiger mosquito, a common carrier of West Nile virus. The number of cases may or may not increase, depending on what people do to control insect populations and avoid insect bites."[54]

Climate change will impact public health infrastructure including hospitals, health departments, emergency medical services, private practices and shelters. These impacts may be due to extreme weather events or increased use of resources to treat and shelter victims. Specifically, environmental justice communities may be most impacted by the lack access to adequate public health infrastructure, including shelter or evacuation transportation.[55]

3.4.4 Connecticut's Climate Change Initiatives

Connecticut has a variety of regulations and organizations dedicated to addressing climate change and its impacts. While the **Capability Assessment Chapter** outlines in detail the significant progress made by regulations, state committees and tasks forces, and external

[51] Public Health and Safety Adaptation Working Group 2020 Final Report to the GC3
[52] EPA 2016 Report: What Climate Change Means for Connecticut
[53] Climate Change Connecticut Report: The Impacts of Climate Change on Connecticut Agriculture, Infrastructure, Natural Resources and Public Health
[54] EPA 2016 Report: What Climate Change Means for Connecticut
[55] Climate Change Connecticut Report: The Impacts of Climate Change on Connecticut Agriculture, Infrastructure, Natural Resources and Public Health

organizations, the following section provides a brief overview of Connecticut's action on climate change.

3.4.4.1 State of Connecticut Enabling Legislation

The State of Connecticut participates in the National Flood Insurance Program (NFIP) and related programs, and meets all Stafford Act and related mandates as authorized under the Connecticut General Statutes Section 25-68b through 25-68h and associated regulations. Other provisions that are relevant to hazard mitigation and climate change are described below.

An Act Concerning the Coastal Management Act and Shoreline Flood and Erosion Control Structures

During 2012 the Connecticut General Assembly passed Public Act 12-101, An Act Concerning the Coastal Management Act and Shoreline Flood and Erosion Control Structures. This legislation combined a number of initiatives to address sea level rise and to revise the regulatory procedures applicable to shoreline protection. Through this Act, the concept of sea level rise was incorporated into the Connecticut Coastal Management Act (CCMA)'s general goals and policies of coastal planning for the very first time.

An Act Concerning the Permitting of Certain Coastal Structures by the Department of Energy and Environmental Protection

An Act Concerning the Permitting of Certain Coastal Structures by the Department of Energy and Environmental Protection (Public Act 13-179) clarifies several Connecticut statutes by making reference to the NOAA sea level rise discussions in Technical Report OAR CPO-1 (Global Sea Level Rise Scenarios for the United States National Climate Assessment, December 6, 2012). The Act also states that municipalities shall consider sea level rise when developing Plans of Conservation and Development, evacuation plan, or hazard mitigation plan.

An Act Concerning Sea Level Rise and the Funding of Projects by the Clean Water Fund

An Act Concerning Sea Level Rise and the Funding of Projects by the Clean Water Fund (Public Act 13-15) allows DEEP to maintain a priority list of eligible water quality projects and established a system setting priority for making project grants, grant account loans and project loans. This law essentially incorporates climate change planning into funding of wastewater (sanitary sewer system and sewage treatment) projects.

An Act Concerning Climate Change Planning and Resiliency

An Act Concerning Climate Change Planning and Resiliency (Public Act 18-82) contains a number of provisions to reduce greenhouse gas emissions and prepare the state for the ongoing effects of climate change and sea level rise, including: Implementing an interim target to reduce greenhouse gas emissions 45 percent from a 2001 baseline by 2030 as recommended by the Governor's Council on Climate Change; Updating current statutory references to sea level rise to reflect CIRCA planning recommendation of nearly two feet by 2050; and Requiring all future state projects located in the Coastal Boundary that are either undertaken by a state agency or funded by a state/federal grant or loan to meet CIRCA's projections.

Executive Orders

Executive Order (EO) 46 (2015): Established a Governor's Council on Climate Change to monitor the state's greenhouse gas emissions and make recommendations to meet the 2050 Global Warming Solutions Act target.

EO 50 (2015): Establishes the State Agencies Fostering Resilience (SAFR) Council, which is responsible for strengthening the state's resiliency from extreme weather events, including tropical storms, hurricanes, storm surges, flooding, ice storms, extreme high winds, extreme heat, and slow onset events such as sea level rise. The "SAFR Council" is responsible for working to create a Statewide Resilience Roadmap based on the best climate impact research and data and assisting CT Office of Policy and Management (OPM) in the creation of a State policy on disaster resilience. SAFR interacts with CIRCA and will be involved with the NRDC-funded planning in the coming years.

EO No. 1 (2019): begins laying foundation for subsequent climate-change-related orders. The order generally directs state agencies to recommit and expand upon *Lead by Example* (a program developed to advance energy efficiency at state facilities), to reduce water consumption, waste, and greenhouse gas (GHG) emissions.

Shortly after EO 1, the Governor signed EO 3 (2019) which has less of an emphasis on state facility related efforts, and a provides a broader directive to continue state climate resilience planning. The order directs the Governor's Council on Climate Change (GC3) to both monitor Connecticut's progress on greenhouse gas emissions mitigation (essentially reduce emissions) and expand efforts into climate resilience and adaptation (reduce damages caused by climate change). This order resulted in the establishment of several GC3 working groups and committees, which ultimately led to a Statewide Adaptation and Resilience Plan. This plan provides the framework for much of EO 21-3 with many of the directives coming from the Plan's recommendations.

EO 21-3 (2021): the most recently signed order of the three, continues to direct state agencies on GHG reduction, energy efficiency, and waste reduction, but expands directives to address infrastructural, natural, and health and equity challenges the state is facing. Ultimately this order works to continue state agency and facility progress, particularly with

stringent interim reduction goals, but also directs specific state agencies to address specific needs in supporting communities. The order touches on transportation, infrastructure, jobs, health and equity, and land. The order calls for specific types of vulnerability and feasibility assessments, the creation of new offices and committees, and the development of a new municipal funding program for resilience.

3.4.4.2 Connecticut State Agencies Associated with Natural Hazard Mitigation

There are a number of state agencies that are associated with natural hazard mitigation and address the growing threat of climate change within Connecticut. Some divisions and agencies share roles and responsibilities. The two primary entities associated with mitigation and planning efforts are DEMHS and DEEP. The following is an overview of the state agencies and their relative divisions associated with climate change capabilities.

DEEP Land and Water Resources Division

DEEP's Land and Water Resources Division has taken on the responsibilities of the former Office of Long Island Sound Programs (OLISP), which administered Connecticut's Coastal Management Program. The program is approved by NOAA under the federal Coastal Zone Management Act and has many responsibilities including the protection of natural shoreline sedimentation and erosion processes, discouraging hard shoreline flood and erosion control structures, creating tools for assorted sea level rise scenarios, and providing guidance in coastal and climate resilience. Formerly, the Office of Long Island Sound Programs ran a number of workshops for climate change adaptation and created the Climate Adaptation Resources Toolkit. The Climate Adaptation Resources Toolkit is a tool for one stop shopping for climate adaptation tools, resources and strategies for Connecticut communities.

State Water Plan

The State Water Plan (2018) includes a climate change analysis that projects an increase in temperature for all calendar months and generally increased precipitation. The largest precipitation increases are projected for the wetter months, and winter and spring precipitation changes are projected to be larger than summer and autumn changes. Drier months are generally projected to remain about the same in terms of both frequency and rainfall level. Based on these results, the State Water Plan recognizes the potential for decreased water availability due to significantly higher temperatures and evapotranspiration losses, as well as the possibility that this dynamic could be offset to a certain extent by increased rainfall. The plan also acknowledges that increased temperatures coupled with increased annual precipitation generally corresponds to higher

intensity storms (greater flood risk) and longer dry periods in the summer months (more frequent and/or intense droughts).

3.4.4.3 Connecticut Legislative and Executive Programs

There are a number of programs and planning groups that are responsible for contributing to hazard mitigation and resiliency capabilities within Connecticut. A brief overview of selected relevant agencies is provided below.

Governor's Council on Climate Change (GC3)

Based on the recent reports reviewing best available climate projections and observed temperature and precipitation patterns, including the 2019 PCSAR and the CIRCA Sea Level Rise in Connecticut report, the GC3 2021 report outlines the following recommendations and findings concerning climate change impacts in Connecticut that will guide the council's objectives and future actions.[56]

- "Comprehensive review of projections be undertaken by the State at five-year intervals.
- Mean sea level in Long Island Sound could by up to 20 inches above National Tidal Datum Epoch by 2050. This projection is not sensitive to future trends in CO2 emissions.
- Changes in mean sea level will significantly impact the frequency of flooding along the Connecticut coast, but the flood zone will not expand much in most areas. With 20 inches of sea level rise, coastal flood risk could increase by a factor of 5 to 10 with no change in storm conditions.
- Sea level rise will continue after 2050. Mean sea level rise could be up to 80 inches higher by 2100 if CO2 emissions are not reduced.
- Average temperatures in Connecticut could increase by 5°F by 2050 compared to the 1970-1999 baseline. Connecticut's temperature has risen more than the global average in part because temperature changes tend to increase in middle and high latitude. Consequently, a 2°C target for global average temperature would result in higher temperature increase in Connecticut.
- All indices of hot weather are expected to shift toward more frequent and higher temperature events. For example, by mid-century, the number of days per year with temperatures above 90 °F (32 °C) could increase. Statewide, from 1970 to 1999, the average number of days was 5, and this is projected to increase to an average of 25

[56] Governor's Council on Climate Change (GC3), Taking Action on Climate Change and Building a More Resilient Connecticut For All. January 2021.

days between 2040- 2069. (Note that specific locations and specific years will show more days with extreme temperatures than statewide and long-term averages). The number of days with frost could decrease from 124 to 85.

- Temperature projections after mid-century are sensitive to policy choices on carbon dioxide emissions. Coordinated mitigation now means it is more likely that the temperature will stabilize after 2050. If not, warming is likely to accelerate.
- Drought risk is also expected to increase. The probability of unusual events (extremely low annual and summer water availability, and extremely high 1-day and 5-day precipitation) are projected to increase by a factor of between 2 and 4 by mid-century.
- Though it is unclear whether the frequency or intensity of extratropical storms in Connecticut will change, they will likely bring more precipitation. In general, warmer temperatures will result in less snow and more rain, but increased humidity will yield high snowfall events when temperatures permit.
- Projection of changes in the frequency of tropical cyclones in a warmer climate are uncertain. However, they will likely have stronger winds and more precipitation. Since 1980 there has been an increase in the frequency of hurricanes in category three or greater."

Connecticut Green Bank

The Connecticut Green Bank is the nation's first green bank. Established by the Connecticut General Assembly on July 1, 2011 as a part of Public Act 11-80, Connecticut Green Bank supports the Governor's and Legislature's energy strategy to achieve cleaner, less expensive, and more reliable sources of energy while creating jobs and supporting local economic development. Since its inception, the Connecticut Green Bank and its private investment partners have deployed over a $1 billion in capital for clean energy projects across the state. Projects recorded through fiscal year 2016 show that for every $1 of public funds committed by the Green Bank that an additional $6 in private investment occurred in the economy.

Sustainable Connecticut

Sustainable CT is a partnership of municipal leaders, residents, the Connecticut Conference of Municipalities, and people from key agencies, non-profits and businesses. The Institute for Sustainable Energy at Eastern Connecticut State University is coordinating and supporting the initiative. Sustainable CT seeks to help cities and towns across the state become more vibrant, healthy, resilient and thriving places for all of their residents. All of Connecticut's 169 towns and cities have been represented in Sustainable CT's development in some way.

National Disaster Resilience Program

National Disaster Resilience Program Winner: The U.S. Department of Housing and Urban Development (HUD) and the Rockefeller Foundation funded a $1 billion design competition for resilient housing and infrastructure projects. Connecticut was one of 13 winners, receiving $54,277,359 to support a pilot program in Bridgeport that is part of the broader Connecticut Connections Coastal Resilience Plan. The Coastal Resilience Plan is focused on reconnecting and protecting economically-isolated coastal neighborhoods through investments in mixed green and gray infrastructure that protect against flooding while strengthening their connectivity to existing transportation nodes.

3.4.4.4 University of Connecticut

The University of Connecticut contributes to a number of programs and research efforts within Connecticut to advance actions regarding resilience and hazard mitigation.

Connecticut Institute for Resilience and Climate Adaptation (CIRCA)

Pursuant to Special Act 13-9, "An Act Concerning Climate Change and Data Collection," the State of Connecticut established the Connecticut Institute for Resilience and Climate Adaptation. CIRCA was established in partnership with DEEP, the former OLISP, and the University of Connecticut. CIRCA is a multi-disciplinary, center of excellence that brings together experts in the natural sciences, engineering, economics, political science, finance, and law to provide practical solutions to problems arising as a result of a changing climate. The Institute helps coastal and inland floodplain communities in Connecticut better adapt to changes in climate and also make their human-built infrastructure more resilient while protecting valuable ecosystems and the services they offer to human society. CIRCA runs a Municipal Resilience Grant Program, which helps municipal governments and councils of government with initiatives that advance resilience.

Through CIRCA and its Resilient CT Initiative, a Climate Change Vulnerability Index (CCVI) is being developed for the state. Resilient CT's guiding principle is to establish resilient communities through forward-looking planning that incorporates economic development framed around transit-oriented development (TOD), conservation strategies, and critical infrastructure improvements. The CCVI includes social, built, and ecological data to characterize vulnerability and identify at risk areas to effectively direct funding and support for building resilience. The project included Zones of Shared Risk (ZSR) and Resilience Opportunity Areas (ROARs) associated with TOD areas, affordable housing, drinking water sources, and wastewater infrastructure. Pilot projects were identified to adapt communities to the effects of climate change, including frequent flooding and excessive heat.

Center for Land Use Education and Research

The University of Connecticut's Center for Land Use Education and Research (CLEAR) provides information, education, and assistance to land use decision makers in support of

balancing growth and natural resource protection. Their Climate Adaptation Academy is a partnership between Connecticut Sea Grant and CLEAR to allow researchers, consultants, and others to work with municipalities and relevant professionals on climate adaptation. This program provides specialized training, such as the "Climate Adaptation Training for Coastal Communities."

3.4.5 Local and Regional Climate Adaptation

DEEP has a Municipal Climate Change Network of towns and state staff who are moving forward with cutting edge climate efforts, and a Connecticut Climate Education Communication Committee which is a varied group of educators from the private, public, and academic sector who meet virtually or in person every month to keep informed on best available science and educational practices. CHAMP is a Coastal Hazards and Management Planning section of the DEEP website that allows selection of inundation from Sea Level Rise scenarios for all Connecticut towns. The website also provides information on how to take action and can be accessed at:
http://www.ct.gov/dep/cwp/view.asp?a=2705&q=480750&depNav_GID=2022

The Sentinel Monitoring for Climate Change in Long Island Sound Program is a multidisciplinary scientific approach to provide early warning of climate change impacts to Long Island Sound (LIS) ecosystems, species and processes to facilitate appropriate and timely management decisions and adaptation responses. Current program successes include a strategic plan outlining key attributes of a sentinel and identifying 17 priority and 37 candidate sentinels for the LIS ecosystem, a website and a searchable data citation clearinghouse with links to all known LIS sentinel related data sets and local researchers, and funding for two pilot monitoring programs and a data synthesis grant that are currently underway. With a scaled up Sentinel Monitoring program, Connecticut and regional efforts can be leveraged to support key monitoring for discernible climate signals and impacts, as well as inform adaptation strategies to keep our ocean and coastal resources as healthy as possible.

New England has received numerous NOAA Grants to "accelerate the pace of municipal response to coastal climate change," Connecticut was the only state to have more than one town selected for funding of adaptation projects: Guilford for workshops/town plan and Greenwich is mapping for enhanced emergency response. The Connecticut Adaptation Resource Toolkit was developed by the Connecticut Department of Energy and Environmental Protection and ICLEI-Local Governments for Sustainability USA (ICLEI USA) with funding from the US Environmental Protection Agency's (US EPA) Climate Ready Estuaries through the Long Island Sound Study, a national estuary program. The Climate Adaptation Resources Toolkit is a tool for centralized climate adaptation tools, resources and strategies for Connecticut communities It is searchable by profession type, resource type (funding, legal, education, communication tools) as well as where you are in the climate action and planning process.

Connecticut communities have received funding from the National Fish and Wildlife Foundation (NFWF) National Coastal Resilience Fund (NCRF). The Fund supports projects that restore, increase, and strengthen natural infrastructure to protect coastal communities while simultaneously enhancing wildlife habitats. Funded projects include those that restore natural features, including coastal marshes, dune systems, oyster reefs, and floodplains that mitigate the impacts of extreme storm events. In the 2022 grant cycle, the NCRF funded a nature-based resilience project with CTDEEP focusing on building capacity and technical assistance, a flood mitigation project with the City of West Haven employing nature-based solutions, and a flood resilience workplan in the City of Norwalk.

The NFWF Long Island Sound Future Fund (LISFF) provides funding to projects in local communities that aim to protect and restore the Long Island Sound, including those that improve water quality through stormwater management, create thriving coastal habitats, and engage with communities to build capacity and educate the public on restoration efforts. In 2022, several Connecticut communities obtained grants through the LISFF. Example projects are: Stormwater and Green Infrastructure Improvements in Downtown Naugatuck, Manure Management at a Dairy Farm in Lebanon to reduce Nitrogen Pollution into the Long Island Sound, Fish Passage on Beaver Brook in Sprague, and Planning for Greening and Public Access on the Bridgeport Waterfront.

The DEEP Climate Resilience Fund, established by EO 21-3 (2021), provides grants to local communities to drive planning and development of projects that enhance resilience, mitigate the impact of climate change, and promote adaptation efforts. At least 40% of the funding resources are targeted at projects that provide benefits to vulnerable populations and address the needs of those populations. Funded activities include planning that addresses the impacts of climate-related hazards and community engagement that supports planning initiatives.

The Connecticut Geological Survey has prepared digital geologic and soils data for hazards assessments and analyses through cooperative efforts with the Natural Resources Conservation Service and the U.S. Geological Survey. This data supports agency assessments of inland and coastal flooding, shoreline erosion, and sea level rise. Information for these sources have been used in the risk assessment.

4 | Risk Assessment

The Risk Assessment provides a statewide overview of how various natural hazards have impacted Connecticut, and how impacts may change in the future.

4.1 Introduction

Natural hazards are environmental phenomena that threaten society and the human environment. Natural hazards have the potential to cause harm to people, property and infrastructure design, agriculture, natural resources, businesses, and other types of harm or loss. The risk assessment uses an all-natural-hazards approach involving identification, classification, and vulnerability assessments to ensure that the analysis is comprehensive.

This chapter presents an overview of the risk assessment process. Once identified and analyzed, the natural hazards were ranked to determine the highest risks to Connecticut. Finally, based on the history of occurrences and exposure, the vulnerability assessment and loss estimates elaborate on the potential impacts of the hazards that pose the highest risks. The risk assessment results are used to develop a comprehensive and effective Mitigation Strategy designed to reduce risks of identified natural hazards.

Identifying the hazard risks to the state is critical when allocating resources to carry out appropriate mitigation actions.

The risk assessment involves the following steps:

1. Identify natural hazards that can affect the State of Connecticut.
2. Assess the risks of each hazard, regarding:
    a. Location: where the hazard affects the state,
    b. Intensity: potential magnitude and extent of the hazard,
    c. Impacts: the potential consequences,
    d. Previous Occurrences and Losses: how often hazard events have occurred in the past,
    e. Probability of Future Hazard Events: how likely hazard events are to occur in the future,
    f. Climate Change Impacts: impacts of climate change on the hazard risk
    g. Vulnerability Assessment: assessing the vulnerability of assets and populations across the state to the hazard, and

h. Changes in Development: how will future development be affected by the hazard.

3. Hazard ranking in terms of overall risk to the state and risk to each county

4.1.1 Methodology

The risk assessment provides a consistent basis for developing effective mitigation strategies for vulnerable jurisdictions within the state. This section details the risk assessment process and the methods used to rank hazard risk. Results from this process and accompanying methods will be presented in hazard-specific sections that follow.

For the purposes of compliance with the Disaster Mitigation Act, the NHMP update only fully addresses the hazards identified by the SHMPT as significant in Connecticut. Additional hazards may be more formally addressed during future updates as their significance warrants.

4.1.1.1 Hazard Identification

This section identifies the natural hazards that are probable, or based on future probability, likely to negatively impact the State of Connecticut. The hazards included in the 2023 plan were identified through the evaluation of:

- Previous versions of the natural hazard mitigation plan,
- Local hazard mitigation plans,
- Presidentially declared disasters affecting the state, and
- National Risk Index data for Connecticut.

The identified hazards for this plan update with general descriptions and definitions are shown in Table 18.

Table 18. Hazard Descriptions

Hazard	Description
Dam Failure	Dam failure is characterized by a sudden, rapid, and uncontrolled release of water from the containment of a dam or levee, causing nearby land to flood.
Drought	A drought is a deficiency of precipitation over an extended period resulting in a water shortage.
Earthquake	An earthquake is a shaking of the earth's surface by energy waves emitted by slowly moving tectonic plates overcoming friction with one another underneath the earth's surface.
Extreme Cold	Extreme cold is characterized by prolonged periods of unusually low temperatures, generally accompanied by high winds.

Hazard	Description
Extreme Heat	Extreme heat is characterized by prolonged periods of unusually high temperatures, generally accompanied by high humidity.
Flooding	A flood is an overflowing of a large amount of water beyond its normal confines, especially over what is normally dry land.
Sea Level Rise	Sea level rise is an increase in the level of the world's oceans because of climate change.
Thunderstorm	A thunderstorm is a rain-bearing cloud that also produces lightning.
Tornado	A tornado is a narrow, violently rotating column of air that extends from the base of a thunderstorm to the ground and is visible only if it forms a condensation funnel made up of water droplets, dust, and debris.
Tropical Cyclone	A tropical cyclone is a rotating, organized system of clouds and thunderstorms that originates over tropical or sub-tropical waters and has a closed low-level circulation.
Wildland Fire	A wildland fire is any non-structure fire, other than prescribed fire, that occurs in the wildland.
Winter Weather	Winter Weather consists of winter storm events in which the main types of precipitation are snow, sleet, or freezing rain.

4.1.1.2 Data Collection

To update the risk assessment, data was collected from a variety of sources and analyzed to determine their risk to the state. The assessment began with a thorough review of all the local hazard mitigation plans available in the state. **Section 3.3** of the **Planning Context Chapter**. While the local plans were a valuable source for qualitative data, additional quantitative data sources were used to determine the jurisdictions most threatened by each hazard. The following sections describe some of the data sources used in the risk assessment. A full list of data sources may be found in Appendix 3.

NCEI Storm Events Database

National Centers for Environmental Information (NCEI) storm events data is published by the National Oceanic and Atmospheric Administration (NOAA), U.S. Department of Commerce. The storm events database contains information on storms and weather phenomena that have caused loss of life, injuries, significant property damage, and/or disruption to commerce from 1950 to December 2022. Most hazards do not have records dating back to 1950, so the period of record changes for each hazard based on earliest available record. Table 19 summarizes the state hazard totals by hazard.

It should be noted that these estimates are believed to be an underrepresentation of the actual losses experienced because losses from events that go unreported or that are difficult to quantify are not likely to appear in the NCEI database; this is especially true with crop damages. As shown in Table 19, several of the hazards are not collected in the

NCEI storm events database. Each of the individual hazard sections uses the best available national and local data.

Table 19. NCEI Storm Events in Connecticut

Hazard Type	Period of Record	Total Events*	Property Damage (2022$)	Crop Damage (2022$)	Injuries	Deaths
Dam Failure	Data not collected by NCEI. The United States Army Corps of Engineers National Inventory of Dams and Levees, Stanford University's National Performance of Dams Database (NPDP), and CT DEEP served as alternative sources.					
Drought	1999 - 2022	63	0	0	0	0
Earthquake	Data not collected by NCEI. United States Geological Survey Earthquake Hazards Program data served as an alternative source.					
Extreme Cold	2000 - 2022	30	0	0	0	0
Extreme Heat	2000 - 2022	47	0	0	0	0
Flooding†	1996 - 2022	850	69,444,687	0	3	6
Sea Level Rise	Data not collected by NCEI. NOAA NWS Nuisance Flood data served as an alternative source.					
Thunderstorm‡	1950 – 2022	3,503	54,165,117	57,950	168	29
Tornado	1950 - 2022	126	1,888,186,729	0	703	4
Tropical Cyclone	2008 – 2022	42	92,553,800	0	0	2
Wildland Fire	Data not collected by NCEI. The National Interagency Fire Center (NFIC) and US Forest Service Fire Program Analysis (FPA) Fire-Occurrence Database (FOD) served as alternative sources.					
Winter Weather§	1996 – 2022	1,306	56,274,910	0	7	54
Total	**1950 – 2022**	**5,967**	**2,160,625,243**	**57,950**	**878**	**95**

* Event totals may reflect a storm event that has affected multiple counties that have been counted as individual events in each affected county

† Coastal flood, flash flood, and flood events are all presented collectively under the Flood-Related hazard

‡ Hail, high wind, lightning, strong wind, and thunderstorm wind events are all presented collectively under the Thunderstorm hazard.

§ Winter weather, winter storms, blizzard, ice storms, and heavy snow events are all presented collectively under the Winter Weather hazard.

Hazus-MH v6.0

FEMA Hazus 6.0 software was used to determine the potential losses from future hazard events. Hazus 6.0 was released in 2022 and uses updated demographics, building stock, essential facilities, utilities, and transportation data. Hazus is a computer modeling tool that enables the use of U.S. Census data to determine risk exposure from floods, coastal wind events, and earthquakes. The Hazus Flood Model was used to calculate physical damages and economic losses due to coastal and riverine flooding. Hazus utilized flood depth grids and functions that relate the depth and type of flooding to the degree of damage for various categories of buildings. The Hazus Hurricane Model was used to estimate physical and economic damage to buildings due to wind and windborne debris. Wind hazard data in Hazus are generated at the census tract level. The model considers peak gusts, terrain roughness, and tree coverage data for incoming hurricanes, historic storms, or probabilistic hazards. Finally, the Hazus Earthquake model was used to evaluate the probability of damage to buildings and infrastructure according to ground shaking data from the United States Geological Survey ShakeMap website.

Connecticut Facility and Infrastructure Data

The state-owned buildings and critical facility data have been updated to reflect the best available 2023 information. State-owned buildings data was provided by Connecticut Office of Policy and Management (OPM). Critical facilities data was provided by OPM and the Department of Consumer Protection. Mitigation strategies have been created to support expansion of this dataset and collection of additional attribute information. The current data set has point locations for state and critical facilities throughout the state but has limited attribute information populated for building information. Additional data should be collected (e.g., year built, first floor elevation, construction type, roof type, property value) to provide in-depth analysis and mitigation strategies, including climate adaptation strategies informed by risk assessment findings.

State Infrastructure

There are 3,698 mapped state-owned facilities, as shown in Figure 16.[57] According to the State Real Property database, which is updated annually in March, the state building portfolio value is estimate at $5.5 billion. A table with counts of state-owned facilities and their value by county and COG can be found in Appendix 3.

[57] Sheds and accessory buildings were removed from the CT OPM State Owned Buildings dataset for this plan.

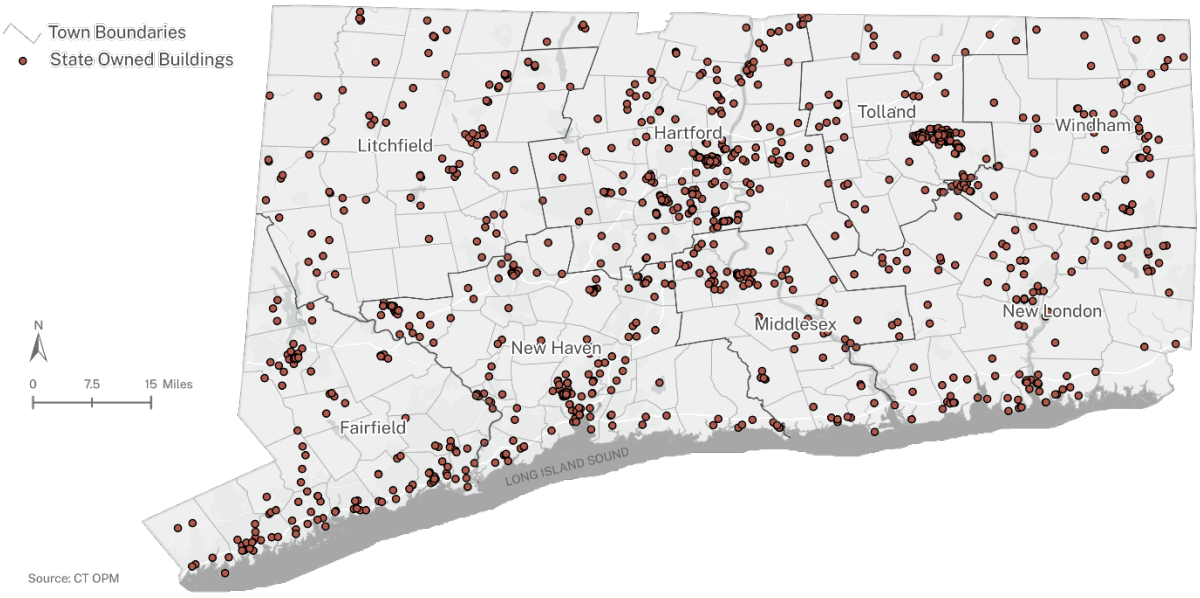


Figure 16. Connecticut state-owned buildings

The state-owned infrastructure and facility data that was used in the hazard vulnerability analyses is the most complete geospatial information available for the 2023 update. The complete infrastructure and facilities datasets can be provided upon request from OPM.

Critical Infrastructure and Facilities

Classification of what constitutes a "critical" facility/infrastructure can vary from federal, state, and local jurisdictions. Critical infrastructure and facilities include systems and assets, whether physical or virtual, so vital to Connecticut that the incapacitation or destruction of such systems and assets would have a debilitating impact on security, economic property, public health or safety, or any combination of those factors. Facilities and infrastructure presented in this section are not limited to only state facilities and infrastructure. Figure 17 displays the location of Connecticut's state and critical facilities.

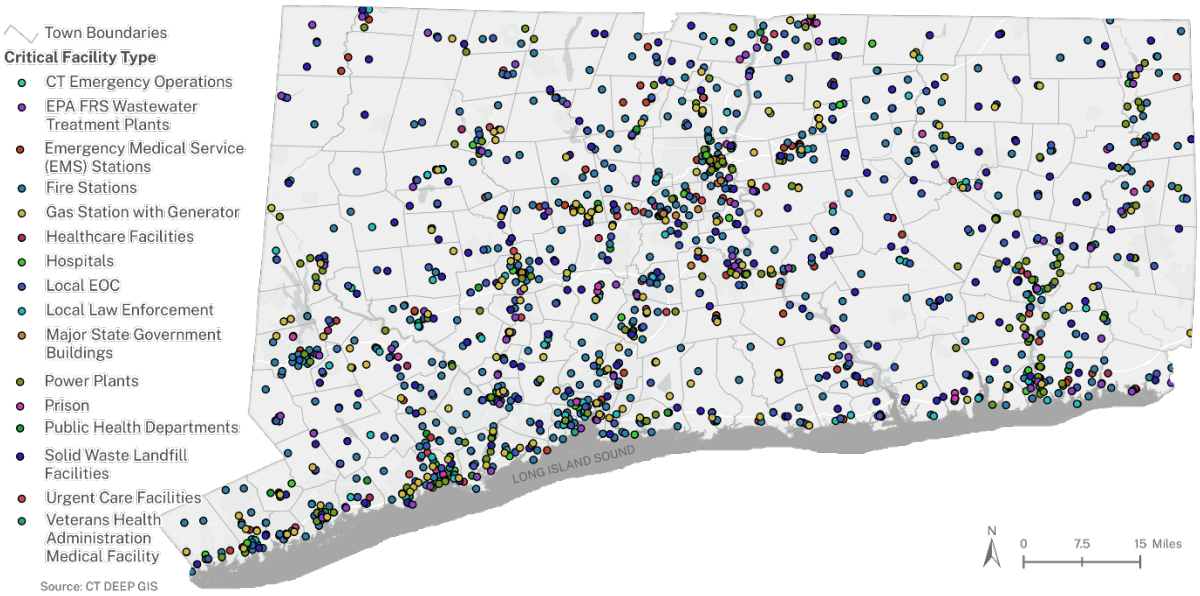


Figure 17. Connecticut critical facilities

For the NHMP update, discretion was used to identify specific types of infrastructure and facilities. This does not preclude other types of facilities/structures that may be deemed critical by government entities in the future, nor should it limit the inclusion of other types of facilities that may benefit from assessment of natural or human-caused threat resiliency.

Using this critical facility definition in conjunction with data readily available from OPM, 2,024 facilities/infrastructure were identified in Connecticut. These were listed in several datasets provided by OPM and merged together for spatial analysis.

Infrastructure and facilities include:

- Emergency Operations Centers
- Wastewater Treatment Plants
- Law Enforcement
- Fire Stations
- EMS Stations
- Healthcare Facilities
- Hospitals
- Local Emergency Operations Centers
- Local Law Enforcement

- Major State Government Buildings
- Prisons
- Power Plants
- Public Health Departments
- Solid Waste Landfill Facilities
- Urgent Care Facilities
- Veterans' Health Administration Medical Facilities
- Gas Stations with Generators

A table with the counts of critical facilities by county and COG can be found in Appendix 3. Fire stations account for 25% of the structures followed by EMS (21%), and local law enforcement (9%).

Each critical facility point was also assigned to a FEMA Community Lifeline category to assess the vulnerability of community lifelines to each hazard type. FEMA developed community lifelines to increase effectiveness in disaster operations and response to catastrophic incidents.

FEMA Community Lifelines

Lifelines are the most fundamental services in the community that, when stabilized, enable all other aspects of society. When disrupted, decisive intervention (e.g., rapid service re-establishment or employment of contingency response solutions) is required.[58]

Community lifeline categories include: Communications; Energy; Food, Water, Shelter; Safety and Security; Health and Medical; Transportation; Hazardous Materials.

The critical facilities used in this plan fall under the Safety and Security, Health and Medical, Energy, and Hazardous Materials community lifelines. The majority of critical facilities fall under the Safety and Security category (44%), followed by Health and Medical with 30% of all critical facilities.

CIRCA Climate Change Vulnerability Index

The risk assessment uses data from the Connecticut Institute for Resilience and Climate Adaptation (CIRCA) Climate Change Vulnerability Index (CCVI) to assess vulnerability to

[58] FEMA. Community Lifelines. https://www.fema.gov/fact-sheet/community-lifelines

flood and heat-related impacts of climate change. The CCVI characterizes areas based on an equation using sensitivity times exposure, divided by adaptive capacity.[59]

The CCVI Social Sensitivity Score was used as the indicator for social vulnerability for each hazard profile. The Social Sensitivity Score considers the following factors:

- Household Median Income
- Percent Living Below 185% Federal Poverty Level
- Percent Over 65
- Population density
- Non-White Population
- Speaks English less than well/not at all
- Over 5 with a Disability
- Percent Over 25 without a high school diploma
- Percent population under 5
- Percent population unemployed
- Over 65 Living Alone (households)
- Single Parent households

Climate Projects

The Risk Assessment considers the impact of climate change on the hazards outlined in the chapter. The Fourth National Climate Assessment (NCA4) published in 2018 summarizes the impacts of climate change on the United States, now and in the future. Key climate data from the NCA4 "Northeast" chapter is included in this section. Additionally, the Climate Mapping for Resilience and Adaptation (CMRA) tool and International Panel on Climate Change Sixth Assessment Report are used for climate-related hazard information and climate projections.

Future Development and Population Growth

Planning for hazard mitigation involves looking at both historical observations and future projections. For the 2023 update, building permits data from Connecticut's Housing and Income Data website was used to determine areas in the state that are projected to have increased development. The number of building permits approved between 2018 and 2022 was used to assess the vulnerability of future development in the state. In addition, population projections provided by the Connecticut State Data Center were used to determine future population exposure to hazards.

In addition, Opportunity Zones GIS data was used to further assess the potential impact of certain hazards on future development. In the United States, federally designated Opportunity Zones encourage investment in development in low-income communities to

[59] Resilient Connecticut. Climate Change Vulnerability Index (CCVI). https://resilientconnecticut.uconn.edu/wp-content/uploads/sites/2761/2023/07/CCVI-Fact-Sheet-2023.pdf

spur economic growth and job creation. There are tax incentives to develop in these areas, and therefore these areas are target areas for development.

Dams

Dams in Connecticut play a pivotal role in water resource management, flood control, and hydroelectric power generation. The integration of dam data into the NHMP is vital for risk reduction and disaster preparedness. Accurate information regarding dam locations, conditions, and potential hazards is critical for conducting thorough vulnerability assessments, formulating targeted mitigation strategies, and fortifying emergency response plans.

For the NHMP update, data were provided by the USACE National Inventory of Dams and Levees, Stanford University's National Performance of Dams Database (NPDP), and CT DEEP. Criteria such as dam location, active status, hazard ranking, primary ownership, and purpose were utilized to identify active dams with high hazard levels. The inundation zone data incorporates details like the dam name, cause of failure and the potential extent of the flood area resulting from a failure.

4.1.1.3 Local Plan Integration

Section 3.3 of the **Planning Context Chapter** describes local plan coordination in detail. Local plan hazard identification, risk assessment, potential losses, and land use derived from the 173 communities that have developed hazard mitigation plans follows.[60] The most current plan document for each community was used, in some cases including drafts or expired plans. All the community plans are multi-jurisdictional plans developed by COGs.

4.1.1.3.1 Local Hazard Identification

Local plans and multi-jurisdiction plan annexes identified 19 distinct hazards, although not all hazards were identified in every plan. Communities used a variety of approaches with a range of complexity to rank their identified hazards. Some plans used a blend of various techniques and discussion to determine final hazard ranking. Ranking/scoring techniques used in the local plans included:

- **Ranking by extent of location impacted, frequency of occurrence, and magnitude of severity**, along with information on structures and populations at risk, historic record, and available loss estimates,
- **Priority Risk Index (PRI)** designed to summarize hazard profile information and measure the degree of relative risk each hazard poses to the planning area (based on exposure, location, probability, potential impact, warning time, and duration),

[60] Connecticut has 169 municipalities; the additional four communities include the two tribal governments and the political subdivisions of Groton, Stonington, and Fenwick.

- **Input from Community Survey** to reflect community perceived risk,
- Interactive activities with Steering Committee Members,
- **Available historical data**,
- **Human judgment**/knowledge of locality, and
- **Numerical Scoring Worksheets** (based on criteria, i.e., FEMA 386-2 worksheets).

FEMA guidance indicates that the jurisdictions at greatest risk to specific hazards should be identified, considering both the characteristics of the hazard and the jurisdictions' degree of vulnerability. A variety of analysis methods may be sufficient to meet these goals; FEMA does not mandate a specific analysis method. As a result, many local and state plans have developed their own ranking system. None of the ranking techniques used in the local plans is incorrect, as there is no standard way to rank hazards that impact specific jurisdictions. The variability in the ranking systems made it challenging to directly compare local hazard rankings to the state risk assessment.

Instead, the qualitative risk assessment information in local plans was used as a component of the composite ranking maps as discussed in the **Methodology** section of this chapter. Some plans provided a direct ranking of hazards by overall risk from low to high, while others only offered general information about hazard risk. In the latter case, a ranking was assumed based on the information provided. Table 20 ranks each hazard as High, Moderate-High, Moderate, Low-Moderate, or Low. A score of one to five was assigned to each local plan hazard ranking (one being for low rank and five being for high rank), with an average score determined based on the mean of the individual ranks. It is important to note that a score can be high for a particular hazard even when only a handful of communities are at risk. One example is Coastal Flooding, which is evaluated in only 45 communities. A high score of 3.98 is possible because the average value is dependent only on the rankings within local plans that include the hazard, rather than the score becoming diluted by averaging across all Connecticut communities. The "Weighted Score" in Table 20 accounts for the number of local plans that do not address each hazard. This index recalculates the risk score after assigning a score of zero to a hazard in each community that did not address the hazard in the plan. Additional details on the local plan review, hazards assessed, loss estimation and tracking information, are available in Appendix 3.

Table 20. Local Hazard Mitigation Plan Results of Hazard Identification.

Hazard	Number of Local Plans	Average Score	Weighted Score
Tropical Cyclones	167	3.89	3.75
Winter Storms	167	3.48	3.36
Thunderstorms	167	2.69	2.60
Drought	167	2.05	1.98

Hazard	Number of Local Plans	Average Score	Weighted Score
Earthquake	167	1.93	1.87
Wildfire	151	1.85	1.62
Dam Failure	136	1.57	1.24
Tornadoes	129	2.96	2.21
Flooding (General)	111	3.15	2.02
Riverine Flooding	56	3.91	1.27
Extreme Heat	55	3.35	1.06
Coastal Flooding	45	3.98	1.03
Shoreline Change	39	1.64	0.37
Pluvial Flooding	38	3.61	0.79
Extreme Cold	32	2.88	0.53
Landslides	21	1.10	0.13
Terrorism	18	4.56	0.47
Tree Disease	15	4.87	0.42
Invasive Species	15	1.00	0.09

SCORE KEY	
Rank	Score
High (H)	4.0-5.0
Medium-High (MH)	3.0-3.9
Medium (M)	2.0-2.9
Medium-Low (ML)	1.0-1.9
Low (L)	0.0-0.9

Tropical Cyclones, Winter Storms, Thunderstorms, Droughts, and Earthquakes are ranked in the greatest number of multi-jurisdiction plan annexes (167). Local plans address flooding in different categories: General Flooding is ranked in 111 plans, Riverine Flooding in 56, Coastal Flooding in 45, and Pluvial Flooding in 38. Overall, flooding is ranked in 167 plans. Wildfire, Dam Failure, and Tornadoes are addressed in most plans (151, 136, and 129, respectively). Lightning, Hail, and Wind are addressed within other hazards like Thunderstorms and Tropical Cyclones. Landslides were evaluated in 21 plans for communities located primarily in the Naugatuck Valley where old mill towns were developed on steep slopes flanking river valleys. Tree Disease and Invasive Species were mentioned in the 15 Municipal Annexes of the Multi-Jurisdiction HMP for RiverCOG. Drought and Extreme Heat were ranked in many plans (151 and 136, respectively),

representing a changing level of awareness about the potential impacts of these hazards in this region.

The range of the possible "Average Score" is one to five. Nine hazards scored greater than 3.0 (Medium-High to High rank). These include tropical cyclones, winter storms, flooding (general, riverine, coastal, and pluvial), extreme heat, terrorism, and tree disease. When considering hazards statewide, accounting for the number of local plans that don't consider a particular hazard, the highest ranked hazards are Tropical Cyclones, Winter Storms, and Thunderstorms ("Weighted Score"). Flooding, when all four categories are considered collectively, also has a "Weighted Score" above 3.0.

It is clear that high wind events and flooding associated with tropical cyclones, thunderstorms, and winter storms are of great concern to local communities. Each of these is associated with potential power outages disrupting communication, downed trees and power lines impacting access, and any associated flooding damages. Several of the hazard categories that were addressed in the local plans are not subject to detailed analysis in this State plan update. Of the hazards considered in this update, average rankings in local and state analysis are typically comparable. Table 21 displays this comparison by capturing the number of municipalities reporting certain ranks for each hazard and the overall state rank.

Table 21. Number of Municipalities Reporting Hazard Rank in Local Hazard Mitigation Plan.

Hazard	H	MH	M	ML	L	Weighted Local Rank	State Analysis Rank
Tropical Cyclones	70	30	49	14	4	MH	MH
Winter Storms	53	29	50	15	20	MH	MH
Thunderstorms	31	23	38	13	62	M	M
Drought	3	24	43	6	91	ML	M
Earthquake	10	0	57	2	98	ML	ML
Wildfire	0	0	50	29	72	ML	ML
Dam Failure	2	0	24	22	88	ML	ML
Tornadoes	15	23	62	0	29	M	M
Flooding (General)	37	12	23	9	30	M	MH
Riverine Flooding	16	23	15	0	2	ML	MH
Extreme Heat	15	23	0	0	17	ML	MH
Coastal Flooding	22	0	23	0	0	ML	MH
Shoreline Change	0	0	1	23	15	L	ML
Pluvial Flooding	0	23	15	0	0	L	MH
Extreme Cold	15	0	0	0	17	L	M

Hazard	H	MH	M	ML	L	Weighted Local Rank	State Analysis Rank
Landslides	0	0	1	0	20	L	ML
Terrorism	14	0	4	0	0	L	H
Tree Disease	14	0	1	0	0	L	H
Invasive Species	0	0	0	0	15	L	L

Future local plan updates present an opportunity to address some of the ambiguity between hazard naming conventions if the State of Connecticut standardizes applicable hazard names or labeling. The State may encourage local plan revisions to approach classifying hazards in a similar fashion as done in the risk assessment in this State plan update.

4.1.1.3.2 Local Plan Assessment of Potential Losses

Local hazard evaluations are highly variable. As a result, each local plan has its own set of criteria to develop monetary loss estimates. Table 22 lists annualized loss estimates, which local plans calculated using the following methods:

- Hazus software,
- Analysis of historic event losses and frequencies (based on available data of reported losses, i.e. Public Assistance Claims, NFIP Insurance Claims, or NCEI loss estimates),
- Review of annual municipal budgets for hazard mitigation activities, such as wildfire fighting and drainage system maintenance, as proxies for losses due to specific hazards, and
- Estimation based on CAMA data combined with exposure analysis.

Note that regional loss estimates from the 2019 Connecticut Natural Hazard Mitigation Plan were downscaled by many communities to provide local loss estimates (commonly for Tornado, Wildfire, Thunderstorm, Winter Storm, Dam Failure, and Drought. Loss estimates based on this information were excluded from the summary and analysis below. Average loss value provided is for a single community. Loss estimates have not been adjusted to account for inflation.

Table 22. Local Plan Annualized Loss Estimates by Hazard Type.

Hazard	Average	Number of Plans with Estimates
Coastal	$136,802,500	14
Riverine	$83,869	102

Hazard	Average	Number of Plans with Estimates
All Flood	$52,567,241	58
Drought	$11,861	5
Dam Failure	$3,400	5
Earthquake	$87,033	102
Hurricane	$1,336,677	62
Thunderstorm	$1,527	28
Wildfire	$1,172,114,541	15
Wind	$375,621	58
Winter Storm	$80,459	134
Tornado	$136,662	6

Table 23 lists a more complete range of loss estimates for each hazard. These were calculated using various methods and present losses for hazards of a variety of return periods. The "Methods" column summarizes both the loss calculation methodology and the return period as applicable. Average loss value provided is for a single community. Loss estimates have not been adjusted to account for inflation.

Table 23. Local Plan Loss Estimates by Hazard Type and Method.

Hazard	Method	Average	Number of Plans with Estimates
Coastal Flood	Hazus: 1% Chance Flood	$544,913,333	12
	CAMA Exposure: 1% Chance Flood (at-risk buildings)	$222,333,333	3
	Coastal Flood Loss Total (structure, content, function loss)	$136,802,500	14
Riverine Flood	Hazus: 1% Chance Flood	$67,851,882	110
	Hazus: Aggregate Economic Loss for 1% Chance Flood	$56,654,899	15
	CAMA Exposure: 1% Chance Flood (at-risk buildings)	$150,733,333	15
	Total FEMA Reimbursement*	$83,869	102
	Total FEMA Public Assistance	$33,282	7
	NFIP Policy Value	$246, 951	15
All Flood	Hazus: 1% Chance Flood	$591,227,105	41
	Hazus: Annualized	$52,567,241	58

Hazard	Method	Average	Number of Plans with Estimates
Drought	USDA Funding	$11,861	5
Dam Failure	NPDP Data	$3,400	5
Earthquake	FEMA AEL Annualized Loss	$25,173	22
	Hazus: Annualized	$87,033	102
	Hazus: East Haddam	$144,682,595	79
	Hazus: Haddam	$85,885,065	77
	Hazus: Portland	$107,471,646	79
	Hazus: Stamford	$280,361,558	77
Hurricane	Hazus: 50 Year	$2,319,091	16
	Hazus: 100 Year	$13,864,657	60
	Hazus: 500 Year	$84,414,650	22
	Hazus: Annualized	$8,416	38
	SLOSH: Category 1	$261,760,600	10
	SLOSH: Category 2	$604,448,800	10
	SLOSH: Category 3	$1,236,725,091	11
	SLOSH: Category 4	$2,033,326,545	11
Thunderstorm	NCEI Annualized Damage	$1,527	28
	Total FEMA Public Assistance	$277	6
Wildfire	CAMA Exposure	$1,172,114,541	15
Wind	Hazus: Annualized	$375,621	58
Winter Storm	Total FEMA Public Assistance	$80,459	134
Tornado	Total FEMA Public Assistance	$136,662	6

* Total FEMA Reimbursement includes all PA and NFIP reimbursements provided since community joined the program

One continued goal of the State plan update is to standardize the data analysis process so that future state and local plan updates are consistent and comparable, including recommendations for assigning annualized loss estimates for hazards not included in the Hazus software. The **Mitigation Strategy Chapter** includes the relevant actions to reach this goal. Analysis in local plans has improved since the last State plan update, with every local plan providing at least one loss estimate, and many plans using comparable loss estimate methodologies. Many of the local plans employed Hazus software to provide loss estimates and others relied on the estimates of the 2019 edition of this plan.

4.1.1.3.3 Local Land Use

Most of the local hazard mitigation plans include a general overview of land uses and development trends. Each local hazard mitigation plan was reviewed for information on local trends. Detailed information pulled from each local plan is available in Appendix 2. Most of the land use and development descriptions included population and 2015 or 2016 CLEAR data.

A review of land use from the local hazard mitigation plans presents a closer look at where development is occurring across the state. A total of 62 municipalities reported in their Local HMP that the population has been increasing, while others stated decreasing population trends or stable populations (52 and 28, respectively).

Although Tolland and Windham Counties have largely remained rural, many of the other counties have seen recent development and may continue to see increased development. Municipalities in Litchfield County noted limited developed areas and static trends in recent development. Future development in the county may be unlikely due to unsuitable building conditions such as steep slopes, floodplains, and wetlands.

Many communities in Fairfield County are projecting continued growth near Metro-North stations, including Fairfield, Darien, Danbury, Greenwich, Norwalk, Stamford, and Bridgeport. Many of these towns are working to balance growth with reduction in natural hazard vulnerabilities through building elevation requirements, limiting development in natural hazard areas, and promoting TOD design. Other communities, like the Town of Stratford, have indicated that future land use plans include TOD and mixed-use development and that growth has been directed to the commercial and industrial corridors that are located within the coastal flood hazard area. Norwalk recognizes that while development trends do not reduce exposure to flooding in the community, the town may be able to reduce risks and damage through TOD designs and development plans including redevelopment opportunities, water-dependent uses along the harbor, and existing flood zones. Killingworth, in Middlesex County, reported that the development of single-family homes in recent years has increased the rate of runoff into streams, which, coupled with increased rainfall projections, may create more challenges for flooding along the rivers.

Overall, 16 municipalities report that their populations are increasing, and that development is primarily new development. This indicates that growth beyond previously developed areas puts new development at risk from natural hazards. 25 municipalities report that while the population in the community has been growing, development is focused on redevelopment of existing buildings or infill within already-developed areas. This growth concentrates populations and buildings in corridors that are already developed so that new at-risk areas at not created. 22 municipalities mention a focus on TOD. TOD can provide easy access to means of egress in case of evacuation or other emergencies, as well as reduce urban sprawl and reliance on vehicles that contribute to local emissions. 14 communities explicitly stated that their exposure to natural hazards has increased in the past several years.

4.1.1.4 Hazard Ranking

A standardized methodology was developed to compare different hazards' risk on a county and state level. This method prioritizes hazard risk based on quantitative factors extracted from NCEI and other available data sources.

As outlined in Table 24, ten parameters were used to determine jurisdiction risk-based hazard rankings. Each parameter was rated on a scale of 1 through 5, with higher numbers signifying higher risk. Weights were then applied to each parameter's score to reflect its estimated level of impact on risk.

Table 24. Hazard ranking parameters

Parameter	Basis for Including	Weight
Hazard concern	Reflects public concern	1
Local plan ranking	State plan results should be consistent with local plan results.	1.5
Geographic extent	Most hazards have defined geography where it is more likely the hazard will occur in the future.	1
Population density	A hazard event that occurs in a highly populated jurisdiction generally has a much higher impact compared to an event that takes place in a sparsely populated jurisdiction.	0.5
Future development	A hazard event that occurs in a highly developing jurisdiction generally may have a much higher impact compared to an event that takes place in a very rural jurisdiction.	0.5
Facility intersect	Measure of exposure	1
Annualized events	NCEI record of historical occurrences of hazards is an important factor in determining where hazards are likely to occur in the future	1
Annualized losses	NECI record of historical losses is an important factor in determining future losses.	1.5
Historic injuries and deaths	Reflects the impact of the hazard on health and safety.	1.5
Social sensitivity	Reflects the impact of the hazard on socially vulnerable populations.	1
Composite rank	**Provides overall rank of the severity of the hazard by county.**	**N/A**

Each parameter's weighted score was added together to create a composite rank for each county. A risk determination of high, medium-high, medium, medium-low, and low was then assigned based on percentiles. A summation of all the composite scores for all assessed hazards in each jurisdiction provides an overall risk rank per county, and a summation of the composite hazard scores for each jurisdiction provides an overall state risk rank per hazard.

Overall state hazard rankings also incorporate a climate change weight (refer to Table 25) where applicable to account for projected changes in risk, which is more accurately approximated at the state level.

Table 25. Hazard Climate Change Weighting

Hazard	Weight	Justification
Dam Failure	1	N/A
Drought	1.15	"Results from PCSAR analysis suggest a strong increase of drought severity and frequency in the future, despite projected increase in precipitation quantities. Potential evapotranspiration resulting from significant future warming conditions will drive the projected increase in drought risk. "
Earthquake	1	N/A
Flood	1.25	"Annual precipitation across Connecticut is projected to increase by 8.5% and 9.5% by mid and late century, respectively…Increases in total annual precipitation and the number of extreme precipitation events has the potential to increase coastal and inland flood risks in the state; consequently, coastal communities in Connecticut are vulnerable to higher precipitation levels and heavy precipitation events because of climate change. "
Sea Level Rise	1.15	"Higher sea levels could increase tidal flooding associated with nuisance-level floods. Such events have the potential to cause damage to infrastructure, including stormwater drainage capacity and road closures." Note: Higher weight not applied because impacts will be larger for coastal communities.
Thunderstorm	1	N/A
Tornado	1	N/A
Tropical Cyclone	1.25	"Storm surges will be amplified by sea level rise and stronger, more frequent hurricane events."
Wildland Fire	1.15	"More intense heat waves may mean more heat-related illnesses, droughts, and wildfires." Note: higher weight not applied because not significant literature on this in climate impact section.
Winter Weather	1	N/A
Extreme Heat	1.2	"Regarding extreme heat conditions, it is projected that warm spell days in the state will increase from the current count of four per year to an estimated 48 per year by 2050."
Extreme Cold	1	N/A

Limitations of Hazard Ranking: The data sources used are not complete data sources. Sources, such as NCEI, were used in the ranking because of their standardized collection of many of the hazards that impact Connecticut.

4.2 Extreme Heat

Extreme heat refers to prolonged periods of unusually high temperatures, generally accompanied by high humidity in the Mid-Atlantic region. A heat wave is defined by NWS as a period of abnormally hot weather generally lasting more than two days.[61] Heat waves can vary in extent and intensity and lead to illness and death, particularly among socially vulnerable populations.

Across the United States, heat waves are occurring more frequently in major cities. During the 1960s, the average number of heat waves occurring in U.S. cities was two per year. During the 2010s and 2020s, the average number of heat waves increased to six per year.[62] As the frequency and intensity of heat waves increase, the likelihood of heat-related illnesses and deaths can also increase. Federal statistics show that based on a 30-year period, extreme heat is the leading cause of weather-related deaths in the United States.[63] In Connecticut, there was an average of 410.6 emergency department visits for heat-related illness each year between 2014 and 2018.[64]

4.2.1 Location

Extreme heat can occur anywhere in Connecticut. The number of days per year (based on data between May and September) from 2012 – 2021 with daily maximum temperatures greater than 90°F by county is shown in Table 26.

Table 26. Days with a maximum temperature greater than 90° F

	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Fairfield	8	10	2	3	9	0	4	2	3	4
Hartford	3	3	2	0	4	0	6	2	3	3
Litchfield	0	1	0	0	1	0	0	1	0	0
Middlesex	1	2	0	0	1	0	0	1	0	0
New Haven	1	2	1	0	3	0	0	2	1	0
New London	3	8	1	1	2	0	5	2	2	0
Tolland	0	2	1	0	1	0	1	1	0	0

[61] NWS. During a Heat Wave. https://www.weather.gov/safety/heat-during
[62] EPA. Climate Change Indicators: Heat Waves. https://www.epa.gov/climate-indicators/climate-change-indicators-heat-waves
[63] National Integrated Heat Health Information System. Heat Severity-USA 2021. https://www.heat.gov/datasets/TPL::heat-severity-usa-2021/about
[64] CT DPH. Chapter 8: Climate & Health. https://portal.ct.gov/-/media/Departments-and-Agencies/DPH/dph/state_health_planning/SHA-SHIP/HCT2025/SHA-Chapters/10_Climate-and-Health-chapter_CT_SHA_Report_Final060520-10.pdf;#:~:text=Among%20the%2073%20cold%2Drelated,between%20from%202014%20to%202018

	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Windham	2	3	2	2	3	0	7	2	4	0
Total	**18**	**31**	**9**	**6**	**24**	**0**	**23**	**13**	**13**	**7**

Source: CDC National Environmental Public Health Tracking Network

Based on this period between 2012 and 2021, the average annual number of days with maximum temperatures greater than 90°F is shown in Figure 18. Fairfield County has the greatest average annual number of days with temperatures greater than 90°F with 5 days, followed by Hartford and Windham both with 3 days.

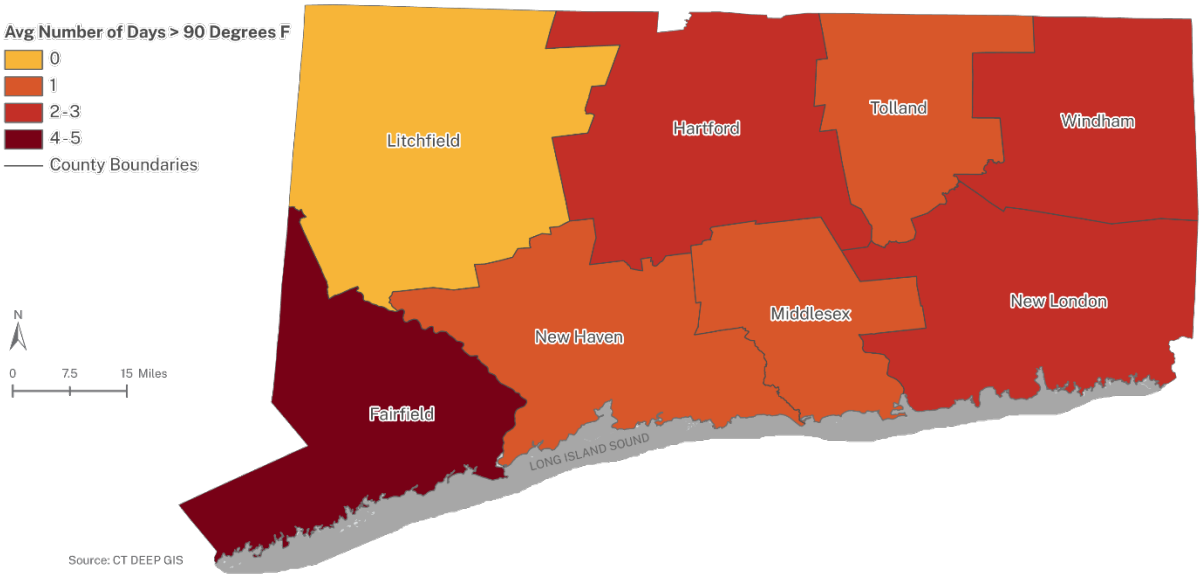


Figure 18. Average annual number of days with maximum temperatures greater than 90° F

Urban areas are more likely to experience higher temperatures due to high amounts of impervious heat-absorbing surfaces, such as pavement and buildings, and minimal tree canopy cover. These areas can become "islands" of higher temperatures relative to surrounding areas, as shown in Figure 19. As a result of the heat island effect, daytime temperatures in urban areas can be 1-7°F higher than temperatures in outlying areas. Similarly, reduced cooling can result in night-time temperatures of about 2-5°F higher than in outlying areas.[65]

[65] U.S. EPA. Learn About Heat Islands. https://www.epa.gov/heatislands/learn-about-heat-islands

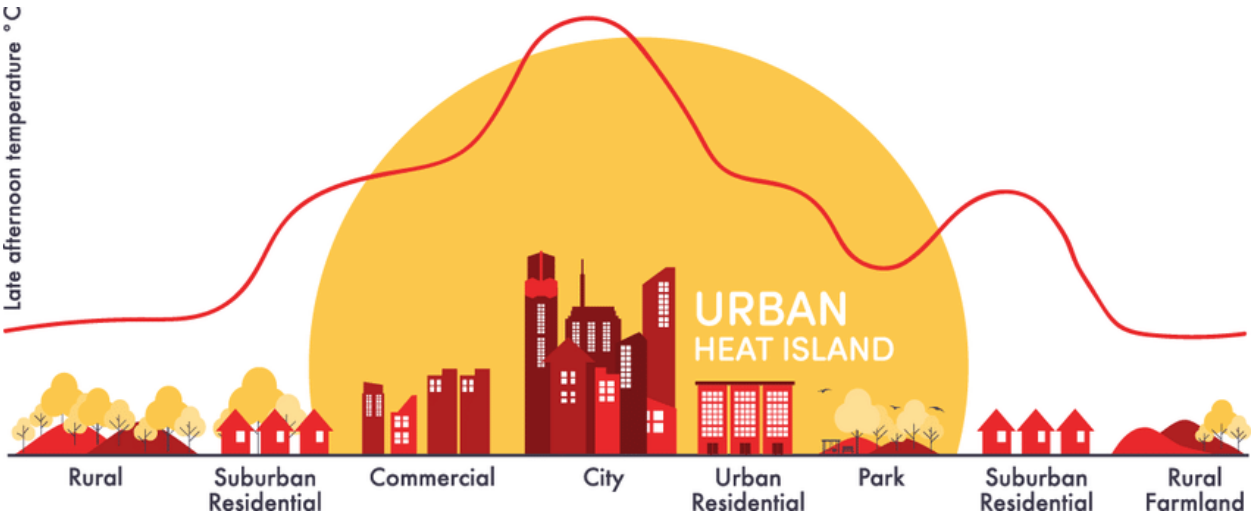


Figure 19. Urban heat island effect[66]

Urban heat island severity can be measured through surface temperature readings captured by satellite imagery. Severity is measured on a scale of 1 to 5, with 1 being a relatively mild heat area (slightly above the mean for an area), and 5 being a severe heat area (significantly above the mean for the area). The heat severity rankings based primarily on data from the summer of 2021 are shown in Figure 20. Due to the heat island effect, the major urban areas of the state, including Bridgeport, Danbury, Hartford, New Haven, Stamford, and Waterbury, are more likely to experience extreme heat events than other areas of the state.

[66] World Meteorological Organization. Urban heat island. Figure is a courtesy of Kamyar Fuladlu. https://community.wmo.int/en/activity-areas/urban/urban-heat-island

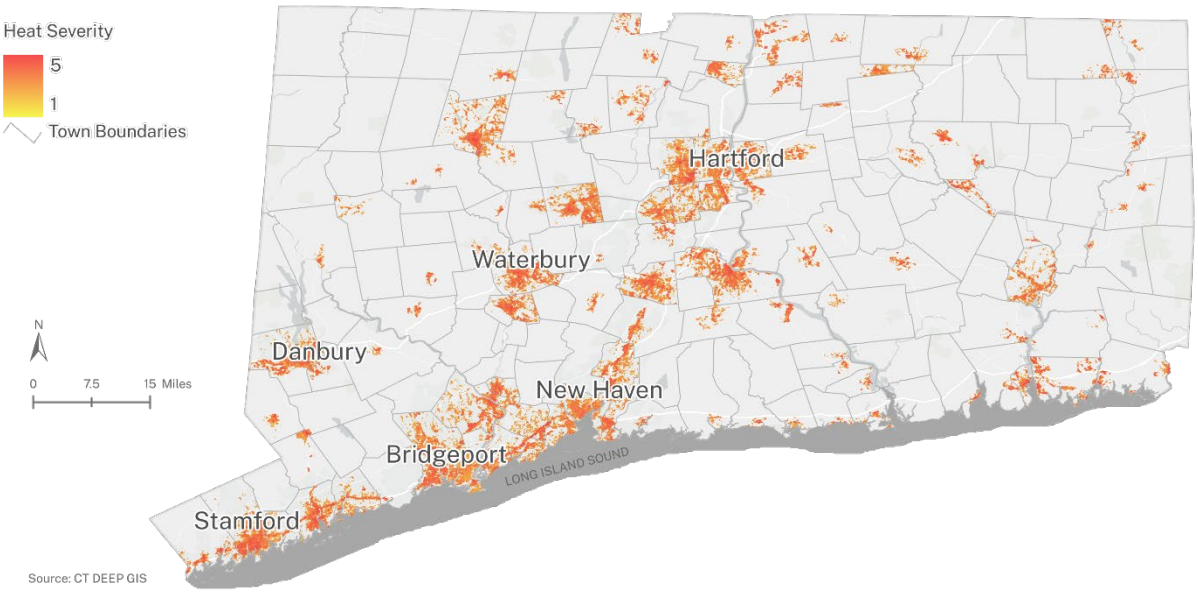


Figure 20. Heat severity rankings

4.2.2 Intensity

The “heat index” is a measure of how heat feels to the human body when the effects of air temperature and relative humidity are combined. For example, a temperature of 90°F “feels like” 100°F when the relative humidity is 60%. The National Weather Service (NWS) heat index chart is shown in Figure 21 and indicates the potential for heat-related disorders under prolonged exposure and/or strenuous physical activity.

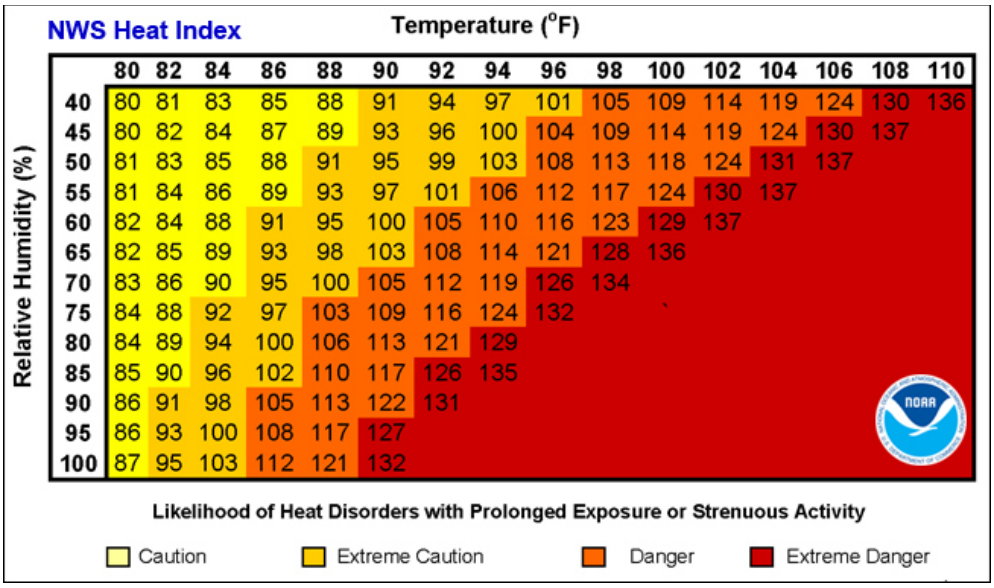


Figure 21. National Weather Service Heat Index Chart[67]

Exposure to high temperatures can be dangerous for the population. The likelihood of heat disorders with prolonged exposure of strenuous activity is classified on a four-step scale, as shown in Table 27. Prolonged exposure, physical activity, and age all tend to increase the risks associated with extreme heat.

Table 27. Classification of heat effects on the body by Heat Index range

Classification	Heat Index (Degrees F)	Effect on the body
Caution	80-90	Fatigue possible with prolonged exposure and/or physical activity
Extreme Caution	90-103	Heat stroke, heat cramps, or heat exhaustion possible with prolonged exposure and/or physical activity
Danger	103-124	Heat cramps or heat exhaustion likely, and heat stroke possible with prolonged exposure and/or physical activity
Extreme Danger	125 or higher	Heat stroke highly likely

The heat index thresholds are used by NWS to issue the following advisories and warnings:[68]

- **Excessive Heat Warning – Take Action!** Heat warnings are issued within 12 hours of when the maximum heat index temperature is expected to be 105 or higher for at

[67] National Weather Service. What is the heat index? https://www.weather.gov/ama/heatindex
[68] NWS. Heat Watch vs. Warning. https://www.weather.gov/safety/heat-ww

least 2 days and nighttime air temperatures will not drop below 75, but these criteria can vary across the country

- **Excessive Heat Watch – Be Prepared!** Heat watches are issued when an excessive heat event may happen within 24 to 72 hours, but the exact timing and occurrence are still uncertain
- **Heat Advisory – Take Action!** Heat advisories are issued within 12 hours of the onset of extremely dangerous heat conditions generally corresponding with a maximum heat index temperature of 100 or higher for at least 2 days and a nighttime air temperature that will not drop below 75, but these criteria can vary across the country.
- **Excessive Heat Outlooks – Be Aware!** Outlooks are issued when conditions are favorable for an excessive heat event within the next 3-7 days.

4.2.3 Impacts

Extreme heat can result in severe public health impacts, as well as economic and environmental impacts. In addition to urban areas, agricultural lands are also particularly susceptible to the impacts of extreme heat, which can lead to cascading impacts for food supply and the economy.



- Temperatures over 100 degrees can cause strain or degrade infrastructure.
- Higher temperatures result in more frequent use of air conditioning to cool buildings, which places increased demand on electricity-related critical infrastructure. The electrical grid can further be strained as a result of higher temperatures reducing transmission capacity.[69]
- Water-related critical infrastructure can be impacted by increased demand for drinking water consumption. Furthermore, conventional power plants require large quantities of water for cooling.



- Extreme heat can lead to pavement buckling and deterioration, as well as warping or buckling of railway tracks.
- High temperatures can cause bridges to expand and accelerate material degradation, reducing the stability and durability of bridges.

[69] NWS. During a Heat Wave. https://www.weather.gov/safety/heat-during

- Agricultural crops can be damaged by extreme heat and livestock can be injured or killed by heat-related illness.
- Extreme heat can contribute to increased risk of wildfires.[70]

- Extremely hot and humid weather can lead to heat-related illness such as heat cramps, heat exhaustion, and heat stroke.[71]
- Groups at greater risk of heat-related illness include but are not limited to outdoor workers, athletes, emergency responders, and socially vulnerable populations. In particular, children, older adults, people experiencing homelessness, and low-income communities face a greater risk of heat-related illness and may lack resources to adapt or recover.[72]

- Reduced agricultural crop production can lead to supply shortages and increased costs to farmers and consumers.
- Increased dependence on air-conditioning can lead to increased utility bills.

4.2.4 Previous Occurrences and Losses

The National Centers for Environmental Information (NCEI) data records an "excessive heat" event when the heat index value meets or exceeds locally or regionally established excessive heat warning thresholds. The NCEI data reports a total of 47 events across Connecticut between 1996 and 2022, as shown in Table 28. The greatest number of excessive heat events, 11, was recorded for New Haven County, followed by Hartford and Litchfield counties, each with 9 events recorded.

Table 28. NCEI Excessive Heat Events by County from 1996-2022

County	Number of Excessive Heat Events
Fairfield	7
Hartford	9
Litchfield	9
Middlesex	6
New Haven	11

[70] EPA. Climate Change Indicators: Heat Waves. https://www.epa.gov/climate-indicators/climate-change-indicators-heat-wave
[71] NWS. Heat Cramps, Exhaustion, Stroke. https://www.weather.gov/safety/heat-illness
[72] Heat.gov. Who is most at risk to Extreme Heat? https://www.heat.gov/pages/who-is-at-risk-to-extreme-heat

County	Number of Excessive Heat Events
New London	2
Tolland	0
Windham	3
Total*	**47**

*Note: The total reflects events reported by county, which may result in a single event that spans multiple counties being recorded multiple times.

There is no NCEI reported property damage, death, or injury associated with extreme heat events. Yet, Connecticut's populations are susceptible to heat-related illness. Between 2014 and 2018, there was an average of 410.6 Emergency Department visits for heat-related illness each year. As well, 4.7% of weather-related mortality in Connecticut are due to extreme heat conditions. As there were 16.4 weather-related deaths each year between 2014 and 2018, the amount of heat related deaths comes out to around 0.77 per year.[73]

CDC's National Environmental Public Health Tracking Network analyzed the average number of days annually with a maximum temperature >90°F by county. Figure 22 shows these values through 2016. Fairfield County has the highest average number of days with a maximum temperature >90°F annually with approximately 7 days per year while Windham, Middlesex, and Litchfield County are the next highest with approximately 3 days per year.

[73] Connecticut State Health Assessment. Chapter 8. https://portal.ct.gov/DPH/State-Health-Planning/Healthy-Connecticut/Healthy-CT-2025-State-Health-Assessment

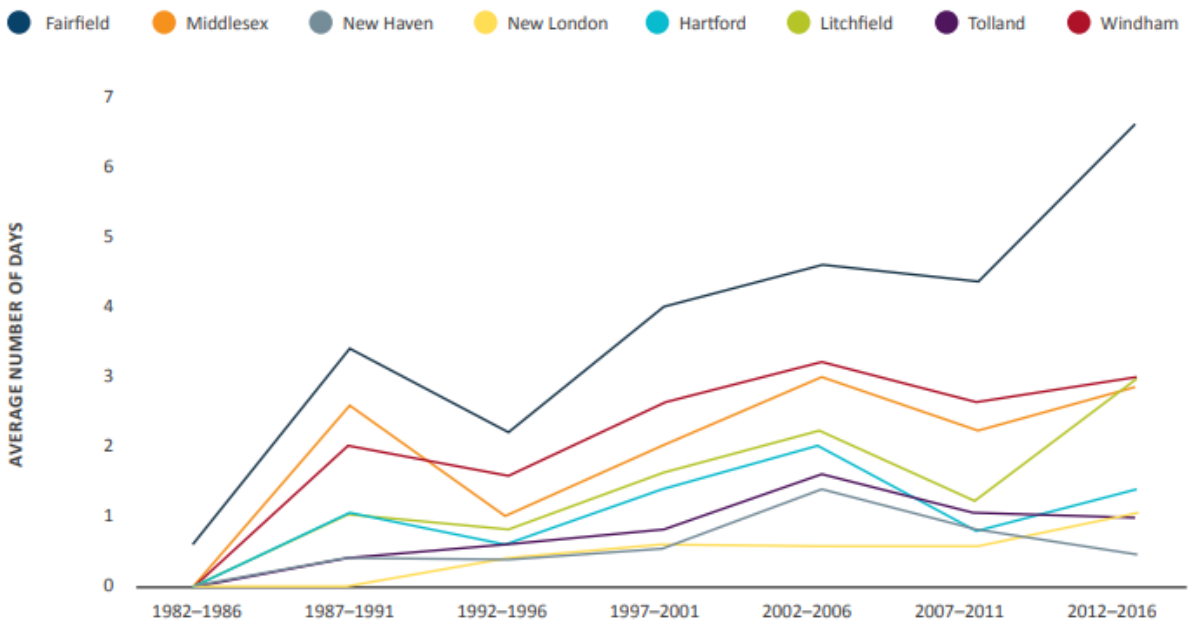


Figure 22. Average Number of Days > 90°F by County Annually[74]

There have been no FEMA Disaster Declarations that indicate excessive heat in Connecticut.

4.2.5 Future Losses

Based on historical data, the state should experience 1 – 2 extreme heat events per year. Table 29 shows NCEI annualized excessive heat events to show the probability of future occurrences for each county in Connecticut. New Haven, Hartford, and Litchfield have the highest probability of experiencing an extreme heat event, followed by Fairfield County.

Table 29. NCEI Annualized Excessive Heat Events by County

County	Annualized Excessive Heat Events
Fairfield	
Hartford	0.27
Litchfield	0.35
Middlesex	0.35
New Haven	0.23
New London	0.42
Tolland	0.08
Windham	0

[74] CT DPH. Chapter 8: Climate & Health.

County	Annualized Excessive Heat Events
Total*	**0.12**

*Note: The total reflects annualized events by county, which may result in a single event that spans multiple counties being recorded multiple times.

The annual average temperature in Connecticut is 51.0°F, with average temperatures of 27.2°F in January and 72.4°F in July. As shown in Figure 23, the average annual temperature in Connecticut is trending upward. During the same time period as the NCEI data recordings (1996 – 2022), Connecticut's average temperature has increased nearly 3°F from 48.4°F to 51.0°F.

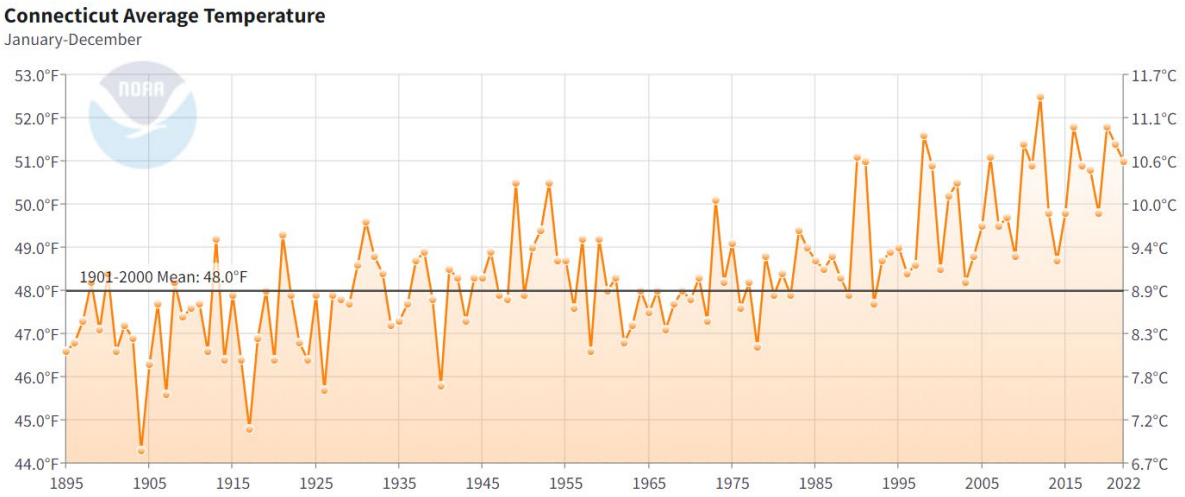


Figure 23. Connecticut Average Temperature Time Series from 1895 to 2022[75]

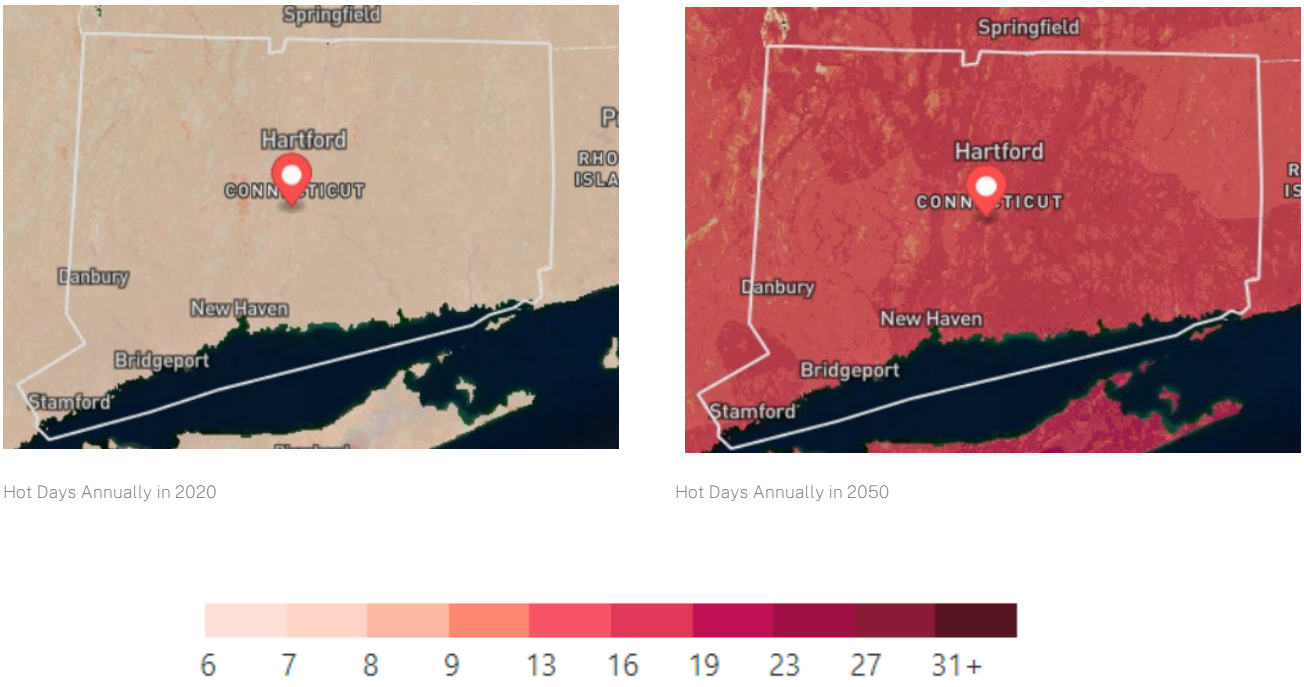
Risk Factor captures trends in Connecticut for the likelihood of current and future projected heat waves and hot days, as shown in Figure 24.[76] A "hot day" is defined as the average of the seven hottest days in the localized area. Currently the average number of hot days annually is 7 days in each county in Connecticut. In 30 years, the projected number of hot days ranges from 15-16 days on average annually.

The heat wave likelihood consists of 3 or more consecutive days where the temperature meets or exceed the local definition of a "hot day". As shown in Table 30, the top counties in Connecticut for heat wave likelihood are as follows: New Haven County with a current heatwave likelihood of 54% and a likelihood in 30 years of 82%; Middlesex County with a current heatwave likelihood of 53% and a likelihood in 30 years of 83%; and Fairfield County with a current heatwave likelihood of 52% and a likelihood in 30 years of 83%.

[75] NOAA. Statewide Time Series. https://www.ncei.noaa.gov/access/monitoring/climate-at-a-glance/statewide/time-series/6/tavg/ann/4/1895-2023?base_prd=true&begbaseyear=1901&endbaseyear=2000
[76] Risk Factor. Does Connecticut have risk? https://riskfactor.com/state/connecticut/9_fsid/heat#heat_trends

Table 30. Heatwave likelihood by county for current (2022) and future (2050) conditions

County	Risk Factor Heatwave Likelihood 2022	Risk Factor Heatwave Likelihood 2050
Fairfield	52%	83%
Hartford	51%	81%
Litchfield	51%	83%
Middlesex	53%	83%
New Haven	54%	82%
New London	50%	83%
Tolland	50%	80%
Windham	50%	80%



Hot Days Annually in 2020

Hot Days Annually in 2050

Figure 24. Hot Days Annually in 2020 vs. 2050[77]

4.2.6 Climate Change Impacts

Extreme temperatures vary across the state. Days with temperatures above 90°F vary from an annual average of 8 days in Falls Village, in the northwest, to 13 days in Hartford (Hartford Brainard Field), in the central part of the state, and 4 days in New Haven, along the coast in the south. Average annual temperature in Connecticut has increased by 3.5°F

[77] Risk Factor. Does Connecticut have risk? https://riskfactor.com/state/connecticut/9_fsid/heat#heat_trends

since 1900. Historically unprecedented warming is projected to continue through this century. Figure 25 shows projected temperature changes in Connecticut under different climate scenarios (lower emission and higher emission scenarios). Less warming is expected under a lower emissions future (the coldest end-of-century projections being about 2°F warmer than the historical average; green shading) and more warming under a higher emissions future (the hottest end-of-century projections being about 10°F warmer than the hottest year in the historical record; red shading).

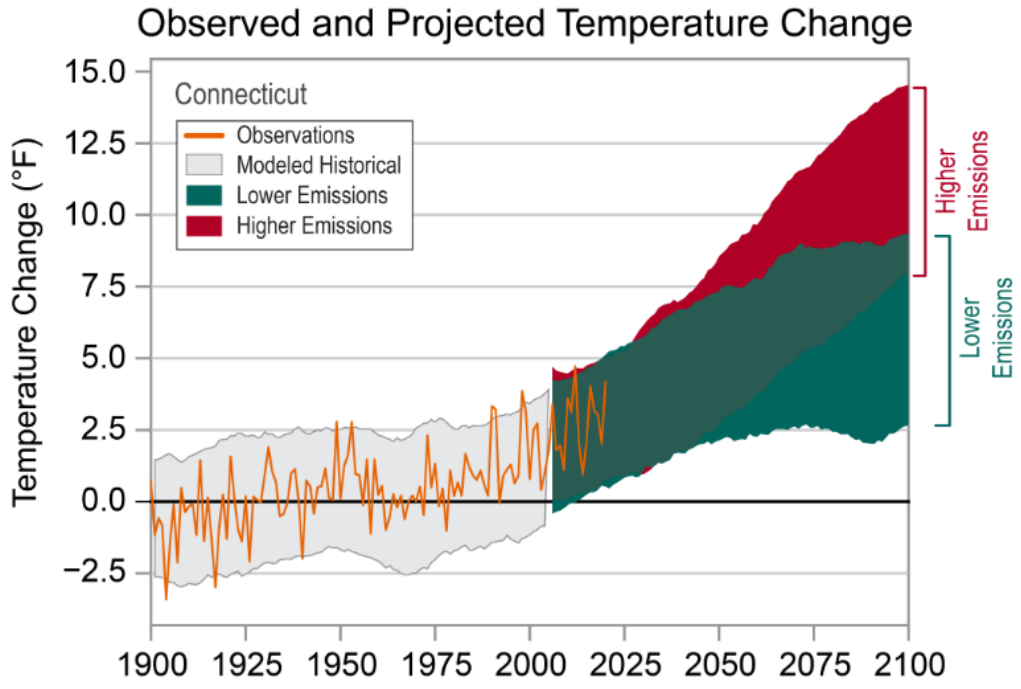


Figure 25. Observed and Projected Temperature Changes in Connecticut[78]

FEMA's Climate Mapping for Resilience and Adaptation (CMRA) Assessment Tool gives a further breakdown of extreme heat impacts, as shown in Figure 26. Annual days with a maximum temperature >90°F are projected to increase by 6.8 days under a lower emission scenario and 7.6 days under a higher emission scenario in the early century (2015-2044) when compared to the CMRA's base time period of 1976-2005. By mid-century (2035-2064), annual days with a maximum temperature >90°F are projected to increase by 11.6 days and 17.5 days under low and high emission scenarios respectively. By late century (2070-2099) annual days are projected to increase to 17.5 days and 44.2 days under low and high emission scenarios respectively (all compared to a base time period of 1976-2005).

[78] CT Changing Climate Booklet. https://portal.ct.gov/-/media/DEEP/education/kellogg/CT-Changing-Climate-Booklet.pdf

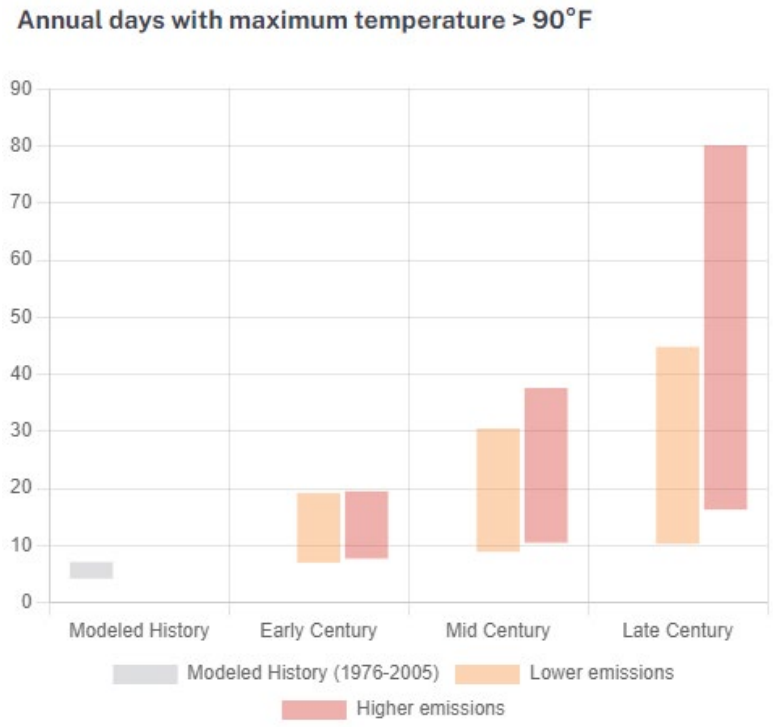


Figure 26. Annual Days with Maximum Temperature > 90°F Under Different Climate Scenarios[79]

A summary of projected climate change impacts on extreme heat is shown in Table 31.

Table 31. Climate Change Impacts on Future Extreme Heat Events

Impact	Projected Change
Location	Climate science does not indicate a change in the location of extreme heat events.
Intensity	Extreme heat is projected to continue to increase in intensity with the hottest end of century projections in average temperature as 10°F warmer than the hottest year in the historical record.
Frequency	Extreme heat will likely increase significantly in frequency, and by century's end, hot days are projected to increase by 17.5 and 44.2 days under low and high emission scenarios respectively.
Duration	Consecutive extreme heat days are projected to increase by 50% in 30 years in the state's most populous counties.
Model Confidence	High confidence.

Higher temperatures will impact public health as a result of environmental changes, including:

[79] CMRA Assessment Tool. https://livingatlas.arcgis.com/assessment-tool/home

- **Hotter nights:** Warmer nighttime temperatures can be especially dangerous, particularly for people living in urban areas and for those without access to air conditioning. This is because cool nights are typically an opportunity for the body to cool down; without this cooling-off time, heat waves can be even more perilous.
- **More heat waves:** While there has not been an observed change in the number of extreme heat days (days with maximum temperature over 90°F) since the mid-1900's, with climate change extreme heat days are expected to increase significantly.
- **Bad ground-level ozone days:** The hottest days often are associated with the highest concentrations of air pollutants, particularly ground-level ozone, or smog. Ground-level ozone pollution is a problem across all of Connecticut. In fact, the American Lung Association gave all eight Connecticut counties "F" grades for ozone pollution in its 2020 State of the Air Report. Looking to the future, higher temperatures caused by climate change are expected to bring about higher ground-level ozone concentrations, especially in already polluted areas. Ozone is dangerous to health, worsening conditions including chronic obstructive pulmonary disease and asthma. Children are at higher risk from ozone exposure, especially for asthma exacerbations, since their lungs are still developing, and they are likely to be active outdoors when ozone levels are high.

4.2.7 Vulnerability Assessment

Extreme heat can affect public health and disproportionately impact socially vulnerable populations, such as the elderly, children, and people experiencing homelessness. Extreme heat leads to higher utility usage which can also place further financial stress on low-income communities. Public infrastructure can also be stressed as increased water consumption decreases the available water supply and high temperatures buckle paved roads. The higher the amount of impervious surface in an area, the more extreme heat can affect the people living in the area. Figure 27 highlights the areas in Connecticut with a greater percentage of impervious surface where populations and infrastructure are more vulnerable to heat impacts. Areas with high amounts of impervious surfaces follow a similar spatial distribution as areas with highest heat sensitivity, as shown in Figure 20 above.

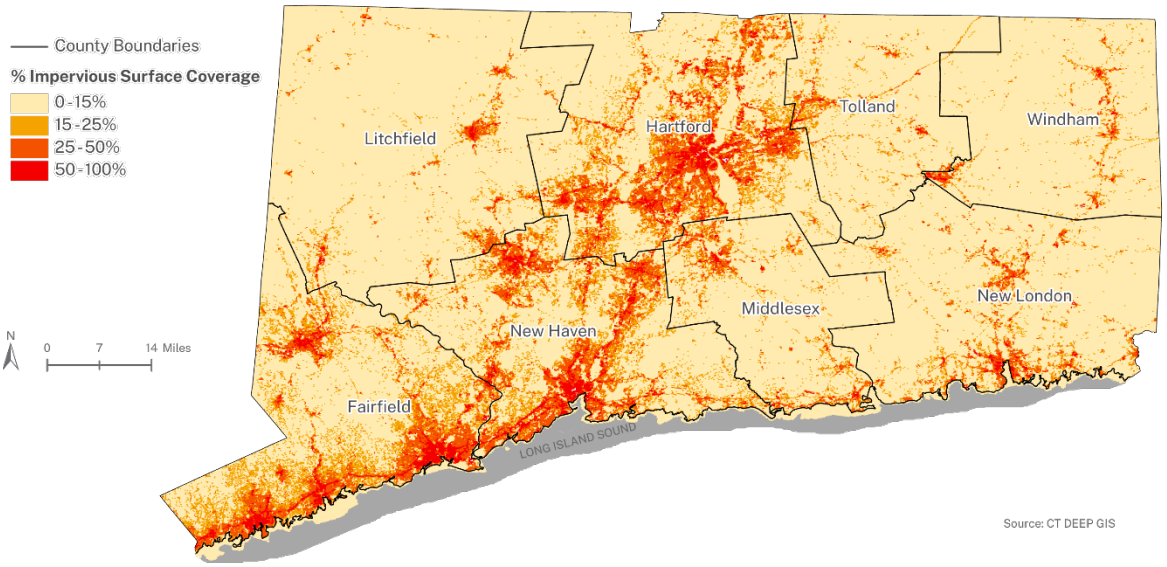


Figure 27. Percent of impervious surface coverage across Connecticut

Areas with low tree canopy cover and high development are more vulnerable to extreme heat. Where there is a lower percentage of tree canopy cover, there is a higher heat sensitivity value associated with it as shown by the Heat Severity Index overlay in Figure 28.

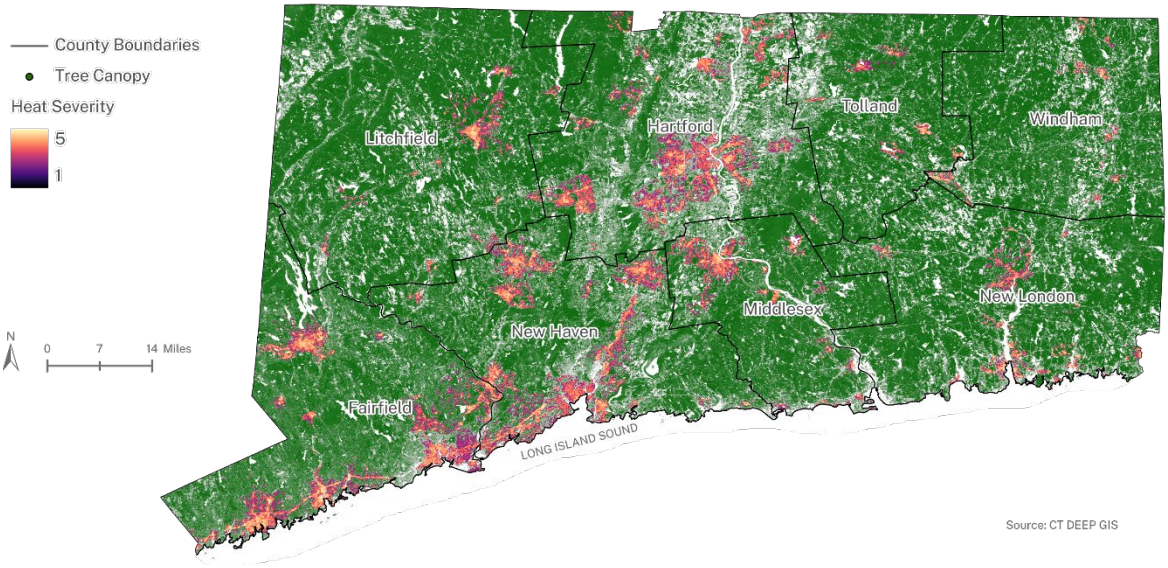


Figure 28. Connecticut Tree Canopy with Heat Severity Index

The CIRCA CCVI Heat Vulnerability map shown in Figure 29 shows heat vulnerability scores in the state based on exposure, sensitivity, and adaptive capacity to extreme heat. Areas with high vulnerability scores are primarily located in urban areas. High vulnerability areas

include areas with low percent tree cover, high percent impervious surfaces, far proximity to cooling centers, and high number of emergency visits for asthma, per population.[80]

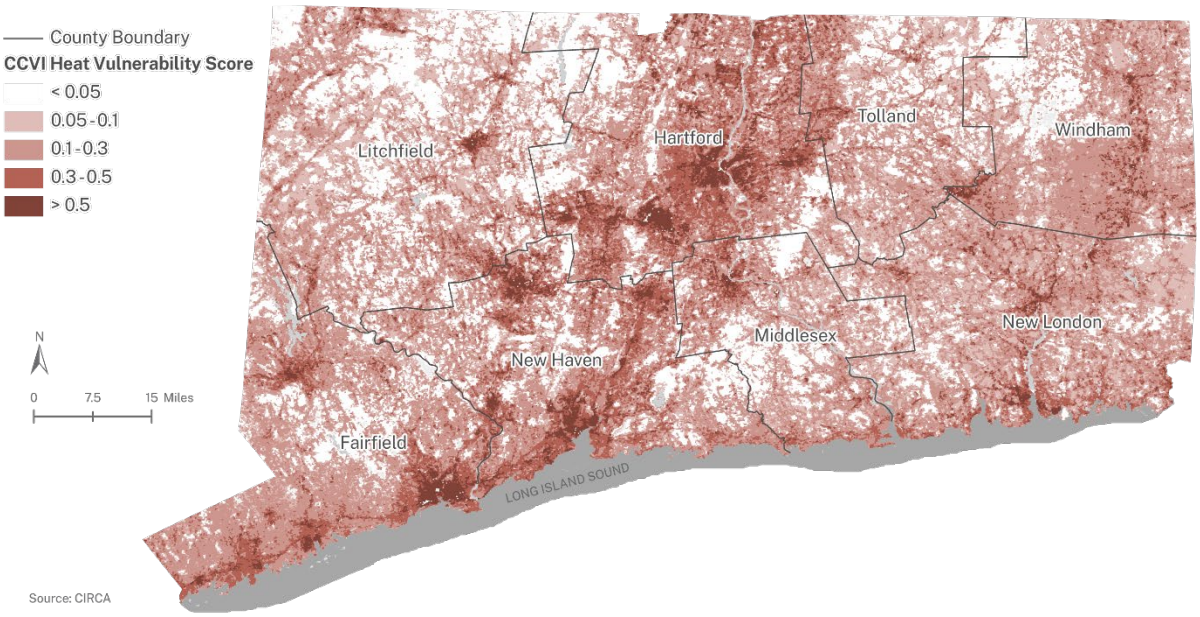


Figure 29. CCVI Heat Vulnerability Score

4.2.7.1 State Vulnerability

All state-owned facilities are exposed to extreme heat. State-owned buildings located in areas with more extreme heat events may require more frequent repair or replacement with heat resistant options. The counties with greater than 5 NCEI extreme heat events recorded are shown in Table 32. Of these counties, Hartford County and New Haven County have the greatest number of state-owned buildings, as well as two of the highest numbers of extreme heat events. Therefore, these buildings are at higher risk of damage from extreme heat.

Table 32. State-owned buildings by county with a high number of NCEI extreme heat events

County	Number of State-Owned Buildings	Number of Extreme Heat Events
Fairfield	267	7
Hartford	688	9
Litchfield	261	9
Middlesex	312	6
New Haven	605	11

[80] Resilient Connecticut. Climate Change Vulnerability Index (CCVI) Fact Sheet. https://resilientconnecticut.uconn.edu/wp-content/uploads/sites/2761/2023/07/CCVI-Fact-Sheet-2023.pdf

County	Number of State-Owned Buildings	Number of Extreme Heat Events
Total*	**2,133**	**42***

*Note: The total reflects events reported by county, which may result in a single event that spans multiple counties being recorded multiple times.

The value of state-owned buildings within these counties is shown in Table 33. The two counties with the highest building value and number of extreme heat events are Hartford County and New Haven County, over $1 billion in state-owned building value each. There is potential for this value to be lost if extreme heat events damage the structure of a building and it collapses.

Table 33. Value of State-Owned Buildings by County with a High Number of NCEI Extreme Heat Events

County	Value of State-Owned Buildings	Number of Extreme Heat Events
Fairfield	$629,154,560	7
Hartford	$1,976,443,953	9
Litchfield	$52,796,110	9
Middlesex	$177,782,640	6
New Haven	$1,038,408,860	11
Total*	**$3,874,586,123**	**42***

*Note: The total reflects events reported by county, which may result in a single event that spans multiple counties being recorded multiple times.

4.2.7.2 Councils of Government Vulnerability

Council of Governments (COGs) in Connecticut experience a range of impacts from extreme heat. Most of these impacts are influenced by whether the COG has a large percentage of impervious surface. Areas with a higher percentage of impervious surface are more likely share characteristics of urban areas that can lead to the heat island effect. COGs with the highest percentage of impervious surfaces are Metropolitan and South Central, followed by Western Connecticut, Naugatuck Valley, and Capitol Region. As shown in Table 34, these COGs are where the highest percentage of the population resides and where the highest heat severity rating can be found. The COGs with the largest amount of heat severe areas are in the COGs with the highest percentage of impervious surfaces, as shown in Figure 30.

Table 34. Population by COG and percent of impervious surface coverage

COG	Total Population	Percent of Impervious Surface Coverage
Capitol Region	1,129,009	10.9%
Metropolitan	411,718	19.4%

COG	Total Population	Percent of Impervious Surface Coverage
Naugatuck Valley	353,855	11.7%
Northeastern Connecticut	119,049	3.3%
Northwest Hills	155,953	2.9%
Lower Connecticut River Valley	190,220	6.3%
South Central Regional	481,071	15.6%
Southeastern Connecticut	204,210	6.4%
Western Connecticut	559,106	12.7%

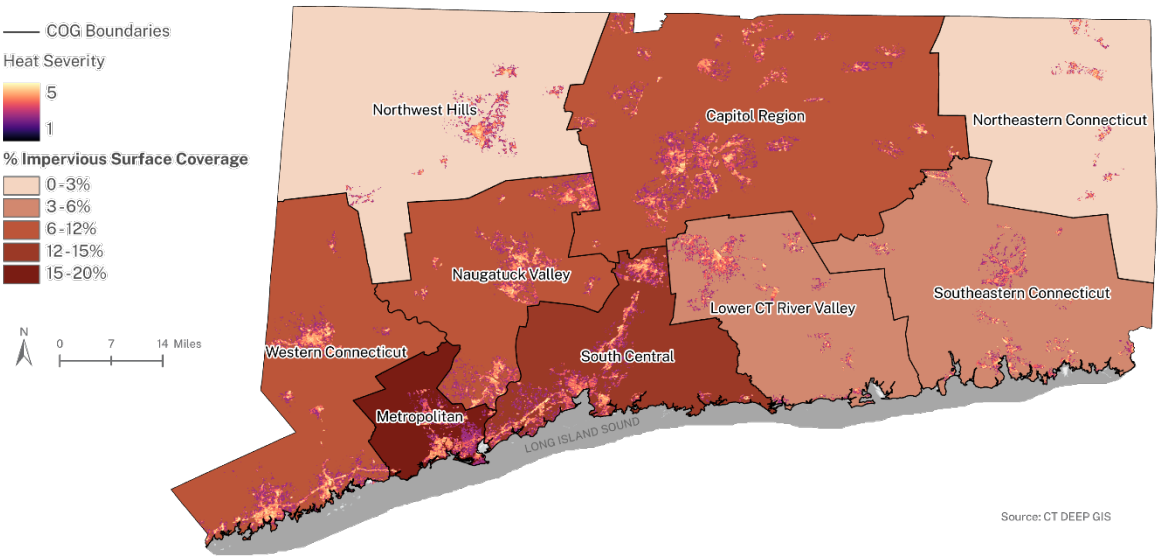


Figure 30. Heat Severity Index relative to Percent Impervious Surface Coverage by COG

The critical facilities whose operations are most likely to be impacted by extreme heat are summarized in Table 35. These include power plants, wastewater plants, emergency operation centers, emergency medical service stations, healthcare facilities, hospitals, urgent care facilities, and veteran healthcare facilities. The Capitol Region sees the highest number of critical facilities affected with 185 total. Southeastern Connecticut, Western Connecticut, and South Central all see over 100 critical facilities affected by extreme heat.

Table 35. Critical Facilities Impacted by Extreme Heat by COG

COG	Critical Facilities Impacted by Extreme Heat
Capitol Region	185
Metropolitan	52

COG	Critical Facilities Impacted by Extreme Heat
Naugatuck Valley	77
Northeastern Connecticut	66
Northwest Hills	64
Lower Connecticut River Valley	74
South Central Regional	110
Southeastern Connecticut	154
Western Connecticut	138
Total	**919**

4.2.7.3 Local Vulnerability

Extreme Heat is projected to incur damages to the population, agriculture, and facilities in the state of Connecticut. The NRI has a calculated expected annual loss value per county assessing what a heat wave is expected to cost in dollars annually. As shown in Table 36, Hartford County is expected to lose the most by far with over a million in expected annual loss. Fairfield County has the second highest expected annual loss with $672,781. After only one other county (New Haven) is expected to lose over $100,000. Hartford and Fairfield Counties have the highest exposed building value and highest exposed population size according to the NRI, which helps to explain these higher expected loss values. There is a relatively moderate expected risk in Hartford and Fairfield County for heat wave while the rest of the counties are considered to be at relatively low risk due in part to these expected loss values.

Table 36. NRI Expected Annual Loss for Heat Wave Annually

County	Expected Annual Loss Due to Heat Wave
Fairfield	$672,781
Hartford	$1,028,613
Litchfield	$19,913
Middlesex	$24,585
New Haven	$125,846
New London	$31,647
Tolland	$26,230
Windham	$18,804
Total	**$1,948,421**

The counties with the highest impervious surface cover are Fairfield, New Haven, and Hartford County, which all have between 10-15% impervious surface, as shown in Figure 31.

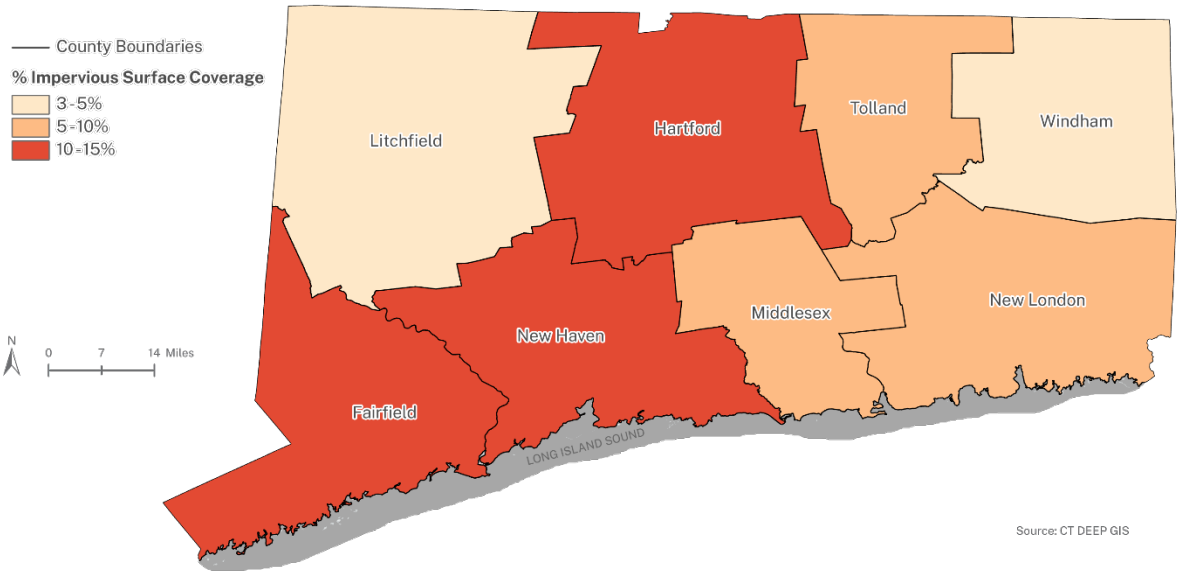


Figure 31. Percent impervious surface coverage by county

Given that impervious cover is an indicator of urban land development, critical facilities within counties with a higher percentage of impervious surface coverage are likely exposed to higher extreme heat risk impacts. The critical facilities whose operations are most likely to be impacted by extreme heat are summarized in Table 37. These include power plants, wastewater plants, emergency operation centers, emergency medical service stations, healthcare facilities, hospitals, urgent care facilities, and veteran healthcare facilities. Power plants and wastewater plants are likely to be impacted by increased electricity demand for air conditioning and increased water usage. Medical facilities may also experience capacity constraints as heat related illness increases. These critical facility types align with the community lifelines of Health and Medical for responding to heat-related illnesses, Energy for increased utility usage, and Communications for emergency operations centers and circulating heat watches and warnings.

Table 37 compares the number of critical facilities that may be impacted by extreme heat to the number of NCEI extreme heat events by county. In total, 919 critical facilities fall into the selected categories likely to be impacted by extreme heat. Fairfield, New Haven, New London, and Hartford counties have the highest number of critical facilities likely to be impacted by extreme heat. Except for New London, these counties also have the highest number of NCEI extreme heat events. Litchfield County has the next highest number of critical facilities impacted by extreme heat and has the same amount of NCEI extreme heat events as Hartford County.

Table 37. Number of critical facilities likely to be impacted by extreme heat and NCEI extreme heat events

County	Critical Facilities Impacted by Extreme Heat	NCEI Extreme Heat Events
Fairfield	187	7
Hartford	144	9
Litchfield	81	9
Middlesex	65	6
New Haven	162	11
New London	157	2
Tolland	53	0
Windham	70	3
Total	**919**	**47***

*Note: The total reflects events reported by county, which may result in a single event that spans multiple counties being recorded multiple times.

The critical facilities impacted by extreme heat also tend to be aggregated in areas of high heat severity. Figure 32 below shows critical facilities compared to heat severity and the highest concentration can be found in the most heat severe urban areas of the state.

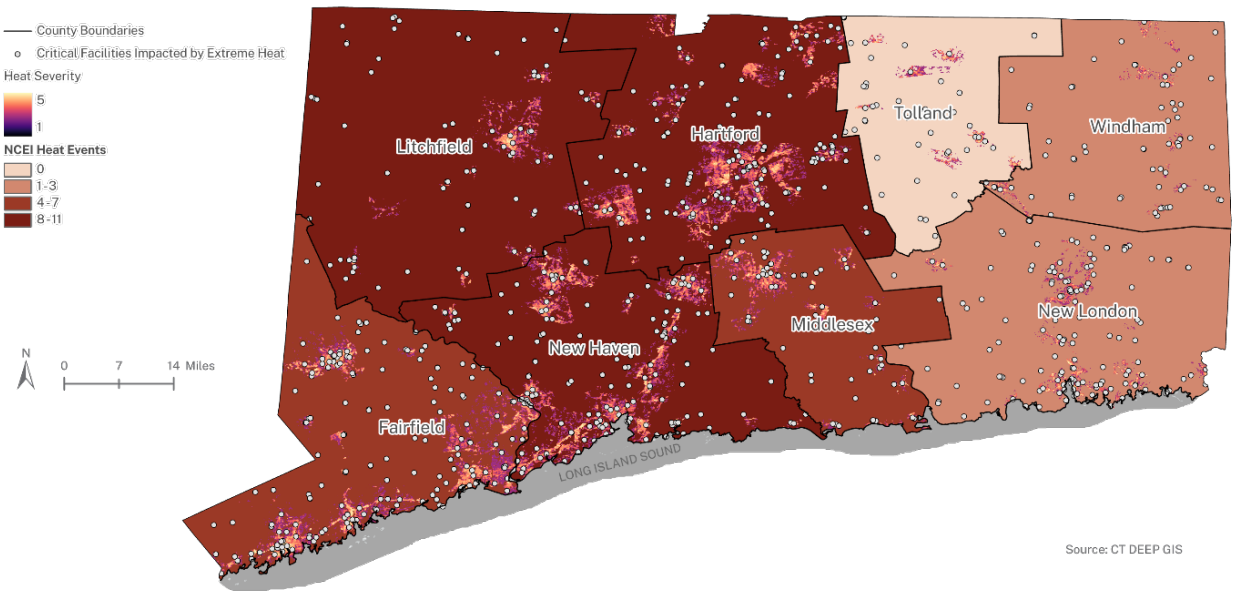


Figure 32. Critical facilities likely to be impacted by extreme heat compared to heat severity and NCEI heat events

Trees offer cooling benefits that can reduce extreme heat impacts in urban areas. A Tree Equity Score is calculated by American Forests based on the surface temperature, percent of socially sensitive population (seniors, children, low-income, people of color), the health

risk index, and tree canopy cover in a census block group.[81] If there is not enough canopy cover to mitigate concerns with the above environmental and social metrics, the tree equity score will be lower. A high tree equity score indicates an amount of canopy per population that is likely to mitigate extreme heat impacts and benefit the health of the community. The tree equity score is only calculated for urban areas in Connecticut.

The impervious surface percentage by county is shown in Figure 33 with the tree equity scores overlaid on top. Areas with lower tree equity scores are primarily in the counties with higher impervious surface coverage, including Fairfield, New Haven, and Hartford counties, and urban areas.

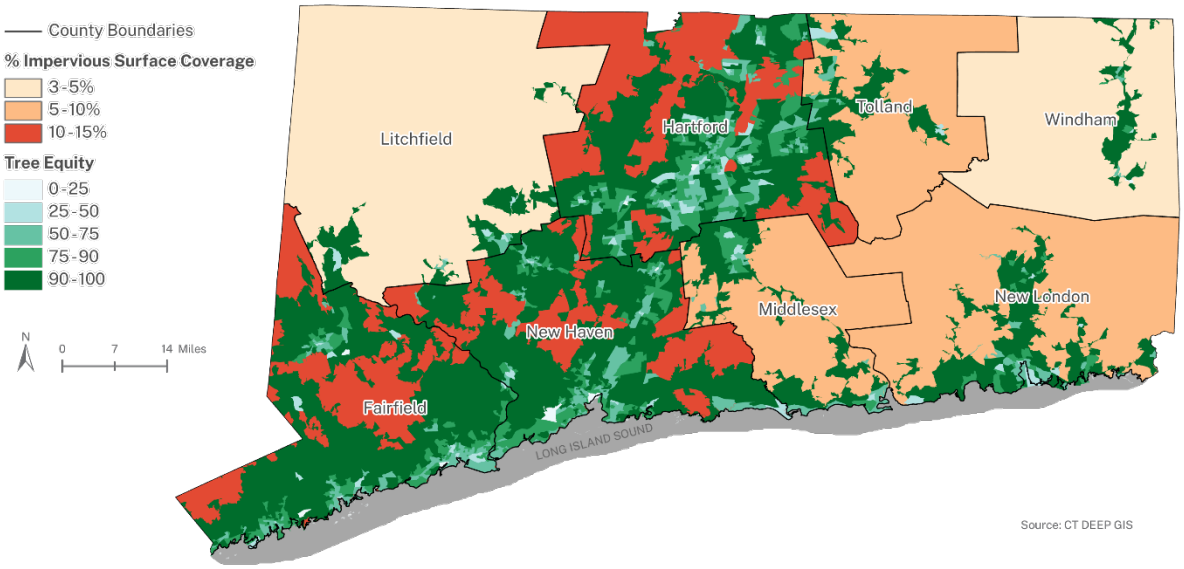


Figure 33. Tree Equity Score compared to percent impervious surface coverage

These same areas with low tree equity scores have high CCVI social sensitivity scores, as shown in Figure 34. Particularly in Hartford and Fairfield Counties the pockets with the lowest social sensitivity are also areas with the lowest tree equity scores in the state. In general, populations most vulnerable to heat related illness include people with chronic health problems (cardiovascular disease, diabetes, and obesity), infants and young children, outside works and older people (greater than age 65). Based on emergency department visits in Connecticut between 2014-2018, Non-Hispanic Black populations are at higher risks for heat-related illness compared to both non-Hispanic White and Hispanic populations.[82] Those considered more socially sensitive with regards to extreme heat share traits such as being below the poverty line, being disabled, lacking a vehicle, and speaking little to no English. Areas that have a higher social sensitivity score have a higher percent of the population with one or some of these traits. This leads them to be more vulnerable to extreme heat impacts as they are either less likely to have the infrastructure and resources

[81] American Forests. Tree Equity Score. https://treeequityscore.org/
[82] CT DPH. Chapter 8: Climate & Health.

available to them to mitigate heat effects and/or they are themselves more sensitive to the effects of heat (such as those with asthma).

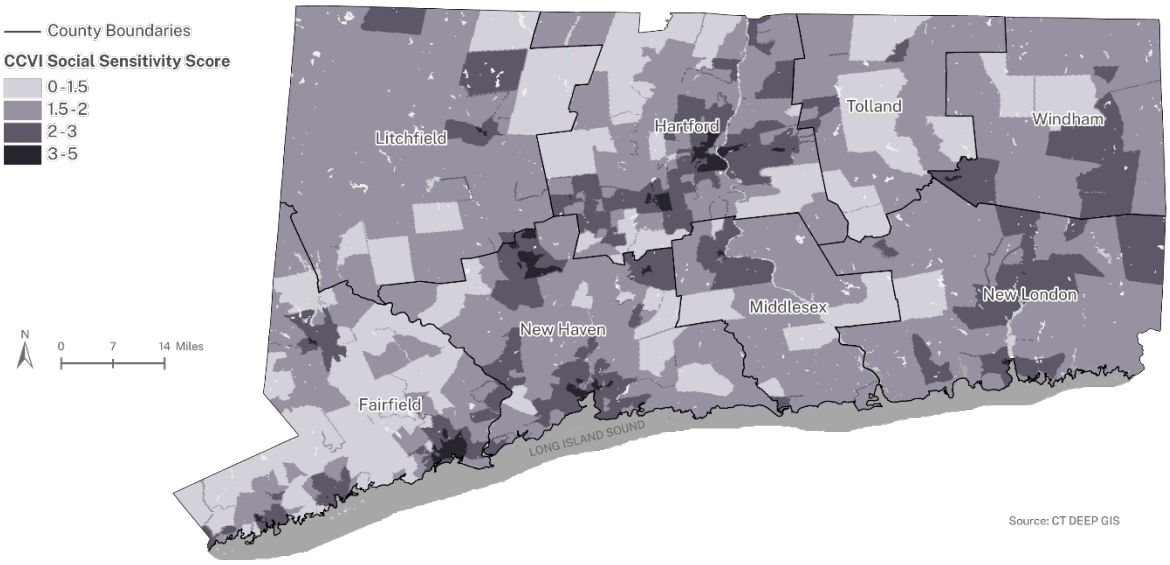


Figure 34. CCVI Social Sensitivity scores for heat risk

4.2.7.4 Changes in Development

Increased development elevates exposure levels of property and people to the impacts of extreme heat. Total building permits issued in each county in Connecticut between 2018 and 2022 indicates areas of the State that have experienced development growth. As shown in Figure 35, Fairfield, New Haven, and Hartford Counties have greater than 3,000 building permits issued and have the highest abundance of heat severe areas across the state. If recent trends in development continue, these Counties will have greater property exposed to extreme heat events, which will consequently place increased stress on utilities in these areas as air conditioning and water usage increases to accommodate the new buildings.

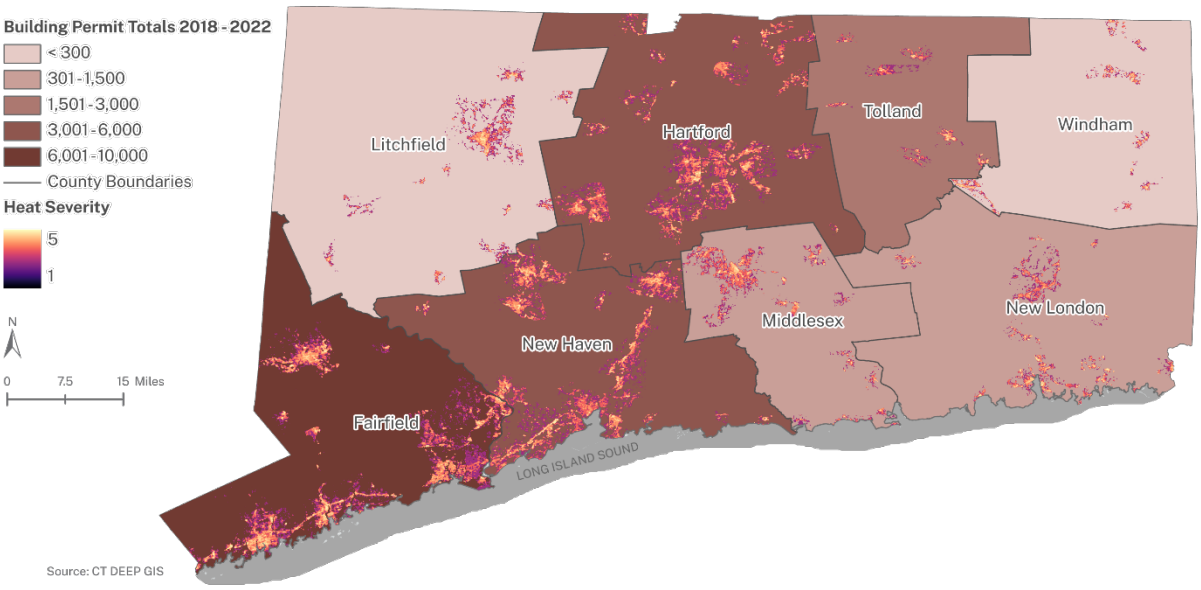


Figure 35. Total building permits issued 2018-2022 by county compared with heat severity

Federally designated Opportunity Zones offer further insights into areas where development is likely to occur. Extreme heat impacts are likely to be more significant in Opportunity Zones as well because they are located in low-income areas that may have reduced access to resources to prepare for and respond to extreme heat impacts. As shown in Figure 36, several Opportunity Zones align with areas that have previously experienced higher numbers of extreme heat events. In particular, 23 Opportunity Zones are located in Hartford County and 19 Opportunity Zones are located in New Haven County, each of which have experienced at least 8 NCEI extreme events since 1996. As development in these Opportunity Zones continues, it will be important to integrate green space to help reduce future extreme heat impacts.

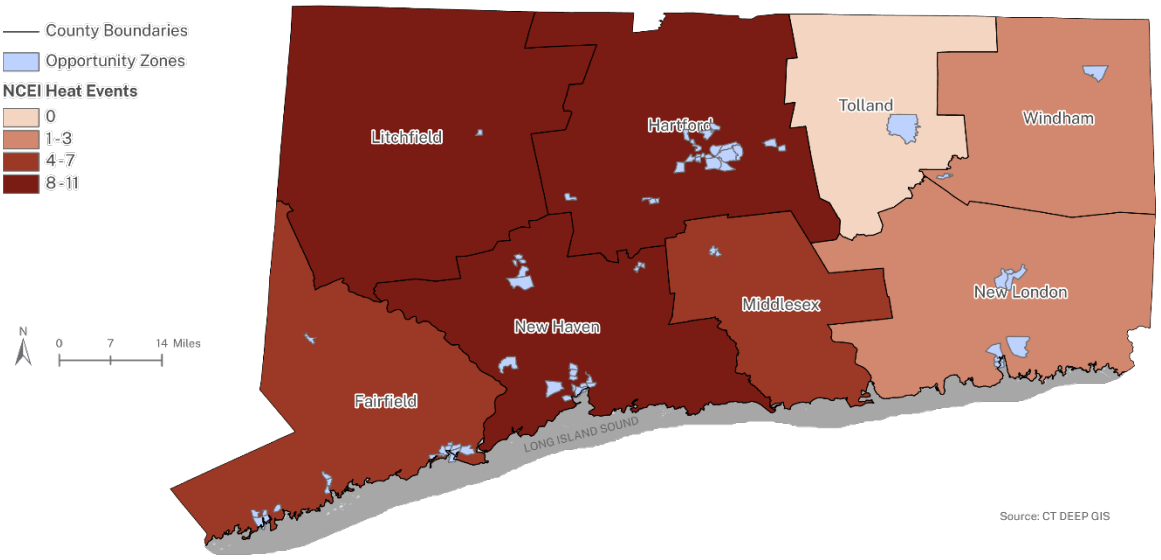


Figure 36. Opportunity Zones and NCEI heat events by county

Future population projections offer further insight into Counties and COGs in Connecticut that are likely to have greater populations exposed to extreme heat. As shown in Figure 37, New Haven and Hartford Counties have projected growth between 1% and 5% and a higher density of heat severe areas. While Windham County has lower heat severity, the growth in population will likely result in more development and impervious area, and consequently increase heat risk. As infrastructure and businesses expand to support the growing population, additional strain will be placed on utility systems and hospitals will need to prepare for supporting larger populations at risk of heat-related illnesses.

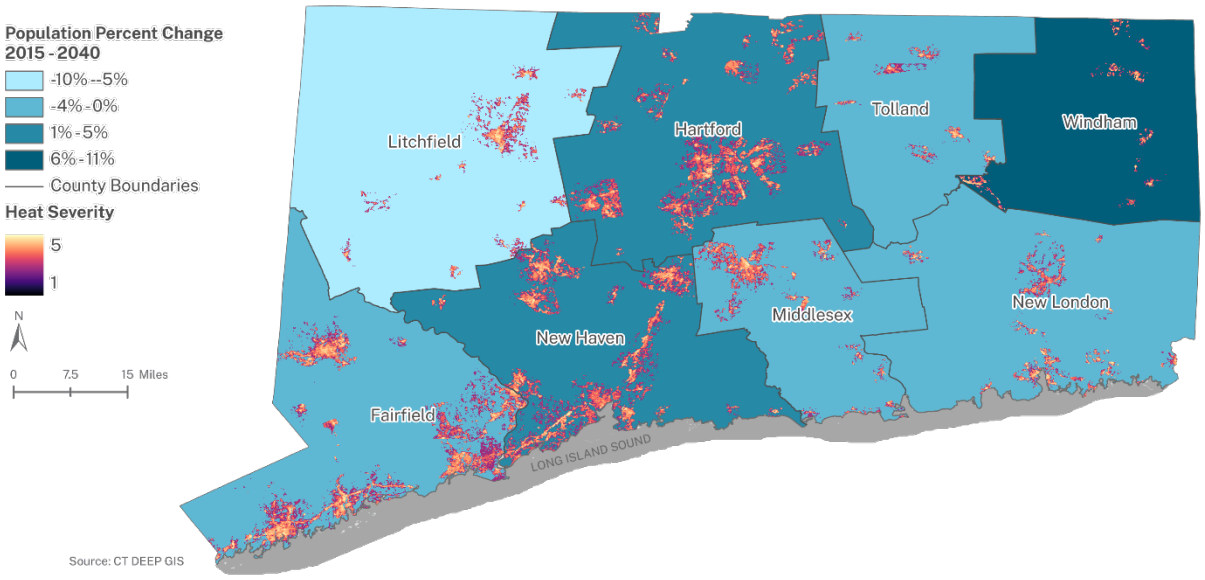


Figure 37. Projected population percent change between 2015-2040 compared with heat severity.

4.2.8 Conclusion

Extreme heat was ranked on the risk parameters as detailed in Table 24. To summarize the overall risk of extreme heat for each county, each risk parameter score was multiplied by its impact weight and combined into a county composite ranking.

Table 38 shows the extreme heat hazard ranking for each county. The high to low comparison does not mean that a low or medium-low hazard will not occur or will not have some impact on the community. However, it does provide an overview of what hazards may pose the greatest risk to each county given available data. This document should serve as a guide to help planners and officials in managing risk and prioritize mitigation actions.

Table 38. Extreme heat hazard ranking by county.

	Fairfield	Hartford	Litchfield	Middlesex	New Haven	New London	Tolland	Windham
Hazard Concern	M-L	M-L	M-L	M-L	M-L	M-L	M-L	M-L
Local Plan Rating	M-H	M-H	M-H	M-H	M-H	M-H	M-H	M-H
Geographic Extent	M-H	M-H	M	M	H	M-L	M-L	L
Population Density	H	M-H	M	M-L	M-H	M	M-L	L
Future Development	H	M-H	M-L	M-L	M-H	M	M	L

	Fairfield	Hartford	Litchfield	Middlesex	New Haven	New London	Tolland	Windham
Facility Intersect	M	M	H	L	M-H	M-L	M	M-L
Future Events	M	L	M-H	H	M-L	M	M-H	M-L
Future Losses	L	L	M	M-H	L	H	M	M-H
Injury & Death	M-H	M-H	M	M	M-H	M	M-L	L
Social Sensitivity	M-H	M-H	M	M-L	H	M	L	M-L
Composite*	**M**	**M-L**	**M**	**M-L**	**M**	**M**	**M-L**	**L**

* Each parameter's weighted score was added together to create a composite rank for each county. A risk determination of high, medium-high, medium, medium-low, and low was then assigned based on percentiles. A summation of all the composite scores for all assessed hazards in each jurisdiction provides an overall risk rank per county. For more information, refer to Section 4.1.1.4.

4.3 Flood

Flooding is the most frequent and costly natural hazard in the United States, causing more than 10,000 deaths since 1900. Nearly 90% of Presidential Disaster Declarations result from natural events where flooding was a major component. There are three main types of flooding: riverine, coastal, and pluvial (flash flooding).

Inland flooding (e.g., riverine, pluvial) commonly results from excessive precipitation within a watershed for an extended time period that causes rivers to swell or excessive precipitation in short duration that impacts a localized area. Inland flooding can also be caused by dam failure and ice jams, as well as exacerbated by wildfires that prevent soil from absorbing rainfall. Coastal flooding includes storm surge (storm-induced wave or tidal action), sea level rise, and nuisance flooding.

This section provides information on riverine flooding, flash flooding, and coastal flooding. Dam failure is covered in **section 4.11**.

4.3.1 Hazard Descriptions

4.3.1.1 Riverine Flooding

Riverine flooding occurs when streams, rivers, channels, and other waterbodies receive more rain or snowmelt from their watershed than their capacity can handle within the normal floodway or when a waterbody becomes blocked by an ice jam or debris. Excess water overloads the channel and extends into or even beyond the natural floodplain.

An ice jam is an accumulation of ice in a river that acts as a natural dam and restricts water flow, causing backwater to flood low-lying areas upstream from the jam. Areas below the ice jam can be affected by flash flooding when the jam releases, sending water and ice downstream rapidly. In the northern United States, where rivers can develop relatively thick ice covers during the winter, ice jams can contribute significantly to flood hazards. Figure 38 shows an aerial view of an ice jam on the Connecticut River.



Figure 38. Ice jam on the Connecticut River[83]

There are two types of ice jams: freeze-up jams and breakup jams. Freeze-up jams typically occur in early winter to midwinter when frazil ice forms and accumulates in the river to create continuous ice cover. Breakup-type jams occur during periods of thaw, generally in late winter and early spring, and are composed primarily of fragmented ice formed by the breakup of an ice cover or freeze-up jam. Because of the large volumes of ice that may be involved and the greater discharges associated with them, breakup-type jams are predominant in ice-jam-caused flooding.

4.3.1.2 Flash Flooding

Flash flooding can occur during a rapid rise of water throughout a watershed or in poorly drained urban areas composed mostly of impervious surfaces that cannot absorb precipitation. Flash flooding is typically a result of an unusually large amount of rain and/or high velocity of water flow (especially in hilly areas) within a very short period of time (e.g., intense downpour, dam failure). Intense wildfires can also lead to flash flooding and debris flows due to the soil developing a layer that repels water and the loss of plant materials that usually hold soil in place.

[83] NASA Earth Observatory. Ice Jams on the Connecticut River.
https://earthobservatory.nasa.gov/images/91620/ice-jams-on-the-connecticut-river

4.3.1.3 Coastal Flooding

Coastal flooding occurs along the coastline of oceans, bays, inlets, large lakes, and coastal rivers. Coastal floods occur when water inundates or covers normally dry coastal land as a result of high or rising tides or storm surges. Coastal flooding can be caused by storm surge, nuisance flooding, and sea level rise.

The following are types of coastal flooding:

- Storm surge: Abnormal rise of seawater that is above the predicted astronomical tides and is generated by a storm's winds pushing water toward land. Storm surge can cause minor to major impacts to coastal infrastructure and buildings, including complete destruction.
- Nuisance flooding: Temporary minor inundation of low-lying coastal areas that happens during exceptionally high tides. Nuisance flooding (also referred to as sunny day or tidal flooding) can cause minor impacts to coastal infrastructure and buildings. Once nuisance flooding reaches a level of moderate to major damage, it becomes classified as flooding from sea level rise.
- Sea level rise: The permanent inundation of low-lying coastal areas as the increasing elevation of the oceans exceeds the land's elevation. Sea level rise can cause complete destruction of coastal communities over time as land is lost. It also worsens storm surge and nuisance flooding severity over time.

Sea Level Rise

Sea level rise is an increase in the level of the world's oceans due to the effects of climate change. According to the Intergovernmental Panel on Climate Changes (IPCC) Sixth Assessment Synthesis Report (AR6), between 1901 and 2018, global mean sea level increased by 0.20 meters.[84] While global sea level has been rising over the past century, the sea surface is not changing at the same rate at all points globally.[85] Relative sea level rise (RSLR) refers to the rate of sea level rise relative to a local fixed reference of land; therefore RSLR is a combination of sea level rise and the local vertical land motion.[86] Connecticut has large exposure to the potential impacts of RSLR, with over 618 miles of tidal shoreline on Long Island Sound which includes numerous inlets and significant areas of low elevation.

Climate change, including the continued increase in global temperature, is projected to result in an acceleration of observed rates of RSLR. The Center for Operational Oceanographic Products and Services (CO-OPS) and its predecessors have gathered

[84] IPCC. Synthesis Report of the IPCC Sixth Assessment Report (AR6).
[85] NOAA National Ocean Service. What is the difference between local sea level and global sea level?
[86] NOAA Tides & Currents. Relative Sea Level Rise Trends

oceanographic data along our nation's coasts for over 200 years and have been measuring sea level for over 150 years. Trends in mean sea level (either rise or fall) are computed at 142 long-term water level stations, utilizing a minimum time span of 30 years and averaged by the month to remove outliers.

CO-OPS calculates the linear trends for two stations in Connecticut, one in Bridgeport and one in New London. Bridgeport station has a registered mean sea level trend of 3.16 mm/year with a 95% confidence interval of +/- 0.37 mm/year. This trend is based on monthly mean sea level data from 1964 to 2022, which is equivalent to a change of 1.04 feet in 100 years. The New London station has a registered mean sea level trend of 2.78 mm/year with a 95% confidence interval of +/- 0.20 mm/year based on monthly mean sea level data from 1938 to 2022. This is equivalent to a change of 0.91 feet in 100 years. The mean sea level trends by station are highlighted in Figure 39.

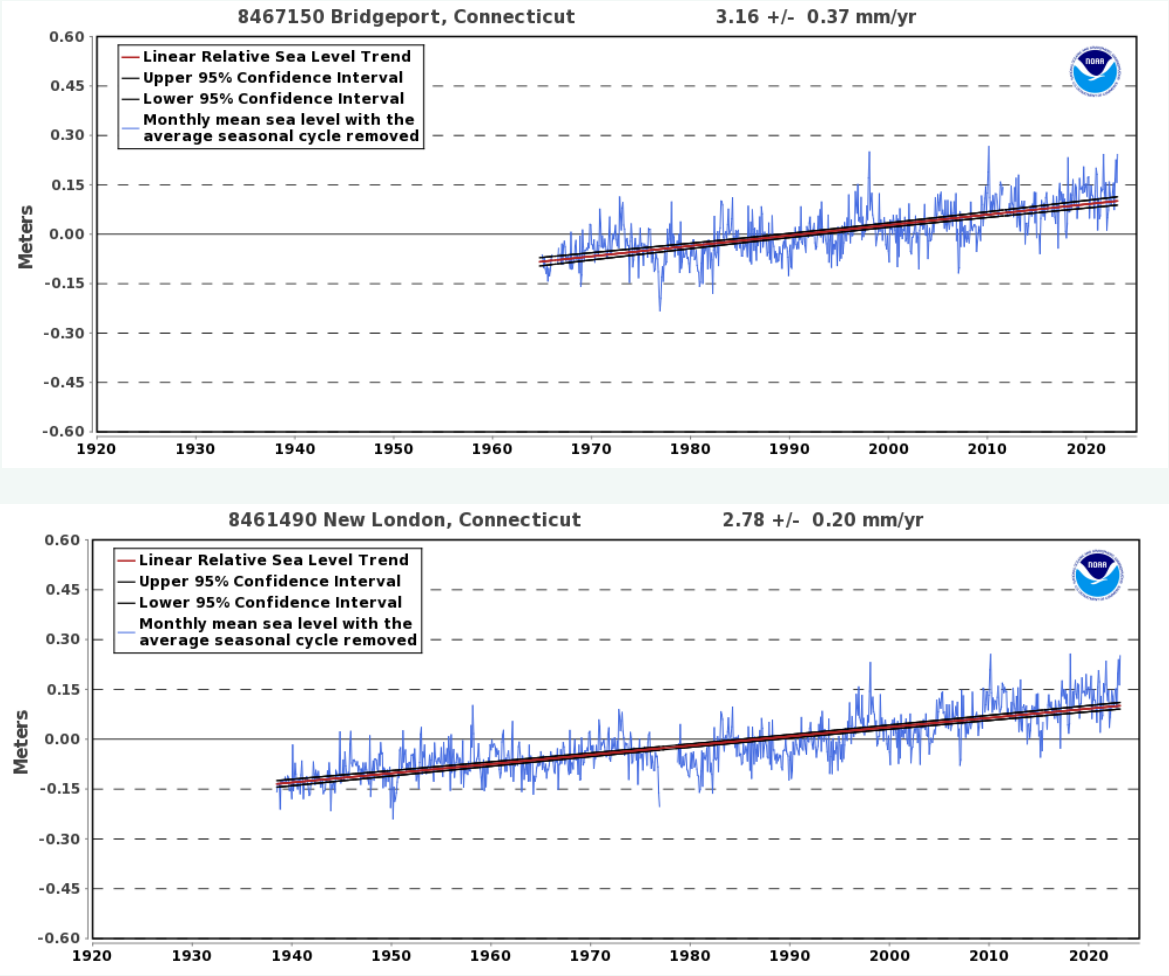


Figure 39. Mean sea level trend in Bridgeport, CT (top) and New London, CT (bottom)

Coastal flooding conditions in Connecticut are produced by hurricanes or tropical storms during the summer and fall and Nor'easters and large coastal storms or extra-tropical storms during the autumn, winter, and spring.

4.3.2 Location

Flooding is the most prevalent and frequent natural hazard that impacts Connecticut. There are numerous rivers throughout the state, as well as estuaries for several major rivers. Larger rivers in Connecticut include the Housatonic, Connecticut, Farmington, Thames, and Naugatuck Rivers. Ice jams can occur along large rivers and are exacerbated by river geometries, weather characteristics, and floodplain land-use practices, such as bridge obstructions or dams.

In addition to these larger rivers, Connecticut has many smaller streams, brooks, and rivers that are also susceptible to flooding throughout the year. Additionally, the Connecticut shoreline is susceptible to coastal flooding during hurricanes and other storm events.

Flooding impacts communities located along the river networks and shorelines in Connecticut. FEMA Flood Insurance Rate Maps (FIRMS) show the location of flood hazard areas in the state.

FEMA Flood Insurance Rate Maps

FEMA-published FIRMs are one way that communities can see which areas have the highest risk of riverine and coastal flooding. Areas with a 1% or higher chance of experiencing a flood each year is considered to have a high risk. Those areas have at least a one-in-four chance of flooding during a 30-year mortgage.

Connecticut has more than 237,000 acres of FEMA Special Flood Hazard Area (SFHA) and 88,689 acres of floodplain modeled through the FEMA Hazus model. The SFHA is a delineation of the extent (flood height and area flooded by a 1% annual chance or “100-year flood” event, which is a flood with a one percent probability of happening or being exceeded annually. Figure 40 shows the FEMA Flood Zones, including the SFHA in Connecticut.

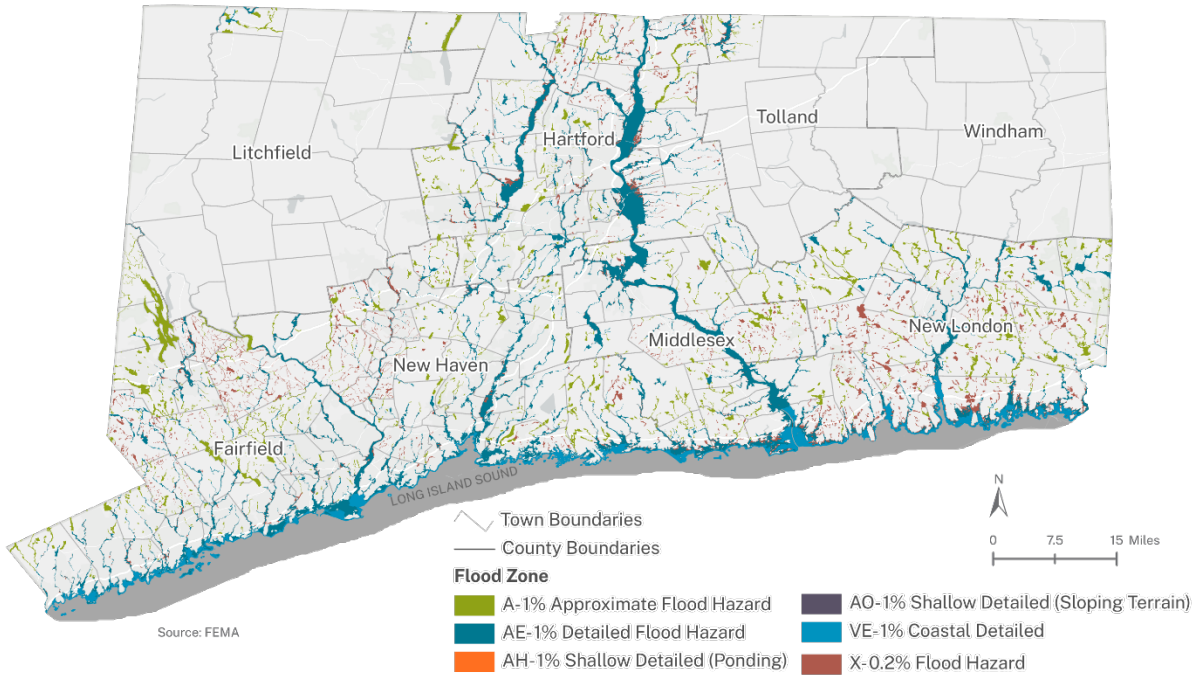


Figure 40. FEMA Flood Zones

Figure 41 shows the location of 1% annual chance floodplains according to the Hazus model. The Hazus output is used to show 1% annual chance flood extent because the mapped FEMA SFHA in Connecticut does not currently include Litchfield, Tolland, or Windham counties. The floodplain area for each jurisdiction has been used as the geographic extent factor for the flood hazard ranking. New Haven County has more than 59,200 acres of floodplain (93 square miles), followed by Hartford County with 49,920 acres (78 square miles) and Fairfield County with 48,000 acres (75 square miles). Within New Haven County, communities with greater than 7,000 acres of floodplain include Madison, Milford and Guilford. The Town of Stratford in Fairfield County has 6,256 acres of floodplain.

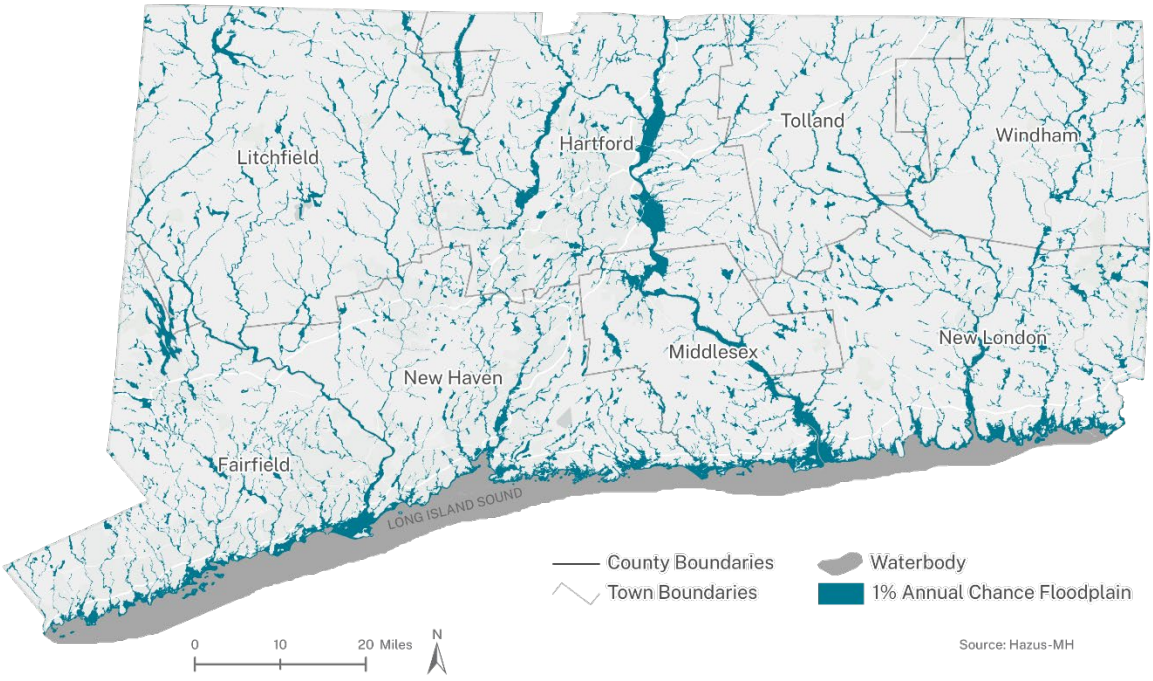


Figure 41. Hazus 1% annual chance floodplain

FEMA flood maps also identify the coastal flooding areas. The Coastal High Hazard Area, or SFHA Zone V or VE, shows locations where waves and fast-moving water can cause extensive damage during the base food event (1% annual chance flood event). In V zones, wave heights are larger than 3 feet during the 1% annual chance flood. For comparison, Zone A areas are determined to have wave heights of between 1.5 and 3 feet during the 1% annual chance flood. "Zone VE" means that a detailed study has been done for the area, and Base Flood Elevations have been calculated. Structures in areas mapped as Zone V and Zone VE are subject to stricter building requirements because of the higher risk of damage from strong waves. In Connecticut, there are 281 VE zone areas, totaling 35,683 acres, shown in Figure 42. The depth of flooding varies across the state based on its location in the flood zone.



Figure 42. SFHA Zone VE in Connecticut

Sea level rise is mostly contained within the coastal communities along the State's eastern seaboard. According to NOAA, Connecticut has 618 miles of coastline bordering Long Island Sound and the Atlantic Ocean. This coastal area includes four counties and 24 municipalities. Municipalities along waterways that drain into the Sound are also at risk. Figure 43 shows what the Connecticut coastline would look like with an additional one foot and an additional six feet of sea level rise above Mean Higher High Water (MHHW). Portions of Fairfax, Middlesex, and New London Counties were highlighted to illustrate localized sea level rise projections.

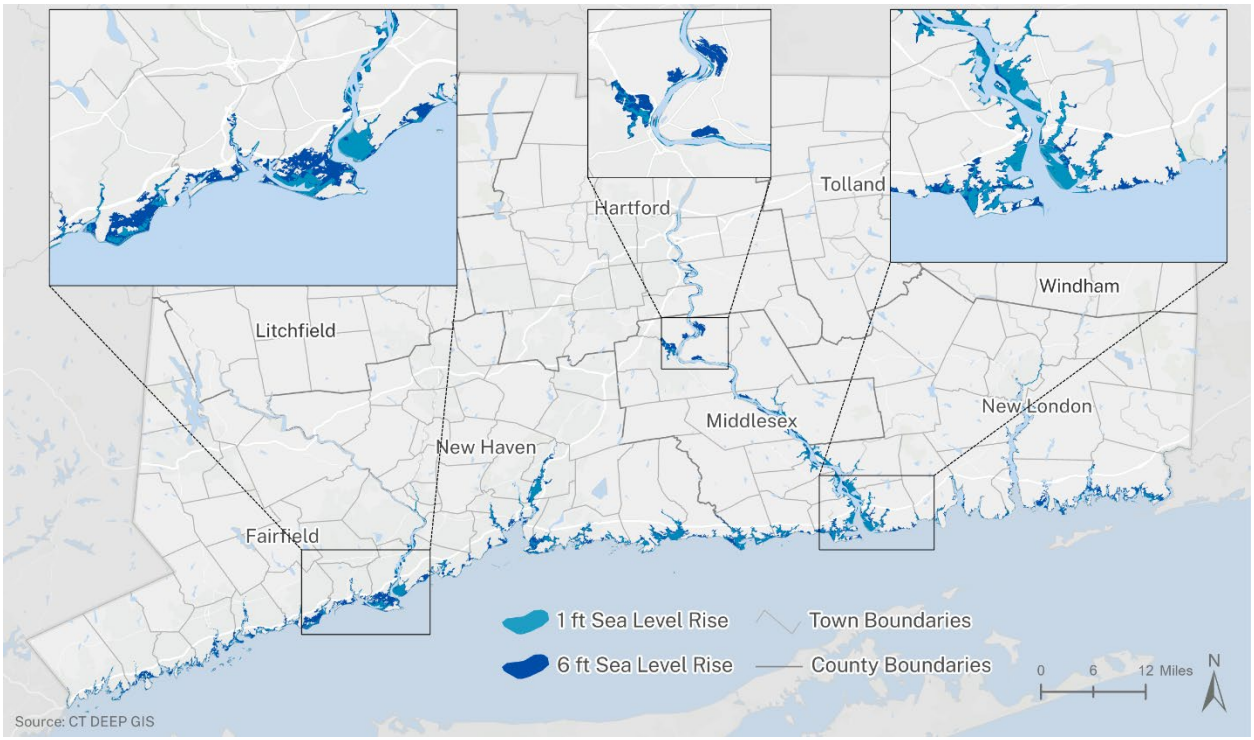


Figure 43. Projected sea level rise in Connecticut using the CIRCA sea level rise scenarios.

Connecticut's Commitment to Studying Sea Level Rise

Connecticut continues to bolster its commitment to studying and analyzing climate change and sea level rise through investments at the state level in collaborative projects with universities, neighboring states, non-profits, and federal agencies.[87]

In 2014, Connecticut's Department of Energy & Environmental Protection and the University of Connecticut founded the Connecticut Institute for Resilience & Climate Adaptation (CIRCA). CIRCA's mission is to increase the resilience and sustainability of vulnerable communities along Connecticut's coast and inland waterways to the growing impacts of climate change on the natural, built, and human environment. In October 2017, CIRCA released the local sea level rise scenarios for Connecticut and recommended that the State plan for up to 50cm (20 inches) of sea level rise by 2050. Furthermore, they noted that the sea level will most likely continue to rise above this level in the future.

The State is also part of the Climate Change and Sentinel Monitoring Program which utilizes a multidisciplinary scientific approach to provide early warning of climate change impacts to Long Island Sound ecosystems, species, and processes to facilitate appropriate and timely management decisions and adaptation responses. The program proved a deeply successful collaborative project with a number of partners and has been scaled up for the entire Northeast and Gulf of Maine region through the joint Ecosystem Heath Committee of Northeast Regional Ocean Council (NROC) and Northeast Regional Association of Coastal and Ocean Observing Systems (NERACOOS).

The location of storm surge risk in Connecticut is shown in Figure 44. In Connecticut, there is a risk of storm surge Categories 1 through 4. Coastal areas along the Long Island Sound and along major rivers that feed into the Long Island Sound are at risk of storm surge.

[87] CT DEEP: Climate Change

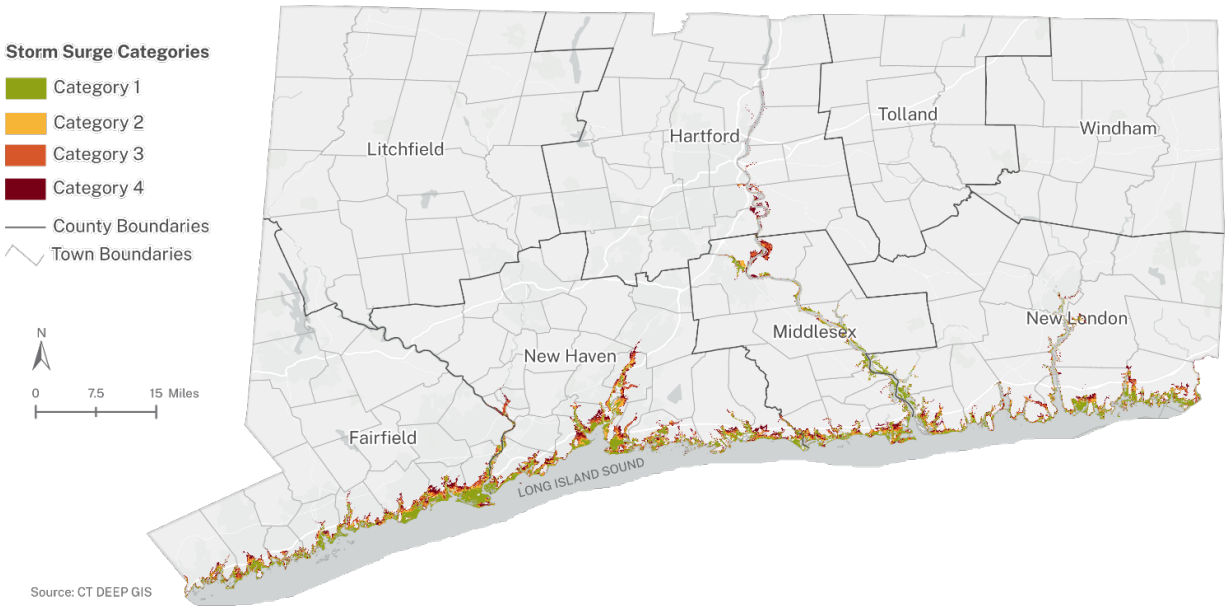


Figure 44. Storm surge extent by storm category

4.3.3 Intensity

Periodic flooding of lands adjacent to rivers, streams and shorelines is a natural and inevitable occurrence that can be expected to take place based upon established recurrence intervals. The recurrence interval of a flood is defined as the average time interval, in years, expected between a flood event of a particular magnitude and an equal or larger flood. Flood magnitude increases with increasing recurrence interval.

FEMA Floodplain Designations

Floodplains are designated by the frequency of floods that are large enough to cover them. For example, the 10-year floodplain will be impacted by a flood with a 10% probability of occurring or being exceeded in any given year; the 100-year floodplain represents the area that would be inundated by a 1% annual probability flood. Flood frequencies, such as the 1% probability (100-year) flood, are determined by plotting a graph of the size of all known floods for an area and determining how often floods of a particular size occur. Flood frequencies are used to characterize flood modeling by FEMA and its floodplain management regulations, stormwater management design requirements, and local floodplain management building standards.

Overall, several factors contribute to the relative severity of a flood. Development, or the presence of people and property in the hazard areas, is a critical factor in determining a flood's relative severity. Additional factors that contribute to flood severity range from topography to characteristics of the structures located within the low-lying coastal area.

The following is a brief discussion of some of these factors and how they may relate to the area:

- **Flood depth**: The greater the depth of flooding, the higher the potential for significant damage.
- **Flood duration**: The longer duration of time that floodwaters are in contact with building components, such as structural members, interior finishes, and mechanical equipment, the greater the potential for damage. Floodwater may linger because of the low relief of the area, but the degree varies. Seawater can be especially harmful to buildings and contents because of the high salinity levels.
- **Velocity**: Flowing water exerts force on the structural members of a building, increasing the likelihood of significant damage. A one-foot depth of water, flowing at a velocity of five feet per second or greater, can knock an adult over and cause significant scour around structures and roadways.
- **Elevation**: The lowest possible point where floodwaters may enter a structure is the most significant factor contributing to its vulnerability to damage due to flooding.
- **Construction type**: Certain types of construction are more resistant to the effects of floodwater than others. Masonry buildings, constructed of brick or concrete blocks, are typically the most resistant to flood damage simply because masonry materials can be in contact with limited depths of water without sustaining significant damage. Wood frame structures are more susceptible to flood damage because the construction materials used are easily damaged when inundated with water.

The National Weather Service classifies flooding severity as Minor, Moderate, or Major based on property damage and public threat.[88]

Flood Severity Category

Minor Flooding: minimal or no property damage, but possibly some public threat or inconvenience.

Moderate Flooding: some inundation of structures and roads near streams. Some evacuations of people and/or transfer of property to higher elevations.

Major Flooding: extensive inundation of structures and roads. Significant evacuations of people and/or transfer of property to higher elevations.

The National Weather Service issues Flood Watches, Advisories, and Warnings for riverine floods, flash floods, and coastal floods. A Flood Watch is issued when conditions are

[88] NWS. Floods, the Awesome Power. https://www.weather.gov/media/bis/Floods.pdf

favorable for a flood event to occur. It does not mean flooding will occur, but it is possible. A Flood Advisory is issued when flooding is not expected to be bad enough to issue a warning. However, it may cause significant inconvenience, and if caution is not exercised, it could lead to situations that may threaten life or property. A Flood Warning is issued when flooding is imminent or occurring. A Flash Flood Warning is issued when a flash flood is imminent or occurring.

The severity of an ice jam is worsened when heavy snowfall and cold temperatures are followed by sudden periods of warm temperatures and heavy rain. The magnitude of an ice jam can depend on how much broken ice has accumulated in the river and if there are other manmade obstructions in a river that are blocking the passage of the ice.

Ice jams often happen with little warning time. The rate of water level rise during an ice jam varies from feet/minute to feet/hour. Rapid rise behind ice jams can lead to temporary ponding and flooding along rivers. A sudden release of a jam can lead to downstream flash flooding especially when compounded by large pieces of ice in the wall of water.

Coastal flooding extent is measured with river/stream gages to determine the water's height above normal water levels. For storm surge, nuisance, and sea level rise flooding, topographical features (particularly elevation), ocean levels, astronomical tide levels, and the storm surge height will determine how far inland coastal flooding extends.

Sea Level Rise: Intensity

Sea level rise is expected to occur gradually over time, though the near-term impacts will vary depending on severity. The severity of sea level rise is dependent on interrelated factors including greenhouse gas emissions, varying ocean temperatures, land subsidence along the coast, coastal erosion due to severe storms, and resilience and mitigation measures that the State has and continues to implement. Projections show that the impact will be severe if average global temperatures and average ocean temperatures continue to increase. The warning time for sea level rise has been, and will continue to be, extensive.

Based on sea level rise projections, CIRCA recommends that the State of Connecticut prepares for up to 20 inches of sea level rise by 2050. Figure 45 shows Connecticut SLR Projections based on local tide gage observations (blue line), the IPCC 2013 RCP 4.5 model simulations near Long Island Sound (yellow line), semi-empirical model predictions (orange line) and ice budgets (magenta line) as in CPO-1.[89]

[89] Connecticut SLR Projections.

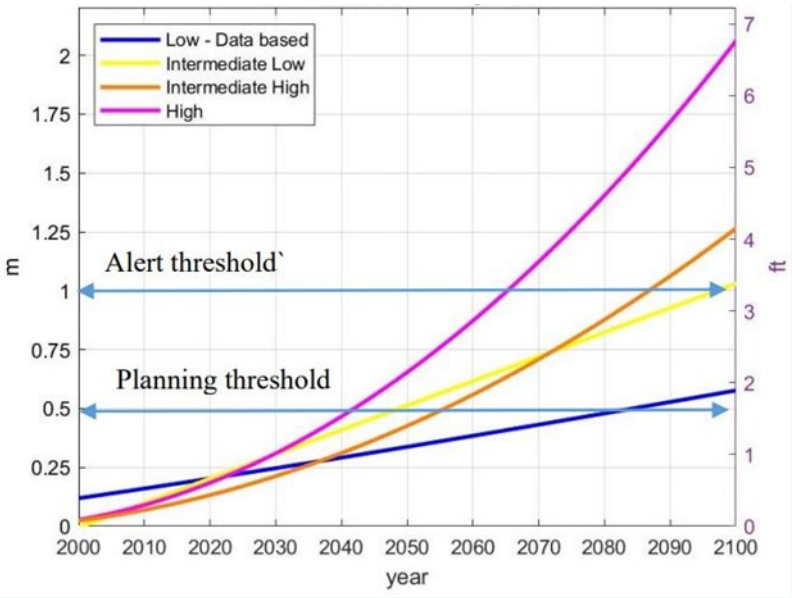


Figure 45. Connecticut sea level rise projections

Storm surge extent is measured by inundation height above the ground (e.g., greater than 3 feet above ground). NOAA, the National Weather Service, and the National Hurricane Center host interactive National Storm Surge Hazard Maps that compute and display storm surge vulnerability in the United States under scenarios from a Category 1 to a Category 5 hurricane. Storm surge depends on the storm's intensity, forward speed, and timing (relative to high tide and lunar cycles).

4.3.4 Impacts

Riverine, flash flooding, and coastal flooding can have numerous impacts on the state. Historic flood damages include foundation and wall damage to structures, contents damage, loss of utilities, infrastructure damage to roads, and shore erosion. Public expenditures on flood recovery and repairs to damaged public property affect all residents of the state, not just those in the floodplain.

Ice jams can cause riverine flooding or flash flooding to areas adjacent to rivers. They can also cause debris accumulation and may lead to erosion of streambanks. Ice jams may also cause transportation disruption, damage to water vessels, and may impact hydropower operations. Jams can also impact the environment by impeding the migration of aquatic creatures and adversely impact wildlife habitats.

Nuisance flooding can cause minor impacts to coastal infrastructure and buildings. Once nuisance flooding reaches a level of moderate to major damage, it becomes classified as flooding from sea level rise. Sea level rise can cause complete destruction of coastal communities over time as land is lost. It also worsens storm surge and nuisance flooding severity over time.

Storm surge can cause minor to major impacts to coastal infrastructure and buildings, including complete destruction, especially if they coincide with the normal high tide to create a storm tide (the sum of storm surge and astronomical tide). Wind-generated storms can even cause flooding, coastal erosion, and structural damage upstream of typical coastal regions. Areas that are not typically susceptible to storm surge can experience damage to structures or infrastructure.



- Critical facilities, such as hospitals may flood and lose power during flood events, forcing them to operate on backup generators.
- Infrastructure may experience flooding impacts in the form of water damage, debris blockages, temporary closure of transportation routes, and the potential inability of the stormwater system to handle floodwater in a severe event. It is estimated there are currently over 7,000 properties at risk from frequent tidal flooding in Connecticut.[90]
- Structures exposed to flooding may develop mold or wood rot, impacting structural stability.



- Flooding can wash out sections of roadways and bridges, blocking transportation routes. Transportation assets along the coast will be directly impacted by sea level rise as nuisance flooding worsens and leads to water ponding on roads and bridges. Based on analysis using the Sea Level Affecting Marshes Model (SLAMM) medium-high sea level rise scenario, it is estimated tidal road flooding will increase to approximately 43 miles by 2040 and 79 miles by 2055.[91]
- Under SLAMM 2055 sea level rise projections, 95% of tidal road flooding is anticipated to occur on municipally controlled roads. This may result in capacity challenges for municipal highways, public works, and emergency service personnel responsible for responding to road flooding.
- Erosion due to floodwaters can damage bridge structures, levees, and buildings causing structural failure and collapse.



- Agricultural fields may be inundated with water, causing crops to die. In the Connecticut Climate Change Preparedness Plan, Shellfish production

[90] Sea Level Rise.org. Overview: Connecticut's Sea Level is Rising. https://sealevelrise.org/states/connecticut/
[91] Connecticut Environmental Conditions Online. Sea Level Rise Effects on Roads & Marshes Results. https://maps.cteco.uconn.edu/projects/slamm/results/

was included among top five most imperiled agricultural planning areas or features in Connecticut.[92]

- Based on SLAMM analysis, it is estimated the total area of Connecticut's 21 largest coastal marshes is expected to increase through the end of the century if projected marsh migration areas remain undeveloped and subject to regular tidal water inundation.
- Rising sea level can increase shoreline, beach, and dune erosion and consequently increase damage from coastal storms.
- Cold water streams, freshwater wetlands, offshore islands, major rivers, and forested swamps are also vulnerable to sea level rise. The degree of impact will vary, but likely changes include conversion of rare habitat types, loss and/or replacement of critical species dependent on select habitats, and the increased susceptibility of habitats to other on-going threats.
- Secondary hazards include fluvial erosion, riverbank erosion, and landslides. Landslides can occur following flood events when high flows oversaturate soils on steep slopes, causing them to fail.



- Flooding can cause injury or loss of life. Evacuations may also be necessary during large-scale flood events.
- Individuals traversing floodwaters or children playing in floodwaters are at risk of contracting diseases, injuries, and infections due to potential contaminants in floodwaters.
- Socially vulnerable populations may have more limited resources to adapt to sea level rise and protect their property from increased flooding. Socially vulnerable populations with functional needs and individuals without personal vehicles also be impacted by disruptions to public transportation caused by flooded roadways.
- Secondary impacts such as compromised sources of drinking water, threatened wastewater treatment and sewage collection systems, and reduced hydraulic capacities, all have the potential to affect residents and communities along the coast of Connecticut.

[92] Governor's Steering Committee on Climate Change Adaptation Subcommittee. Connecticut Climate Preparedness Plan. https://portal.ct.gov/-/media/DEEP/climatechange/ConnecticutClimatePreparednessPlan2011pdf.pdf



- Flood damage to businesses can lead to loss of inventory, lack of communication with customers, and may force a business to completely shut down operations.
- Employers may be disrupted regardless of their location within the floodplain when customers and clients cannot reach their location due to flood damage to roads.
- Public related costs include debris clearance; equipment, material and labor expenses related to emergency response and recovery; and building or facility repair or replacement.
- Mitigation actions are underway to reduce future flood risk and require significant financial resources to implement. Connecticut is currently projected to spend over $2 billion on storm protection and coastal resilience solutions.

4.3.5 Previous Occurrences and Losses

Flooding is one of the most frequently occurring natural hazards that impacts Connecticut. The most recent major flood disaster events were related to Hurricane Henri and Hurricane Ida in 2021. Major flood events that have impacted Connecticut in the past 25 years are described below. Descriptions of additional notable flood events can be found in Appendix 3.

Tropical Storm Irene: Tropical Storm Irene swept across the east coast on August 28, 2011 hitting Connecticut harder than any other state. Maximum wind gusts were 66 mph, while average wind gusts for the entire state were 52.3 mph. The storm killed two Connecticut residents and left hundreds of thousands of people without power. The storm hit the coast at high tide, which caused a storm surge that flooded roads and homes from Fairfield to New London counties. Many homes were a 'total loss' and residents needed to be rescued as waters rose up to a quarter mile from the shoreline. Following the storm, trees, branches, and power lines remained scattered across roads in every town in the state. About 2,000 residents were in shelters and the number of power outages was highest in recent memory.

Hurricane Sandy: Super Storm Sandy began as a tropical wave in the Caribbean on October 19, 2012, quickly developed into a tropical storm in just six hours, and ultimately upgraded to a hurricane on October 24th. An emergency declaration for Sandy was issued in Connecticut on October 28, followed by a disaster declaration on October 30. As it reached Connecticut, Sandy caused the Long Island Sound to flood basements and roads along the coast. Millions of gallons of raw and partly untreated sewage were discharged into the Long Island Sound. The storm left about 30 percent of customers in the state without

power, and three deaths were reported. Fairfield County was the hardest hit with over 1,000 trees down, 1,000 homes flood-damaged, 5,000 citizens evacuated, six homes washed out to sea, and more than 24 homes condemned.

Hurricane Henri: Tropical Storm Henri made landfall in southwest Rhode Island around noon on August 22nd, then moved slowly northwestward and westward across northern Connecticut and weakened. Henri brought strong wind gusts and flash flooding. The worst flash flooding occurred in northeast Connecticut. The highest rainfall totals over the two-day period ranged from 5 to 6 inches in Hartford and Tolland Counties in northern Connecticut.

Hurricane Ida: Extremely heavy rainfall associated with the remnants of Hurricane Ida overspread southern Connecticut during the evening of September 1 and continued through the early morning hours of September 2. Rainfall totals ranged from 5-8+ inches across much of the region, with much of that rain falling in just a few hours. Heavy rain and flash flooding resulted in over $5 million in damages.

The US Army Corps of Engineers' Cold Regions Research and Engineering Laboratory (CRREL) maintains a database of ice jam history drawing largely from USGS river gauge information. This database includes 205 records of jams from 1902 to 2019. Events recorded in the last 20 years have been summarized in Table 39. The database indicates that the state experiences both freeze and breakup events.

Table 39. History of ice jams in Connecticut

Event Date	River	Location	Description/Losses
1/25/2019	Housatonic River	Fort Kent	Break-up jam
1/15/2018	Connecticut River	Middle Haddam	Break-up jam
1/15/2018	Housatonic River	New Milford	Unknown
1/13/2018	Quinebaug River	Quinebaug	Break-up jam
1/13/2018	Housatonic River	Kent	Break-up jam
1/13/2018	Shepaug River	Roxbury	Break-up jam
1/21/2015	Saugautuck River	Westport	The Saugautuck River near the Levitt Pavillion for the Performing Arts was jammed with ice late on January 21, 2015.
1/6/2014	Pomperaug River	Woodbury	An ice jam resulted on the Pomperaug River at Judson Avenue bridge in Woodbury, CT on Monday, January 6 due to warm temperatures and heavy rain.

Event Date	River	Location	Description/Losses
1/27/2005	Connecticut River	Middletown	An ice jam on the Connecticut River in Middletown, CT was frozen in place for about one week. The ice jam was located immediately upstream of Wilcox Island, which is just upstream of Arrigoni Bridge. The jam slowly began to dissipate starting February 7.
2/7/2004	Yantic River	Norwich	The National Weather Service reported an ice jam developed on the Yantic River at Norwich, CT at noon on 2/7/2004. By 7AM on 2/8/2003, NWS reported the river was rising rapidly behind the jam, with no flooding reported.
1/24/2003	Shetucket River	Baltic	Freeze up ice jams developed on the Shetucket River near the route 97 bridge at Baltic, a site that previously had ice jam problems including the 1994 ice jam.

According to NCEI records, there have been 850 total flood events in Connecticut between January 1996 to December 31, 2022. The total flood event count includes general flood, coastal flood, and flash flood events, as shown in Table 40. These events resulted in $69,444,687 in estimated property damages in 2022 adjusted dollars, as shown in Table 41. A total of 9 deaths and three injuries are attributed to these floods.

Table 40. NCEI total flood events by county (1996 – 2022)

County	Number of Flood Events	Number of Coastal Flood Events	Number of Flash Flood Events	Total Flood Events
Fairfield	27	22	127	176
Hartford	93	0	57	150
Litchfield	79	0	60	139
Middlesex	16	8	25	49
New Haven	35	23	103	161
New London	45	8	75	128
Tolland	15	0	5	20
Windham	17	0	10	27
Total*	**327**	**61**	**462**	**850**

*Note: event totals may reflect a storm event that has affected multiple counties that have been counted as individual events in each affected county.

Table 41. NCEI flood damages by county (1996 – 2022)

County	Flood Damages	Coastal Flood Damages	Flash Flood Damages	Total Damages
Fairfield	$5,368,437	$0	$20,822,521	$26,190,958
Hartford	$17,054,694	$0	$2,555,329	$19,610,023
Litchfield	$2,238,546	$0	$2,545,623	$4,784,169
Middlesex	$429,475	$0	$379,553	$809,028
New Haven	$147,632	$0	$4,914,453	$5,062,085
New London	$8,804,237	$0	$899,171	$9,703,408
Tolland	$1,866,151	$0	$129,069	$1,995,220
Windham	$1,083,251	$0	$206,544	$1,289,795
Total	$36,992,424	$0	$32,452,263	$69,444,687

The rate of sea level rise along the Connecticut coast and broader mid-Atlantic coast has been faster than the global rate. As noted previously, CO-OPS reports mean sea level trends of 3.16 mm/year and 2.78 mm/year for Bridgeport and New London stations respectively. Rising sea levels result in increased coastal flooding during storms and flooding even during high-tide with sunny-day conditions. Sea level rise also contributes to increased coastal erosion of beaches and coastal land mass loss to permanent inundation.

Nuisance flood events are those in which water levels exceed the local threshold for minor impacts, as set by NOAA NWS. With rising sea levels, the number of tidal flood days exceeding the nuisance-level threshold has also climbed. Between 2011 and 2020, 43 nuisance flooding days were recorded, which exceeded the number of events in any historically observed 10-year period.[93]

There have been 3 FEMA Disaster Declarations for flood events in Connecticut, summarized in Table 42. There have been no federally declared major disasters related to flooding since the 2019 plan update.

Table 42. Connecticut FEMA Disaster Declarations

Disaster Number	Program Type	Declaration Date	Incident Type	Title	Declared County Area
661	IA/PA	6/14/1982	Flood	Severe Storms & Flooding	All CT Counties
711	IA/PA	6/18/1984	Flood	Severe Storms & Flooding	Fairfield, Hartford, Litchfield, Middlesex, New Haven, Tolland

[93] Runkle et al. (NOAA Report)

Disaster Number	Program Type	Declaration Date	Incident Type	Title	Declared County Area
972	IA/PA	12/17/1992	Flood	Winter Storm & Coastal Flooding	Fairfield, Middlesex, New Haven

4.3.6 National Flood Insurance Program

The National Flood Insurance Program (NFIP) enables property owners in participating communities to purchase Federally backed insurance for flood losses. For a community to participate in the NFIP they must adopt floodplain management regulations that reduce future flood damages, adopt the FEMA FIRMs and Flood Insurance Study for the jurisdiction and manage a floodplain management program which enforces federal, state and local floodplain regulations affecting development in the designated SFHA (1% annual chance floodplains depicted on the FIRM).

Flood insurance backed by the federal government is designed to provide an alternative to disaster assistance so that the high costs associated with repairing damage to buildings and their contents caused by floods is reduced. Flood insurance is available to property owners and contents coverage is available to renters in communities in good standing with FEMA in terms of their local floodplain management ordinance.

In addition to providing flood insurance and reducing flood damages through floodplain management regulations, the NFIP identifies and maps the nation's floodplains. Mapping flood hazards creates broad-based awareness of the flood hazards and provides the data needed for insurers to actuarially rate structures for flood insurance coverage.

As of May 2023, all 177 communities in Connecticut participate in the NFIP.[94] Table 43 shows NFIP policies in force, as well as total coverage and premiums. There are 31,423 policies in-force for Connecticut NFIP communities. Policy holders pay more than $38 million annually in premiums for nearly $8.5 billion in building and contents coverage.

The coastal counties of Fairfield, Middlesex, New Haven and New London, along with Hartford County (due to the location of the Connecticut River within the center of the county), have the highest risk of flooding within the state, and therefore have the highest numbers of NFIP Policies in Force.

Appendix 3 includes the municipality specific information for the NFIP statistics.

Table 43. NFIP Policies in Force (as of March 31, 2023)

County	Policies In-Force	Total Coverage	Written Premium In-Force
Fairfield	14,097	$3,941,438,000	$17,571,382

[94] FEMA Community Status Book Report. Connecticut. 2023. https://www.fema.gov/cis/CT.pdf

County	Policies In-Force	Total Coverage	Written Premium In-Force
Hartford	2,171	$570,732,000	$2,449,184
Litchfield	770	$177,218,000	$938,244
Middlesex	2,700	$740,542,000	$3,605,605
New Haven	8,028	$2,070,572,000	$9,556,062
New London	3,394	$925,387,000	$4,279,884
Tolland	145	$37,754,000	$171,850
Windham	118	$32,856,000	$166,990
Total	**31,423**	**$8,496,499,000**	**$38,739,201**

Table 44 summarizes the NFIP policy and claim statistics for each county. Losses (claims) include any flood damage where water crossed a property line. These values include only those losses to structures that were insured through the NFIP policies, and for losses where insurance claims were filed and received. It is likely that many additional instances of flood losses in Connecticut were either uninsured, denied claims payment, or not reported.

Table 44. NFIP Claims (as of February 25, 2023)

County	Number of Total Losses	Total Payments
Fairfield	12,439	$278,291,843
Hartford	1,880	$14,657,832
Litchfield	459	$6,442,690
Middlesex	2,217	$37,870,211
New Haven	9,512	$169,315,055
New London	2,118	$30,281,116
Tolland	162	$1,739,414
Windham	70	$1,763,458
Total	**28,857**	**$540,361,618**

4.3.6.1 Community Rating System

The NFIP Community Rating System (CRS) is a voluntary incentive program that recognizes and encourages community floodplain management activities that exceed the minimum NFIP requirements. As a result, flood insurance premium rates are discounted to reflect the reduced flood risks. There are ten CRS classes: Class 1 requires the most credit points and gives the largest flood insurance premium reduction; Class 10 does not receive a premium

reduction. These discounts are applied per each CRS community and apply to all flood insurance policyholders. For CRS participating communities, flood insurance premium rates are discounted in increments of 5% (i.e., a Class 1 community receives a 45% premium discount, while a Class 9 community receives a 5% discount).[95]

Table 45 lists the communities in Connecticut that are currently participating in the CRS. There have been four communities that have joined the CRS program since the 2019 plan update.

Table 45. Participating CRS communities in Connecticut

Community Number	Community Name	CRS Entry Date	Current Effective Date	Current Class	Discount for SFHA	Discount for Non-SFHA
90007	Town of Fairfield	10/1/2016	10/1/2016	8	10%	5%
90011	Town of Newtown	10/1/1991	10/1/1991	9	5%	5%
90012	City of Norwalk	10/1/1993	10/1/1998	10	0%	0%
90015	City of Stamford	10/1/2002	10/1/2002	7	15%	5%
90019	Town of Westport	10/1/1995	10/1/2000	8	10%	5%
90070	Town of Westbrook	5/1/2005	5/1/2011	10	0%	0%
90074	Town of Cheshire	10/1/1993	10/1/2003	10	0%	0%
90076	Town of East Haven	10/1/2003	10/1/2010	10	0%	0%
90078	Town of Hamden	10/1/1993	10/1/2006	10	0%	0%
90082	City of Milford	5/1/2012	5/1/2012	9	5%	5%
90084	City of New Haven	5/1/2017	5/1/2017	7	15%	5%
90096	Town of East Lyme	10/1/1991	5/1/2016	8	10%	5%
90106	Town of Stonington	10/1/2017	10/1/2017	8	10%	5%
90193	Borough of Stonington	10/1/2004	10/1/2014	8	10%	5%

[95] FEMA Community Rating System https://www.fema.gov/national-flood-insurance-program-community-rating-system

Community Number	Community Name	CRS Entry Date	Current Effective Date	Current Class	Discount for SFHA	Discount for Non-SFHA
95082	Town of West Hartford	10/1/1991	10/1/2007	8	10%	5%
090077	Town of Guilford	5/1/2018	5/1/2018	9	5%	5%
090102	City of Norwich	5/1/2020	5/1/2020	8	10%	5%
090016	Town of Stratford	5/1/2019	5/1/2019	8	10%	5%
090017	Town of Trumbull	5/1/2019	5/1/2019	8	10%	5%

Source: FEMA Community Status Book Report

4.3.6.2 Addressing Repetitive Loss and Severe Repetitive Loss Properties

A Repetitive Loss structure is defined under both the NFIP and the FEMA Flood Mitigation Assistance (FMA) program. The NFIP definition identifies a Repetitive Loss structure as a structure that meets one of the two following qualifiers:

1. Two or more claims of more than $1,000 paid by the NFIP within any rolling 10-year period, since 1978; or
2. Two or more claims (building payments only) that, on average, equal or exceed 25 percent of the market value of the property.[96]

Similarly, Severe Repetitive Loss refers to a structure that meets one of the two following qualifiers:

1. Received four or more separate claim payments of more than $5,000 each (including building and contents payments); or
2. Received two or more separate claim payments (building payments only) where the total of the payments exceeds the current value of the property.[97]

Through the FMA program, properties are classified as repetitive loss when they incur flood-related damages exceeding 25% of their market value on at least two occasions. If a

[96] This definition is based on the definitions for Repetitive Loss used by the NFIP program. See 44 C.F.R. § 209.2 and pt. 61, Appendices A(1)-A(3); see FEMA, National Flood Insurance Program, Flood Insurance Manual, Appendix A, pg. 11-12, and Appendix E, pg. 5 (Apr. 2021); and see FEMA, National Flood Insurance Program, Community Rating System Coordinator's Manual, pg. 120-7 (2017).
[97] This definition is based on the definitions for SRL used by the NFIP program. See 42 U.S.C. § 4014(h); see FEMA, National Flood Insurance Program, Flood Insurance Manual, Appendix I, pg. 1, and Appendix L, pg. 8 (Apr. 2021); and see FEMA, National Flood Insurance Program, Community Rating System Coordinator's Manual, pg. 120-8 (2017).

property has received more than its market value in NFIP claim payments or has incurred damages greater than or equal to 25% of its market value at least twice, it is considered to be a severe repetitive loss property.

As of April 2023, Connecticut has a total of 3,488 NFIP repetitive loss properties, as shown in Table 46. Fairfield County has the highest number of repetitive loss properties and total losses, followed by New Haven and Middlesex Counties. All of these counties are located along the coast of the state, indicating that they are at risk from coastal flooding, as well as riverine and urban flooding. This high risk of flooding most likely contributes to the higher amount of loss due to flooding for properties in these counties.

Table 46. Summary of Repetitive Loss Properties in Connecticut

County	Repetitive Loss Properties	Total Losses	Total Building Payments	Total Contents Payments
Fairfield	1,395	4,256	$116,295,643.20	$19,496,753.51
Hartford	175	537	$5,570,248.81	$1,772,204.27
Litchfield	41	115	$2,696,332.61	$1,094,946.73
Middlesex	836	2,367	$68,683,411.51	$7,875,526.06
New Haven	855	2,554	$59,402,897.15	$8,274,779.17
New London	158	421	$7,853,172.22	$1,741,177.34
Tolland	11	51	$590,789.64	$193,395.50
Windham	6	16	$370,767.48	$52,161.26
Unknown	11	38	$285,915.87	$127,091.15
State Total	**3,488**	**10,355**	**$261,749,178.49**	**$40,628,034.99**

The state has 424 Severe Repetitive Loss properties, as shown in Table 47. New Haven County and Fairfield County have the highest number of Severe Repetitive Loss properties and total losses. Additional site-specific Severe Repetitive Loss and Repetitive Loss claims histories can be obtained by contacting the state. A complete listing of the number of Severe Repetitive Loss and Repetitive Loss properties by Jurisdiction is included in Appendix 3.

Table 47. Summary of Severe Repetitive Loss in Connecticut

County	Severe Repetitive Loss Properties	Total Losses	Total Building Payment	Total Contents Payments
Fairfield	179	945	$33,914,613.58	$8,718,057.38
Hartford	21	122	$2,332,124.62	$688,164.03
Litchfield	4	22	$1,735,587.23	$686,277.37
Middlesex	24	114	$4,983,909.30	$1,931,374.33

County	Severe Repetitive Loss Properties	Total Losses	Total Building Payment	Total Contents Payments
New Haven	181	1,074	$37,402,507.64	$5,050,474.1
New London	9	46	$1,006,408.05	$469,018.61
Tolland	3	29	$423,600.21	$133,913.09
Windham	1	2	$39,534.14	$0
Unknown	2	15	$118,933.03	$120,492.15
State Total	**424**	**2,369**	**81,957,217.80**	**$17,797,771.06**

4.3.6.3 Coastal Barrier Resource System

To prevent damage from coastal storms and sea level rise, the Coastal Barrier Resources Act (CBRA) of 1982 established Coastal Barrier Resource Systems (CBRS) to serve as important buffers between coastal storms and inland areas, often protecting properties on land from serious flood damage. The CBRS contains two mapped units, System Units and Other Protected Areas (OPAs). Residents in CBRS areas are eligible for federally-regulated insurance if their property was built before 1982 and their community participates in the NFIP.[98]

Overall, Connecticut has 26 system units and 7 OPA units, with the most units located in New London County. Figure 46 shows the locations of these units.

[98] FEMA. Coastal Barrier Resources System (CBRS). If you live in a CBRS area, you are eligible for federally regulated flood insurance only if your property was built before 1982 and your community participates in the NFIP.

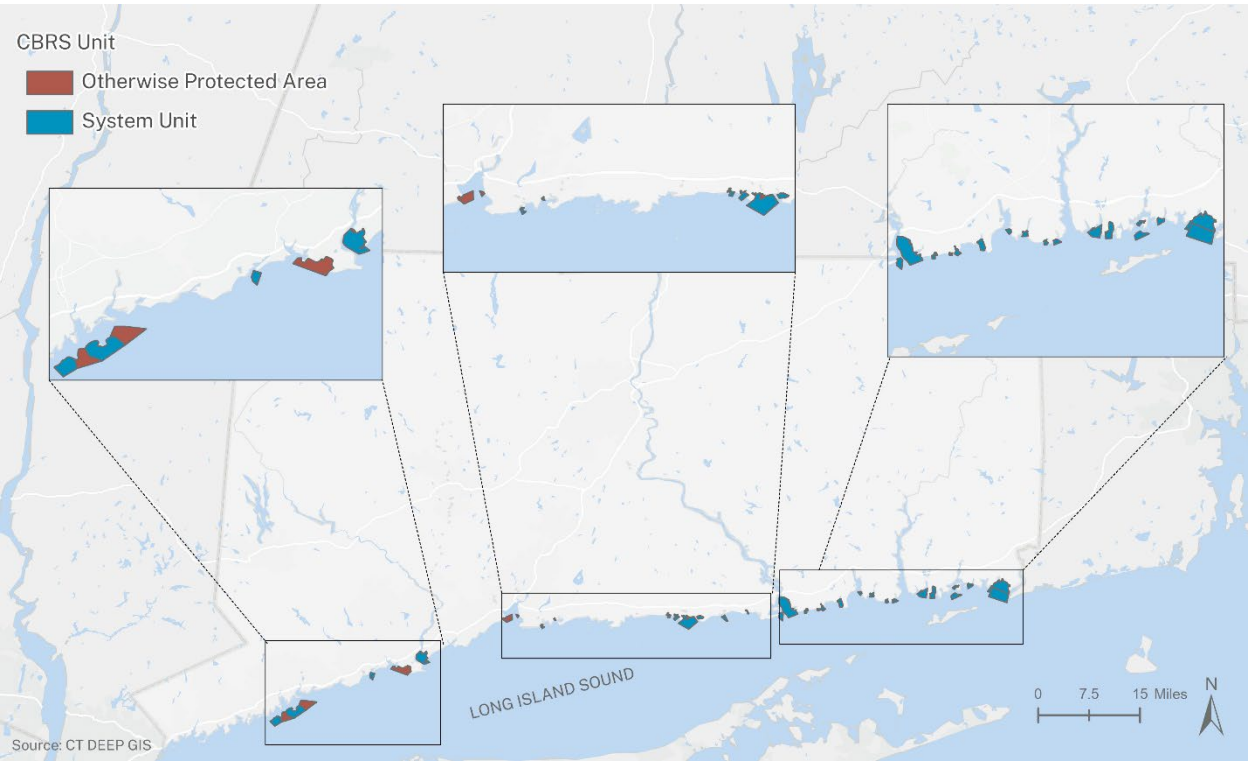


Figure 46. Coastal Barrier Resources System unit locations

4.3.7 Future Losses

All of Connecticut is vulnerable to some degree of flooding. Based on historic flood event data, multiple flood events can be expected to occur each year across the state. NCEI data on past flood events suggests that approximately one to six flood events of some significance occur in each county in Connecticut annually.

Connecticut, based on historical information, has a high probability of future flood occurrence. Fairfield and New Haven counties have had the highest number of annualized flood events, followed by Hartford and Litchfield counties. Table 48 shows the annualized number of flood events by county and the annualized property damage based on the NCEI historical record. Flood events include general flood, coastal flood, and flash flood events as categorized by NCEI records.

Table 48. NCEI annualized flood events and property damages

County	Number of Events	Property Damage (2023 Dollars)
Fairfield	6.5	$970,035.50
Hartford	5.6	$726,297.15
Litchfield	5.1	$177,191.45
Middlesex	1.8	$29,964.01

County	Number of Events	Property Damage (2023 Dollars)
New Haven	6.0	$187,484.62
New London	4.7	$359,385.49
Tolland	0.7	$73,897.04
Windham	1.0	$47,770.20
Total*	**31.5**	**$2,572,025.45**

*Note: event totals may reflect a storm event that has affected multiple counties that have been counted as individual events in each affected county.

Ice jams are a frequent hazard in Connecticut that can affect any community that borders a river. The CRREL database recorded 205 ice jams between 1902 and 2019. Based on this record, Connecticut can expect to experience between one and two ice jams annually.

Evaluating multiple sea level rise scenarios allows for experts and decision makers to consider alternative future conditions and tailor responses to reduce future impacts and vulnerabilities. The 2022 Federal Interagency Global and Regional Sea Level Rise Scenarios for the United States technical report analyzes changes in annual number of tidal floods in New London, CT under two sea level rise scenarios, Intermediate and Intermediate-Low. By 2100, under the Intermediate scenario, tidal flooding is projected to occur every day of the year. Projected increases are large even under the Intermediate-Low scenario with an estimated 240 days per year with tidal floods occurring in New London, CT. For additional information on how climate change may influence sea level rise frequency, see the Climate Change impacts section (**section 4.3.8**).

The Federal Interagency projected range of RSLR values under different emissions scenarios for the New London and Bridgeport tide gage locations are shown in Table 49. The plots of these values as sea level rise scenario curves are shown for New London and Bridgeport in Figure 47. By identifying the scenario that upper-bounds observation-based extrapolation at year 2050 for a given region, the scenario that the historical observational data aligns with can be identified. In the northeast region, the observation-based extrapolation is the same as the intermediate-low scenario 2050 projection (0.4m or 1.3 ft). However, given the accelerating rate of RSLR, conditions are likely to be higher than the intermediate-low scenario unless significant greenhouse gas mitigation measures occur.

Table 49. New London and Bridgeport sea level rise scenario values

Scenario	SLR by 2050 (ft)	SLR by 2070 (ft)	SLR by 2100 (ft)
New London			
Low	1.04	1.35	1.71
Intermediate-Low	1.18	1.68	2.34
Intermediate	1.30	2.09	3.86
Intermediate-High	1.50	2.63	5.04

Scenario	SLR by 2050 (ft)	SLR by 2070 (ft)	SLR by 2100 (ft)
High	1.61	3.18	6.47
Bridgeport			
Low	1.02	1.33	1.68
Intermediate-Low	1.15	1.64	2.30
Intermediate	1.27	2.04	3.79
Intermediate-High	1.47	2.58	4.98
High	1.58	3.15	6.41

Source: Federal Interagency Sea Level Rise Scenario Tool (2022)

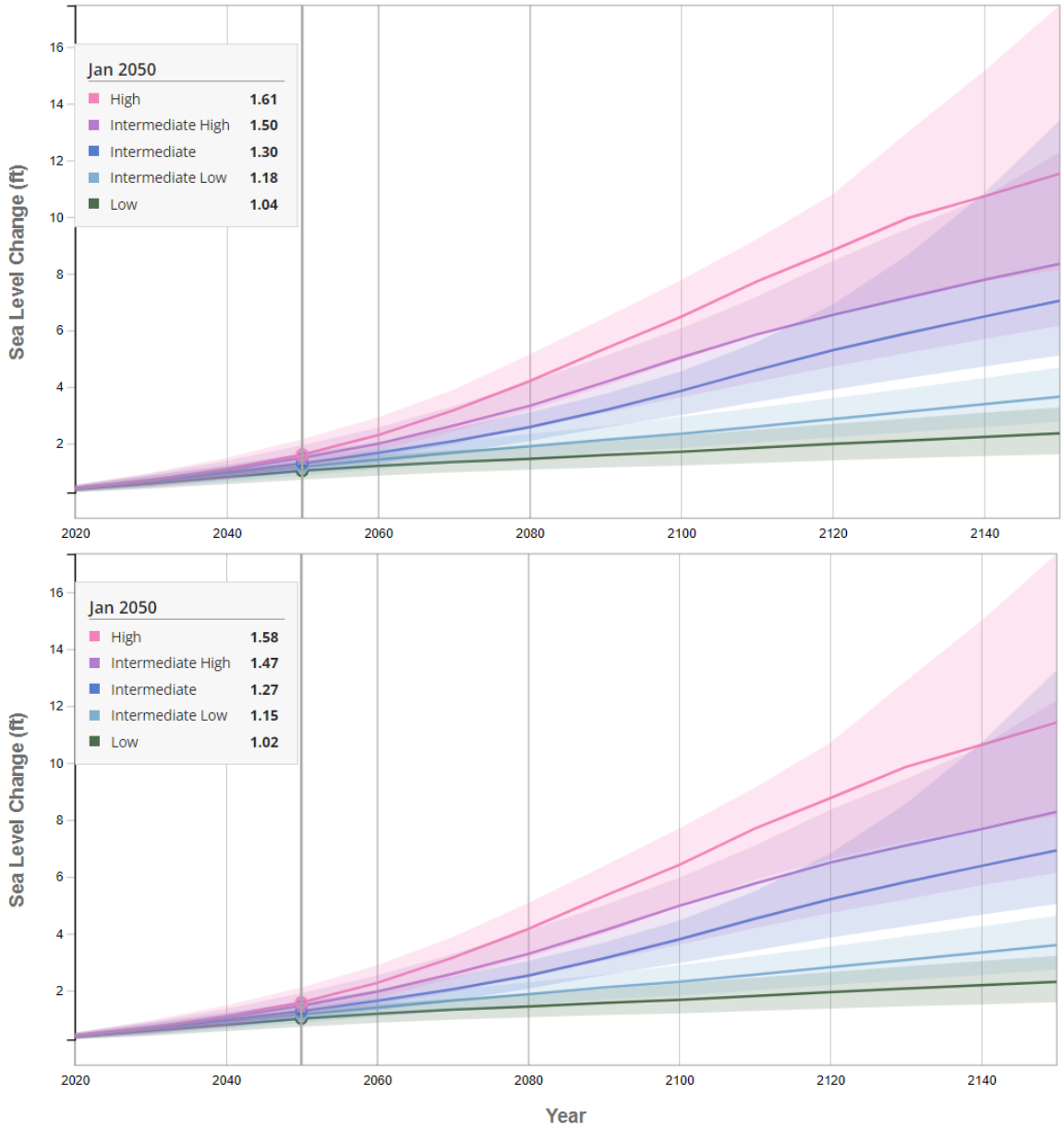


Figure 47. New London (top) and Bridgeport (bottom) sea level rise projections from 2022 Interagency Sea Level Rise Scenario Tool

4.3.8 Climate Change Impacts

Flooding events are expected to increase in both frequency and intensity due to climate change. Precipitation events are expected to increase in intensity with seasonal variations due to climate change. With the Northeast Region experiencing a 70% increase in the amount of precipitation falling in very heavy precipitation events, Connecticut can be expected to experience a similar increase in amount of precipitation.[99] More intense rainfall

[99] U.S. Global Change Research Program. Impacts, Risks, and Adaptation in the United States: Fourth National Climate Assessment, Volume II (2018). https://nca2018.globalchange.gov/chapter/18/

is likely to increase peak flooding, particularly in urban environments. The magnitude of this increase is dependent on the level and rate of greenhouse gas emissions through the end of the century.

Changes in precipitation patterns in Connecticut are likely to amplify flood impacts.[100] Heavy precipitation events above the 99th percentile of daily values have increased by 55% since 1958.[101] Climate change is increasing water temperatures in the ocean and cause the development of stronger tropical storms that can cause more severe coastal flooding and intensify storm surge, increasing the vulnerability of coastal communities. In addition, precipitation is expected to increase during the winter months. However, due to warming air temperatures, this is expected to fall more frequently as rain or freezing rain versus snow. Increased precipitation will increase the probability of rain-induced flooding (i.e., pluvial) and riverine flooding events in low-lying areas and in areas with impervious surfaces that do not have adequate mitigation measures in place. Projected climate change impacts on flooding are detailed in Table 50.

Table 50. Climate change impacts on flooding

Impact	Projected Change
Location	Riverine flooding location is not projected to change. Increased flash flooding may expand the extent of inland flooding. Coastal flooding may impact areas further inland due to stronger storms increasing the extent of coastal flooding and storm surge (NCA).
Intensity	Rainfall magnitude is projected to increase by 10-15% across Connecticut due to climate change, causing more intense floods (NCA).
Frequency	Frequency of heavy precipitation events in the Northeast is projected to continue to increase, which will increase flooding frequency. Annual days with rainfall that exceeds 99th percentile precipitation is projected to be 3.9 days higher by late century than records from 1976 – 2005 (CMRA).
Duration	Not likely to change significantly (NCA).
Model Confidence	High confidence (NCA).

Sea level has been rising since the end of the last ice age, but the rate of change has been greater in the in the 19th and 20th centuries, much of which has been attributed to anthropogenic influence.[102] Sea level rise is a complex problem, but the future impacts will be influenced by two primary factors: thermal expansion of water in the ocean and the melting of land-based ice, much of which is contained in ice sheets in Greenland and the Antarctic.[103] These two factors are accelerated by the observed increase in global average temperatures since the mid-20th century, which is very likely due to the observed increase

[100] https://19january2017snapshot.epa.gov/sites/production/files/2016-09/documents/climate-change-ct.pdf
[101] U.S. Global Change Research Program. Impacts, Risks, and Adaptation in the United States: Fourth National Climate Assessment, Volume II. Chapter 2: Climate (2018). https://nca2018.globalchange.gov/chapter/2/#key-message-6
[102] CT DEEP and IPCC, Climate Change 2014 Synthesis Report Summary for Policymakers.
[103] IPCC. Climate Change 2014 Synthesis Report Summary for Policymakers.

in anthropogenic greenhouse gas concentrations.[104] As the oceans warm and expand, and the ice sheets continue to melt, sea level rise will continue to be seen in coastal communities around the world, within the United States, and on the coast of Connecticut. Table 50 summarizes the projected sea level rise conditions for Connecticut.

Table 51. Summary of projected climate change impacts on sea level rise

Impact	Projected Change
Location	Sea level rise will result in the greatest flooding in coastal counties, including Fairfield, New Haven, Middlesex, and New London. By 2070 under a high emissions scenario, 3 ft of sea level could impact land areas into parts of Hartford County.
Intensity	Sea level rise scenarios vary in projected water level increases based on different greenhouse emissions scenarios. The CIRCA Sea Level Rise report concluded mean sea level in Long Island Sound could increase by up to 20 inches above the National Tidal Datum Epoch by 2050. Mean sea level rise could be up to 6 ft higher by 2100 under high greenhouse emissions scenarios.
Frequency	Changes in mean sea level will significantly impact the frequency of flooding along the Connecticut coast. With 20 inches of sea level rise, coastal flood risk could increase by a factor of 5 to 10 with no change in storm conditions
Duration	Sea level rise will result in land area loss. Areas projected to be covered under Mean Higher High-Water conditions in the future will be permanently inundated.
Model Confidence	Near term (2050) projections for different emissions scenarios generally have more agreement than longer term projections.

4.3.9 Vulnerability Assessment

Flood vulnerability was assessed through a variety of analyses, including a Hazus-MH Flood Loss analysis, a GIS analysis of state-owned buildings, a critical facility analysis, and a local loss analysis. Flooding continues to be a jurisdictional-level issue throughout the state, with communities each contributing to the mitigation of threats from numerous flooding sources.

The most significant effects of sea level rise will be experienced by Connecticut's coastal counties of Fairfax, Middlesex, New Haven, and New London. Given that the adopted sea level change scenario for Connecticut is up to 20 in (1.67 ft) higher than the national tidal datum in Long Island Sound by 2050, the corresponding flood inundation extent was used to conduct an exposure analysis of critical facilities and state-owned buildings. The state sea level rise scenario is approximately aligned with the High scenario of the 2022 Federal interagency sea level rise scenarios, which project 1.61 ft and 1.58 ft of sea level rise by 2050.[105] Under the 2022 federal interagency high sea level rise scenario, approximately 3 ft

[104] IPCC. AR4 Climate Change 2007: Synthesis Report.
[105] The federal interagency sea level rise projections are referenced to a baseline year of 2000, while the Connecticut sea level rise projections are referenced to a baseline year of 1992. An offset would need to be calculated to compare the numbers exactly.

of SLR is projected by 2070 (3.18 ft for New London and 3.15 ft for Bridgeport) and approximately 6 ft by 2100 (6.47 ft for New London and 6.41 ft for Bridgeport). These representative values of 3 ft and 6 ft of SLR were selected for the exposure analysis to project conditions beyond 2050. The sea level rise scenarios relative to MHHW are shown in Figure 48.

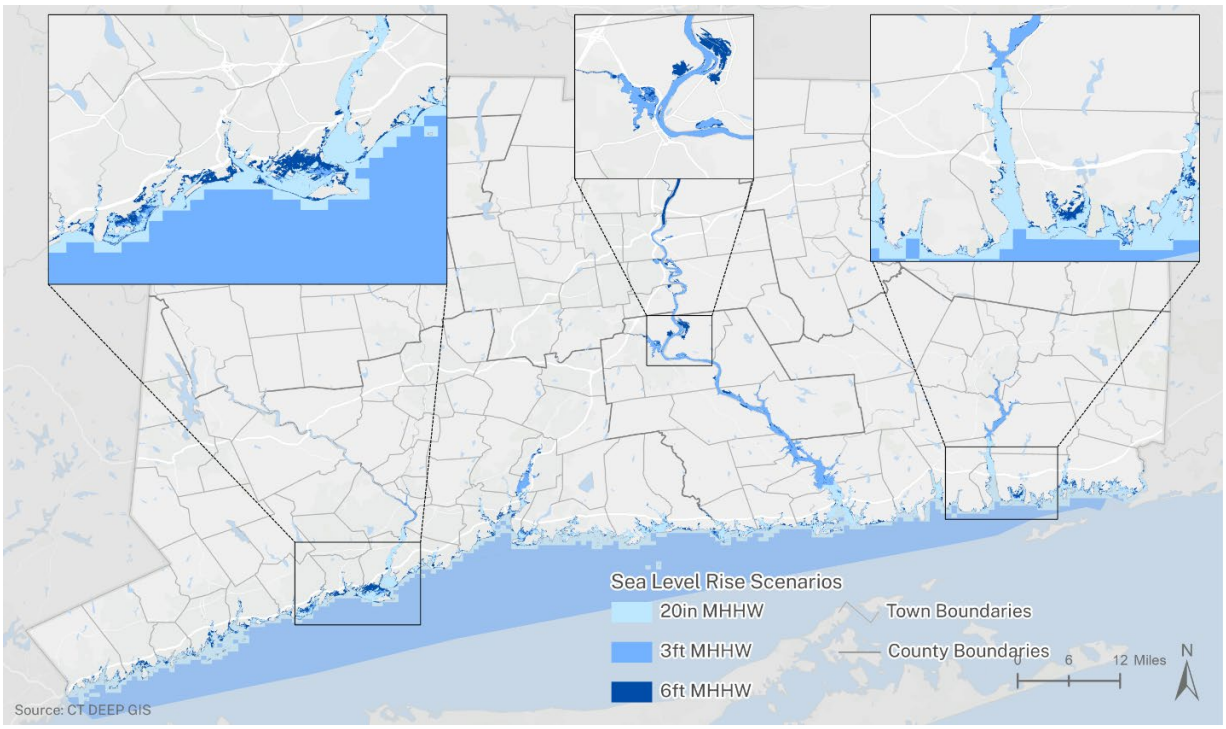


Figure 48. Three sea level rise scenarios for Connecticut above current MHHW conditions (20 in, 3 ft, and 6 ft)

In addition to MHHW conditions, the CIRCA sea level rise data provides multiple storm frequencies with the 20 in sea level rise scenario. These include the 10-year, 30-year, 100-yr, and 500-yr probability flood events. The 100-yr event was selected for exposure analysis because it aligns with the projected future Special Flood Hazard Area floodplain management boundaries. The projected future 100-yr floodplain with 20 in of sea level rise is shown in Figure 49.

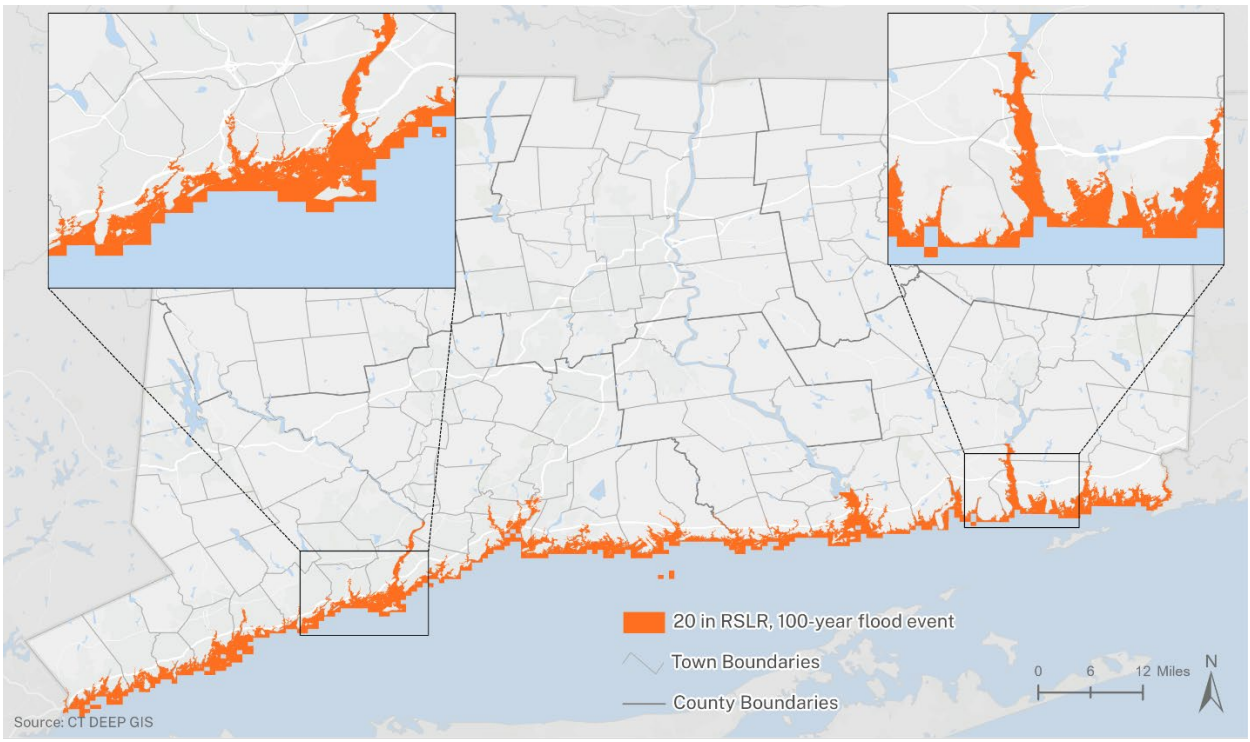


Figure 49. Projected 100-year floodplain with 20in of sea level rise.

4.3.9.1 State Vulnerability

Flooding can cause direct damage to state-owned facilities and result in flooded streets that impact the ability of public safety and emergency vehicles to respond to calls for service. The number of state-owned buildings within the floodplain by county is shown in Table 52.

A total of 213 state-owned buildings are located within the mapped 1% annual chance floodplain. There are a total of 71 state-owned buildings located within the 0.2% annual chance floodplain. New London and Litchfield Counties have the highest number of state-owned buildings in the 1% annual chance floodplain, and New London and New Haven Counties have the highest number of state-owned buildings in the 0.2% annual chance floodplain.

Table 52. State buildings within mapped floodplains

County	Total Buildings in 1% Floodplain	Total Buildings in 0.2% Floodplain	Total Buildings in Mapped Floodplain
Fairfield	41	9	50
Hartford	21	6	27
Litchfield	68	0	68
Middlesex	7	1	8

County	Total Buildings in 1% Floodplain	Total Buildings in 0.2% Floodplain	Total Buildings in Mapped Floodplain
New Haven	25	21	46
New London	42	34	76
Tolland	1	0	1
Windham	8	0	8
Total	**213**	**71**	**284**

The 284 state owned buildings that fall within the 1% annual chance and 0.2% annual chance floodplains have a combined total of approximately $332 million dollars in building value, as shown in Table 53. There is more value of state-owned buildings located in the 1% annual chance floodplain, with buildings in Fairfield, New London, and New Haven counties accounting for the majority of the total value in the 1% annual chance floodplain. State-owned buildings in these three counties also account for the majority of the value exposed to flooding in the 0.2% annual chance floodplain.

Table 53. Value of state-owned buildings in the mapped floodplain

County	Value in 1% Floodplain	Value in 0.2% Floodplain	Total Value in Mapped Floodplain
Fairfield	$86,680,670	$31,868,580	$118,549,250
Hartford	$5,725,900	$5,725,900	$11,451,800
Litchfield	$4,285,640	$0	$4,285,640
Middlesex	$167,230	$0	$1,745,570
New Haven	$58,053,760	$6,456,830	$64,510,590
New London	$73,223,540	$42,973,330	$116,196,870
Tolland	$0	$0	$0
Windham	$16,151,580	$0	$16,151,580
Total	**$244,288,320**	**$88,602,980**	**$332,891,300**

Flood loss estimates have been derived using the FEMA Hazus module for riverine and coastal flood hazards. Flood hazard is defined by a relationship between depth of flooding and the annual chance of flooding to that depth. A Hazus Level 2 analysis was performed with user-created depth grids that were generated from Hazus-provided terrain data and FEMA Digital Flood Insurance Rate Maps (DFIRMs). The type of data shown in Table 54 includes information on the local economy that is used in estimating losses.

Table 54. Hazus direct economic loss categories and descriptions

Category Name	Description of Data Input into Model	Hazus Output
Building	Cost per sq ft to repair damage by structural type and occupancy for each level of damage	Cost of building repair or replacement of damaged and destroyed buildings
Contents	Replacement value by occupancy	Cost of damage to building contents
Inventory	Annual gross sales in $ per sq ft	Loss of building inventory as contents related to business activities
Relocation	Rental costs per month per sq ft by occupancy	Relocation expenses (for businesses and institutions)
Income	Income in $ per sq ft per month by occupancy	Capital-related incomes losses as a measure of the loss of productivity, services, or sales
Rental	Rental costs per month per sq ft by occupancy	Loss of rental income to building owners
Wage	Wages in $ per sq ft per month by occupancy	Employee wage loss as described in income loss
Business Disruption	N/A	Combination of inventory, relocation, income, rental, wage loss, direct output loss*

*Calculated value

The flood model was used to run a 1% annual chance flood based on the hazard depicted on the FIRMs. FIRMs were available for Fairfield, Hartford, Middlesex, New Haven, and New London Counties. Floodplains derived using the Hazus software with 10-meter National Elevation Dataset and a one square mile threshold were used to analyze Litchfield, Tolland, and Windham counties.

Figure 50 shows the estimated total 1% annual chance flood exposure by county. It is apparent that the coastal and riverine areas are at higher risk, specifically in Fairfield and New Haven counties. Appendix 3 includes scenario- and jurisdiction-specific results from the Hazus analysis.

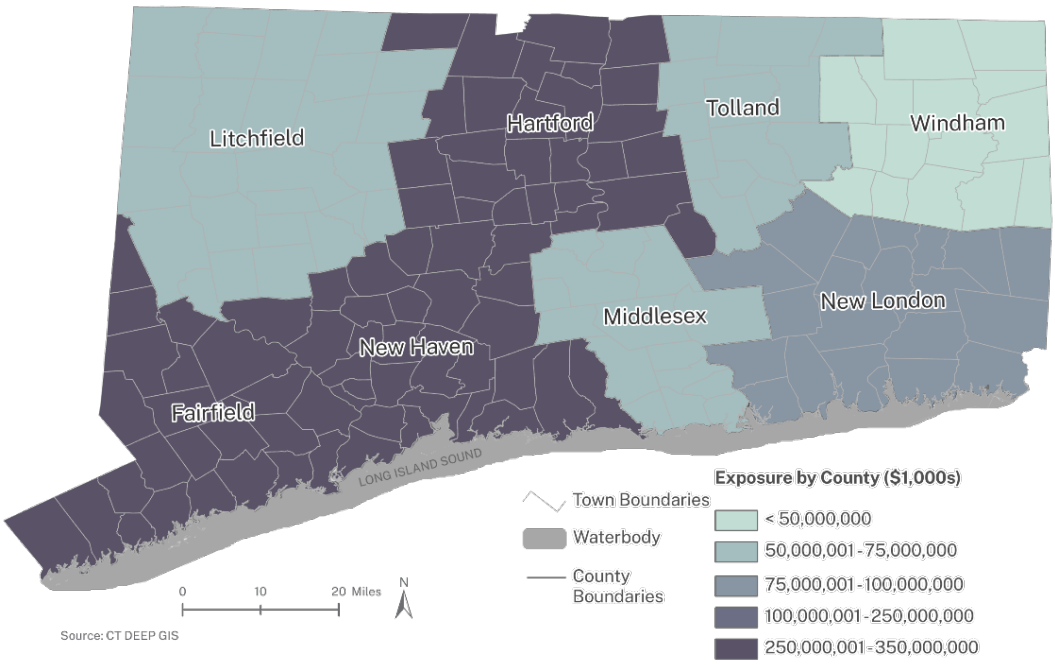


Figure 50. 1% annual chance flood exposure by County

Table 55 shows 1% annual chance flood loss estimation values by county. Litchfield County had the highest percent loss, with 7.19%. Windham County has the lowest exposure value but is estimated to experience the second largest percent loss at 4.78%. Fairfield County has the highest exposure value and will experience the largest total loss and the largest amount of business disruption. Overall, business disruption loss accounts for the highest portion of total loss.

Table 55. Hazus 1% annual chance flood loss estimation by County ($1,000's)

County	Exposure	Building Loss	Contents Loss	Business Disruption	Total Loss	% Loss
Fairfield	$342,668,054	$1,148,591	$1,613,260	$10,730,133	$13,491,984	3.94%
Hartford	$298,788,011	$172,529	$262,644	$3,247,418	$3,682,591	1.23%
Litchfield	$73,734,504	$688,610	$1,205,937	$3,404,886	$5,299,433	7.19%
Middlesex	$56,204,726	$228,119	$289,489	$1,356,042	$1,873,650	3.33%
New Haven	$271,484,041	$434,198	$691,453	$5,456,940	$6,582,591	2.42%
New London	$88,544,795	$319,006	$421,388	$2,053,174	$2,793,568	3.15%
Tolland	$50,676,029	$96,707	$192,186	$732,264	$1,021,157	2.02%
Windham	$38,714,659	$203,841	$397,437	$1,250,587	$1,851,865	4.78%
State Totals	**$1,220,814,819**	**$3,291,601**	**$5,073,794**	**$28,231,444**	**$36,596,839**	**3.00%**

FEMA's Hazus-MH software was also used to determine losses due to storm surge in Connecticut. The Hazus storm surge analysis uses the National Hurricane Center's (NHC) Sea, Lake, and Overland Surges from Hurricanes (SLOSH) Maximum of the Maximum Envelope of Waters (MEOWs) (MOM) depth grid. Four separate single-frequency depth grid scenarios for the Category 1 to 4 hurricanes were run, and a loss estimate was determined for each hurricane category.

Table 56 and Table 57 show the results of the storm surge building-related economic loss analysis for the entire state. Storm surge impacts to residential buildings is projected to be the highest building loss value, followed by commercial buildings. The results indicate that the "commercial" and "other" sectors are the most vulnerable to business interruption during a storm surge event.

Table 56. Hazus Connecticut storm surge building loss estimates (Millions of USD)

Storm Surge Category	Residential	Commercial	Industrial	Other	Total
Category 1	15,336.97	11,600.78	4,677.44	3,743.48	35,358.66
Category 2	40,857.38	33,487.59	14,264.32	10,458.46	99,067.74
Category 3	74,741.18	66,339.57	26,235.46	20,963.14	188,279.35
Category 4	124,916.37	110,963.42	39,815.99	37,483.85	313,179.62
Total	**255,851.90**	**222,391.36**	**84,993.21**	**72,648.93**	**635,885.37**

Table 57. Hazus Connecticut storm surge business interruption loss estimates (Millions of USD)

Storm Surge Category	Residential	Commercial	Industrial	Other	Total
Category 1	4,273.55	17,423.30	556.86	20,130.49	42,384.19
Category 2	8,049.87	33,881.49	938.75	34,819.30	77,689.41
Category 3	12,583.74	56,918.38	1,346.46	56,724.11	127,572.69
Category 4	18,867.53	85,809.14	1,773.37	84,156.86	190,606.90
Total	**43,774.69**	**194,032.31**	**4,615.44**	**195,830.76**	**438,253.19**

To estimate state-owned facilities exposure to future flooding, RSLR hazard layers produced by CIRCA and NOAA were intersected with state-owned facility locations. Exposed state-owned facilities and exposed asset value was tabulated by county. Counties with no exposure were excluded from reporting. Counts of state-owned facilities are reported in Table 58 and associated building values are reported in Table 59. Fairfield County has the greatest number and value of state-owned facilities projected to be exposed to RSLR, followed by New Haven County.

Table 58. Number of state facilities exposed to RSLR scenarios.

County	1.8 ft SLR, MHHW	1.8 ft SLR, 100-yr storm	3 ft SLR, MHHW	6 ft SLR, MHHW
Fairfield	0	19	2	9
Middlesex	0	0	1	1
New Haven	0	13	2	10
New London	0	1	0	1
Total	**0**	**33**	**3**	**21**

Table 59. Value of state facilities exposed to RSLR scenarios.

County	1.8ft RSLR, MHHW	1.8 ft RSLR, 100-yr storm	3 ft RSLR, MHHW	6 ft RSLR, MHHW
Fairfield	$0	$77,942,310	$570,420	$34,012,970
Middlesex	$0	$0	N/A	N/A
New Haven	$0	$35,680,950	N/A	$23,946,650
New London	$0	$3,507,110	$0	$1,606,820
Total	$0	$117,130,370	$570,420*	$59,566,440

* Building values were not available (N/A) for properties exposed to RSRL in Middlesex and New Haven under 3ft and properties in Middlesex under 6ft RSL.

4.3.9.2 Councils of Government Vulnerability

To determine vulnerability of COG regions to flood-related hazards, a critical facilities vulnerability analysis was completed. To determine the number of critical facilities exposed to the 1% annual chance flood event extent and 0.2% annual chance flood event extent in each COG region, critical facility points were intersected with the 1% and 0.2% annual chance floodplains GIS layer and analyzed for vulnerability by COG region. The results of this critical facilities vulnerability analysis for each COG region are shown below in Table 60.

Table 60. Critical facilities in floodplains by COG region

COG Region	Number of Critical Facilities in 1% Annual Chance Floodplain	Number of Critical Facilities in 0.2% Annual Chance Floodplain	Total Critical Facilities in Mapped Floodplain
Capitol Region	15	12	27
Metropolitan	20	1	21
Naugatuck Valley	16	16	32

COG Region	Number of Critical Facilities in 1% Annual Chance Floodplain	Number of Critical Facilities in 0.2% Annual Chance Floodplain	Total Critical Facilities in Mapped Floodplain
Northeastern Connecticut	13	0	13
Northwest Hills	23	0	23
Lower Connecticut River Valley	9	15	24
South Central Regional	17	3	20
Southeastern Connecticut	29	11	40
Western Connecticut	21	6	27
State Total	**163**	**64**	**227**

Overall, there are 163 critical facilities throughout the state that are located in the 1% annual chance floodplain. Southeastern Connecticut COG has the highest number of vulnerable critical facilities, with 40 critical facilities located in the mapped floodplain. Naugatuck Valley has the second highest number of total vulnerable critical facilities, followed by the Capitol Region and Western Connecticut Region. The COG regions with the highest vulnerability are located either along the coastline or have a large number of waterbodies running through the region.

Critical facilities in Connecticut can also serve as community lifelines that provide fundamental services to each community. When critical facilities are damaged by flooding, a community has reduced capacity to support continuous operation of critical government and business functions, and human health and safety may be at risk. When analyzing vulnerable critical facilities, it was determined that the most vulnerable community lifelines to flooding in the state are Safety and Security, Health and Medical, and Energy lifelines.

The flood model was used to run a 1% annual chance flood based on the hazard depicted on the FIRMs. FIRMs were available for Fairfield, Hartford, Middlesex, New Haven, and New London Counties. Floodplains derived using the Hazus software with 10-meter National Elevation Dataset and a one square mile threshold were used to analyze Litchfield, Tolland, and Windham counties.

Figure 51 shows the estimated total 1% annual chance flood exposure by COG. It is apparent that the coastal and riverine areas are at higher risk, specifically Capitol Region COG, South Central Region COG, Naugatuck Valley COG, and Western Connecticut COG. Appendix 3 includes scenario- and jurisdiction-specific results from the Hazus analysis.

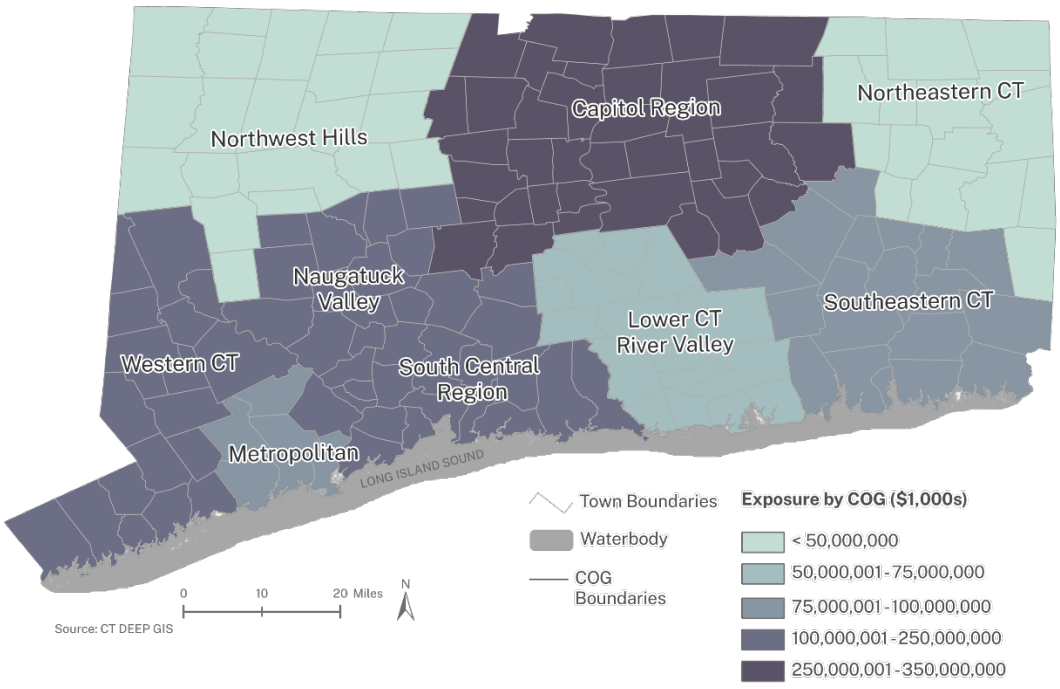


Figure 51. 1% annual chance flood exposure by COG

Table 61 shows Hazus 1% annual chance flood loss estimations by COG region. The Connecticut Metropolitan COG has the highest total loss due to flood, but the Northwest Hills COG has the highest percent loss due to flood. Overall, business disruption loss accounts for the highest portion of total loss.

Table 61. Hazus 1% annual chance flood loss estimation by COG ($1,000s)

COG	Exposure	Building Loss	Contents Loss	Business Disruption	Total Loss	Percent Loss
Capitol Region	$329,362,943	$251,953	$426,366	$3,700,328	$4,378,647	1.33%
Metropolitan	$95,014,173	$517,343	$907,799	$5,947,492	$7,372,634	7.76%
Naugatuck Valley	$133,830,413	$225,855	$460,183	$1,787,282	$2,473,320	1.85%
Northeastern Connecticut	$32,393,754	$152,149	$286,110	$1,017,759	$1,456,018	4.49%
Northwest Hills	$47,102,787	$492,788	$794,092	$2,517,650	$3,804,530	8.08%
Lower Connecticut River Valley	$60,617,277	$265,367	$323,505	$1,457,841	$2,046,713	3.38%
South Central Regional	$185,131,714	$369,949	$573,212	$4,784,701	$5,727,862	3.09%

COG	Exposure	Building Loss	Contents Loss	Business Disruption	Total Loss	Percent Loss
Southeastern Connecticut	$90,782,941	$333,795	$499,011	$2,185,020	$3,017,826	3.32%
Western Connecticut	$246,578,817	$682,402	$803,516	$4,833,371	$6,319,289	2.56%
COG Total	**$1,220,814,819**	**$3,291,601**	**$5,073,794**	**$28,231,444**	**$36,596,839**	**3.00%**

The COG regions most exposed to SLR conditions include Connecticut Metropolitan (MetroCOG), Lower Connecticut River Valley (RiverCOG), Southeastern Connecticut (SCCOG), South Central Regional (SCROG), and Western Connecticut (WestCOG). The COGs with the greatest number of critical facilities exposed to RSLR are the SCCOG and WestCOG, as shown in Table 62.

Table 62. Number of critical facilities exposed to RSLR by COG Region

COG Region	Total Critical Facilities	1.8 ft SLR, MHHW	1.8 ft SLR, 100-yr storm	3 ft SLR, MHHW	6 ft SLR, MHHW
Metropolitan	120	1	10	1	6
Naugatuck Valley	211	0	0	0	1
Lower Connecticut River Valley	171	0	2	1	1
South Central Regional	254	0	10	1	5
Southeastern Connecticut	275	1	13	2	11
Western Connecticut	285	1	12	1	7
Total	**1,316**	**3**	**47**	**6**	**31**

To estimate the population vulnerable to RSLR, the population of each COG intersecting the projected floodplains under each SLR area was estimated based on census tract population estimates. As shown in Table 63, the COG Region with the greatest population exposed to RSLR is the SCROG, followed by WestCOG, MetroCOG, and SCCOG. It is important to note that these population counts are based on the population of entire census tract and therefore likely overestimate the population directly exposed to RSLR because the floodplains will only extend through discrete portions of the census tract.

Table 63. Population exposed to RSLR by COG Region

COG Region	Total Population	1.8 ft SLR, MHHW	1.8 ft SLR, 100-yr storm	3 ft SLR, MHHW	6 ft SLR, MHHW
Capitol Region	1,129,009	0	0	69,386	89,378
Metropolitan	411,718	127,133	166,582	126,104	144,691
Lower Connecticut River Valley	190,220	62,628	74,555	111,885	118,059
Naugatuck Valley	353,855	3,524	8,287	34,319	34,319
South Central Regional	481,071	213,123	251,458	229,889	252,286
Southeastern Connecticut	204,210	100,709	100,709	133,473	133,473
Western Connecticut	559,106	119,855	172,950	132,154	142,158
Total	**3,329,189**	**626,972**	**774,541**	**837,210**	**924,364**

4.3.9.3 Local Vulnerability

Flood events can impact jurisdictions in all of Connecticut's counties. People that live within or near floodplains are more likely to experience flooding compared to those that do not. Using population data from the 2020 Census, census tracts in Connecticut counties were overlaid with the 1% annual chance floodplain to identify areas where residents may be exposed to flooding. Census tracts identify total population, but do not indicate where within these boundaries residents live.

Figure 52 shows population of census tracts in Connecticut and the 1% annual chance floodplain. Every County has a populous area near or within a flood zone. It is difficult to determine the exact population living in the floodplain in Connecticut, but nearly all census tracts intersect a portion of the floodplain area indicating that there is high vulnerability to flooding across the state.

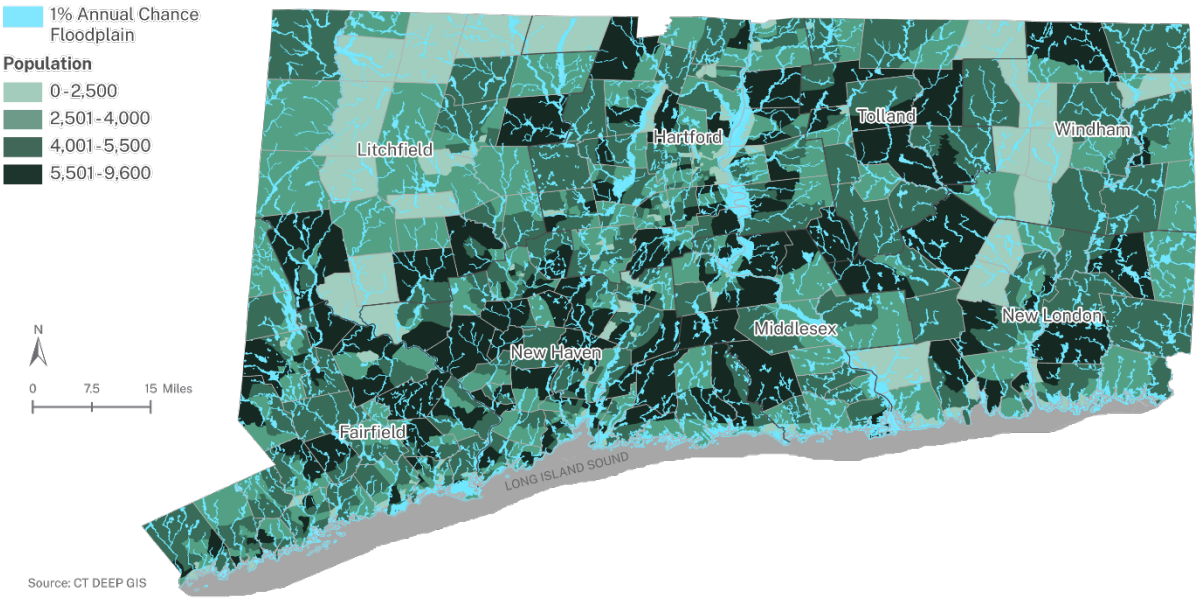


Figure 52. Population by census tract and 1% annual chance floodplain

To estimate the population vulnerable to sea level rise in each county, population of the county intersecting the future floodplains areas were determined. The same GIS analysis was conducted for county population data as the COG population analysis. It is important to note that these population counts are based on the population of entire census tract and therefore likely overestimate the population directly exposed to RSLR because the floodplains will only extend through discrete portions of the census tract. The Counties with the greatest population exposed to RSLR are Fairfield and New Haven, as shown in Figure 53.

GIS analyses were performed to assess hazard risk for the state's transportation infrastructure to produce Figure 53. Please see Appendix 3 for percentages of transportation infrastructure located within each spatial hazard area.

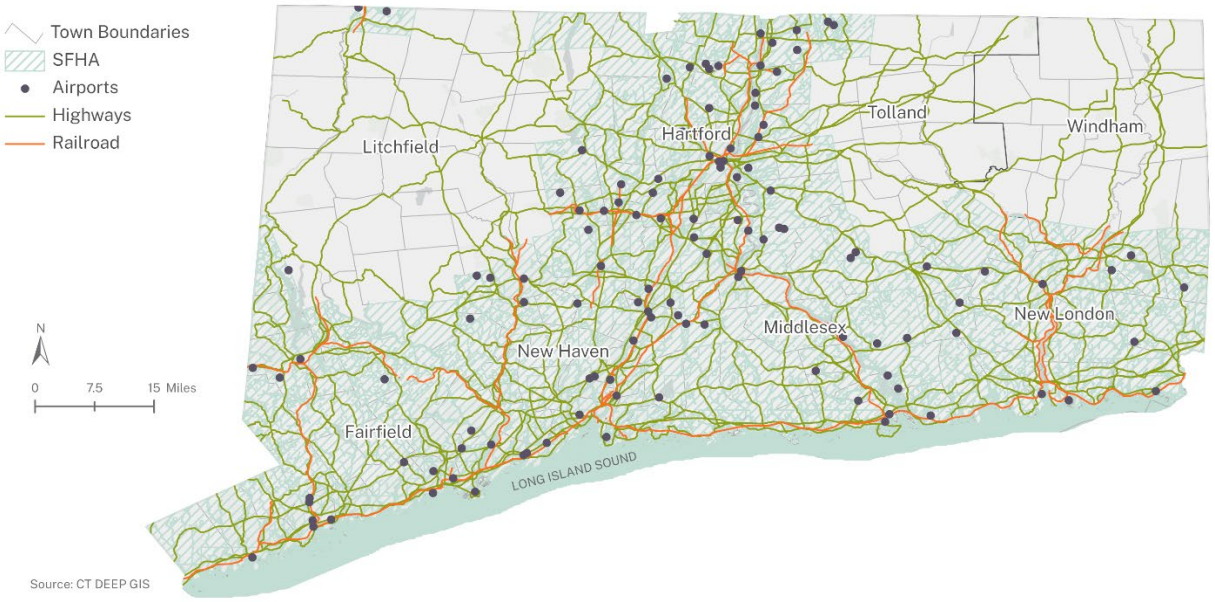


Figure 53. Transportation infrastructure within the SFHA.

Table 64. Estimated population by total census tracts exposed to flooding under each SLR scenario.

County	Total County Population	1.8 ft SLR, MHHW	1.8 ft SLR, 100-yr storm	3 ft SLR, MHHW	6 ft SLR, MHHW
Fairfield	957,322	259,533	333,451	254,859	293,450
Hartford	898,547	0	0	49,400	66,081
Middlesex	164,179	32,980	39,154	102,223	111,708
New Haven	864,495	266,336	280,526	282,307	304,704
New London	268,434	115,657	121,410	148,421	148,421
Total	**2,254,430**	**674,506**	**774,541**	**837,210**	**924,364**

To estimate the direct economic losses associated with sea level rise, the expected annual loss for coastal flooding from the National Risk Index was used. Coastal flooding, as defined by the National Risk Index, occurs "when water inundates or covers normally dry

coastal land as a result of high or rising tides or storm surges."[106] It is important to note this definition includes storm surge and considers impacts from minor (1-2 year), moderate (10-50 year), and major flooding events (100-year flood) under present conditions. While sea level rise is not directly considered in this definition, higher frequency storm events can be used as proxy for future floodplain conditions under sea level rise. The reported Total Expected Annual Loss is the average economic loss in dollars resulting from coastal flooding impacts to buildings and the population. As shown in Table 65, the greatest total expected annual losses are estimated for Fairfield ($13.7M) and New Haven ($7.4M) counties.

Table 65. Estimated total expected annual loss from the National Risk Index for coastal flooding.

County	Total Expected Annual Loss
Fairfield	$13,706,025
Hartford	$20,316
Middlesex	$1,722,300
New Haven	$7,409,588
New London	$1,144,022
Total	**$24,002,251**

4.3.9.3.1 Critical Facilities

The critical facilities vulnerability analysis depicted below in Table 66 shows the number and type of critical facilities located in the 1% annual chance and 0.2% annual chance floodplains in Connecticut by County. Fairfield County has the most critical facilities within the 100-year floodplain, with a total of 36, followed by Litchfield and New London with 31 and 29 critical facilities, respectively. There is a total of 64 critical facilities within the 0.2% annual chance floodplain. The majority of these critical facilities are located in Hartford County, followed by Middlesex, New London, New Haven, and Fairfield counties. Litchfield, Tolland, and Windham counties have no critical facilities in the 0.2% annual chance floodplain.

Table 66. Critical facilities in floodplains by County

County	Critical Facilities in 1% Annual Chance Floodplain	Critical Facilities in 0.2% Annual Chance Floodplain	Critical Facilities in FEMA Floodplain
Fairfield	36	7	43
Hartford	14	15	29
Litchfield	31	0	31

[106] National Risk Index Technical Documentation.

County	Critical Facilities in 1% Annual Chance Floodplain	Critical Facilities in 0.2% Annual Chance Floodplain	Critical Facilities in FEMA Floodplain
Middlesex	9	13	22
New Haven	27	16	43
New London	29	13	42
Tolland	3	0	3
Windham	14	0	14
State Total	**163**	**64**	**227**

Some towns in Connecticut are more vulnerable to flooding of critical facilities than other towns. Bridgeport in Fairfield County has 10 critical facilities intersecting the floodplain. The facilities in Bridgeport at risk include four power plants, two fire stations, one EMS Station, one prison, and one Wastewater Treatment Plant. In Windham County, the City of Putnam has 8 critical facilities in the 1% annual chance floodplain, including three EMS Stations, two local law enforcement stations, one fire station, one local Emergency Operations Center, and one Wastewater Treatment Plant. Critical facility vulnerability to flooding in each town is further detailed in Appendix 3.

To determine critical facilities vulnerability to coastal flooding, Connecticut's storm surge layer was intersected with critical facilities points. Connecticut has a total of 212 critical facilities within hurricane storm surge zones.

Table 67 provides totals for each hurricane category and jurisdiction. A Category 1 hurricane has maximum sustained wind speeds of 74-95 miles per hour (mph), Category 2 hurricanes have a maximum sustained wind speed of 96-110 mph, Category 3 hurricanes have a maximum sustained wind speed of 111-130 mph, and Category 4 hurricanes have a maximum sustained wind speed of 131-155 mph.

Fairfield County has the highest number of critical facilities within the storm surge zones. Within Fairfield County, Bridgeport has the most critical facilities located within storm surge zones, followed by Stamford.

New Haven County has the second highest number of critical facilities within hurricane storm surge zones 1 through 4. The majority of these critical facilities are located in the City of New Haven, with a total of 10 critical facilities exposed to storm surge.

Table 67. Critical facilities exposed to storm surge

County	Category 1	Category 2	Category 3	Category 4	Total (All Categories)
Fairfield	22	39	57	79	197
Hartford	0	0	0	0	0

County	Category 1	Category 2	Category 3	Category 4	Total (All Categories)
Litchfield	0	0	0	0	0
Middlesex	2	3	11	17	33
New Haven	14	26	40	71	151
New London	17	24	32	45	118
Tolland	0	0	0	0	0
Windham	0	0	0	0	0
Total	**55**	**92**	**140**	**212**	**-**

Table 68 shows a summary of the number and types of critical facilities located within projected future floodplains. Fairfield and New London Counties have the greatest number of critical facilities exposed to sea level rise. Emergency Management Services facilities, Fire Stations, and Wastewater Treatment Plants are the facility types likely to experience the greatest direct impacts of future flooding. These directly relate to the community lifelines of Health and Medical, Safety and Security, and Hazardous Materials.

Table 68. Number of critical facilities exposed to RSLR scenarios.

County	Facility Type	FEMA Community Lifeline	1.8 ft SLR, MHHW	1.8 ft SLR, 100-yr storm	3 ft SLR, MHHW	6 ft SLR, MHHW
Fairfield	Law Enforcement	Safety and Security	0	1	0	1
	Fire Station	Safety and Security	0	4	0	3
	EMS	Health and Medical	0	6	0	2
	Urgent Care Facilities	Health and Medical	0	1	0	1
	Gas Station with Generator	Energy	0	1	0	1
	Power Plant	Energy	0	4	0	1
	Municipal Solid Waste	Hazardous Materials	0	1	0	1
	Wastewater Treatment Plant	Hazardous Materials	2	4	2	3
Middlesex	EMS	Health and Medical	0	1		

County	Facility Type	FEMA Community Lifeline	1.8 ft SLR, MHHW	1.8 ft SLR, 100-yr storm	3 ft SLR, MHHW	6 ft SLR, MHHW
	Wastewater Treatment Plant	Hazardous Materials	0	1	1	1
New Haven	Law Enforcement	Safety and Security	0	1	0	0
	Fire Station	Safety and Security	0	3	1	2
	EMS	Health and Medical	0	2	0	0
	Power Plant	Energy	0	2	0	2
	Wastewater Treatment Plant	Hazardous Materials	0	2	0	2
New London	Law Enforcement	Safety and Security	0	1	0	1
	Fire Station	Safety and Security	0	4	0	3
	EMS	Health and Medical	0	4	0	3
	Power Plant	Energy	0	1		1
	Wastewater Treatment Plant	Hazardous Materials	1	3	2	3
Total	**All**		**3**	**47**	**6**	**31**

4.3.9.3.2 CCVI Flood Vulnerability

The CCVI Flood Vulnerability Score can also be used to determine local vulnerability to flood-related impacts of climate change. The Flood Vulnerability Score considers sensitivity, exposure, and adaptive capacity of areas in Connecticut. By comparing the average vulnerability of each County and Council of Governments in the state to the average Flood Vulnerability Score for the entire state, areas with higher vulnerability based on a multitude of contributors related to climate change can be determined.

As shown in Table 69 and Table 70, the average Flood Vulnerability Score for the state is 0.0875. Fairfield, Hartford, New Haven, and New London counties each have a Flood Vulnerability Score above the statewide average. The COG regions with a Flood Vulnerability Score above the statewide average include the Metropolitan Region, Lower Connecticut River Valley Region, South Central Regional, and Southeastern Connecticut

Region. Out of these counties and COG regions, the areas with the highest Vulnerability Scores are located along the coastline and along major rivers.

Table 69. Average CCVI flood vulnerability score by County

County	Average CCVI Flood Vulnerability Score
Fairfield	0.0883
Hartford	0.0950
Litchfield	0.0752
Middlesex	0.0941
New Haven	0.1034
New London	0.1333
Tolland	0.0653
Windham	0.0848
State Average	**0.0875**

Table 70. Average CCVI flood vulnerability score by COG Region

COG Region	Average CCVI Flood Vulnerability Score
Capitol Region	0.0854
Metropolitan	0.1120
Naugatuck Valley	0.0857
Northeastern Connecticut	0.0830
Northwest Hills	0.0753
Lower Connecticut River Valley	0.0946
South Central Regional	0.1107
Southeastern Connecticut	0.0926
Western Connecticut	0.0792
State Average	**0.0875**

Figure 54 and Figure 55 show an overview of CCVI Flood Vulnerability in the state by County and COG regions, respectively. Upon further analysis of individual jurisdictions' vulnerability, the City of Hartford has high vulnerability, as well as the coastal cities of Bridgeport, New Haven, and New London. Cities with high vulnerability are shown in Figure 56.

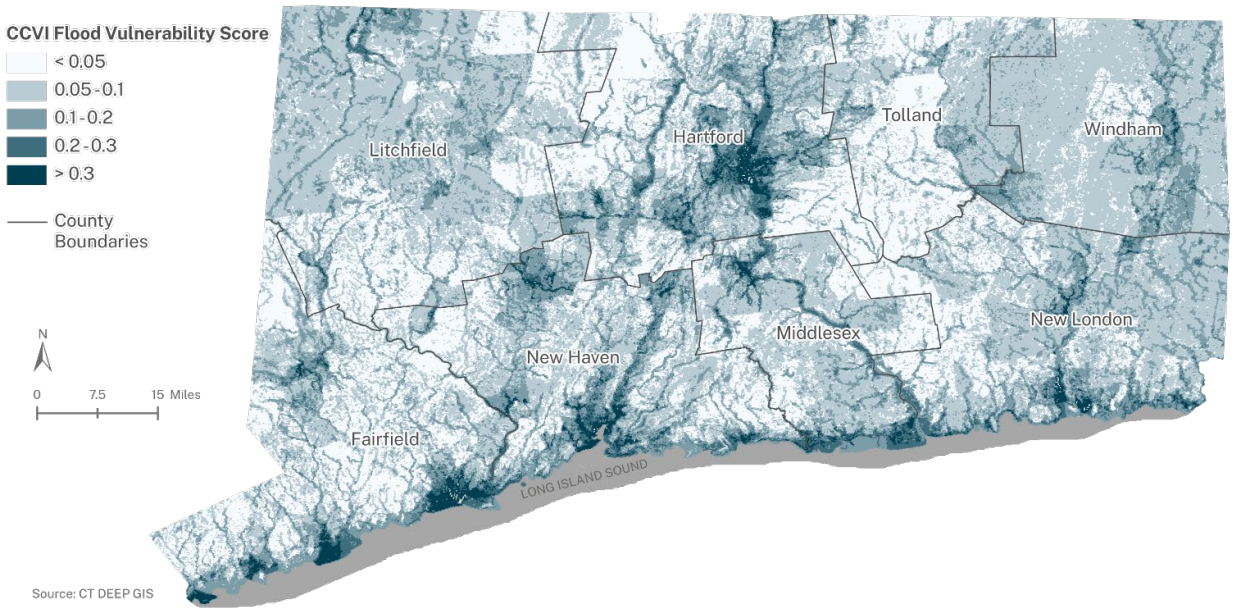


Figure 54. CCVI flood vulnerability score by County

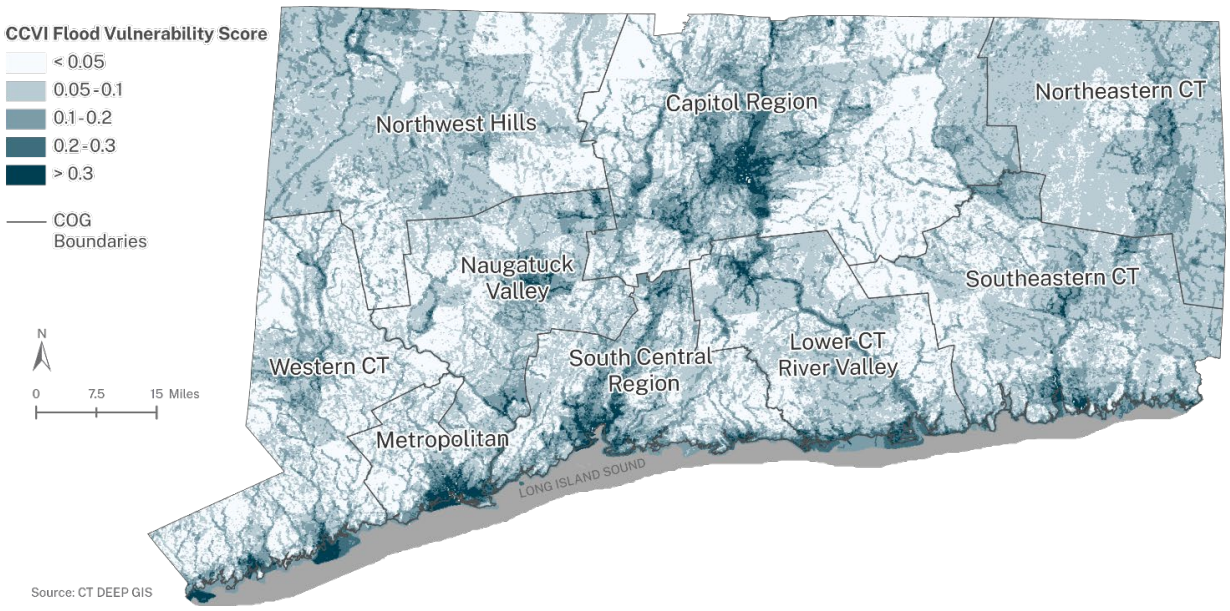


Figure 55. CCVI flood vulnerability score by COG

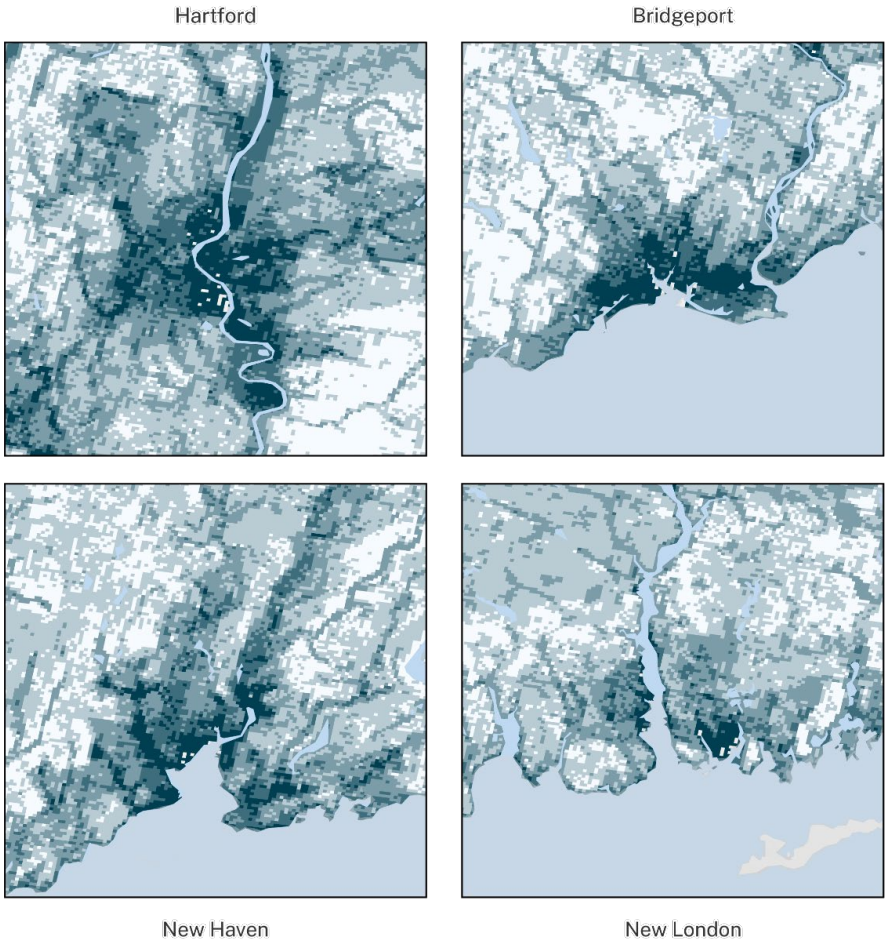


Figure 56. Cities with high flood vulnerability scores

4.3.9.3.3 Social Vulnerability

Flood risk is higher for socially vulnerable populations. Property values within floodplains are lower, and many floodplain areas have been developed for multi-family housing and single-family low-income neighborhoods.[107] Therefore, socially vulnerable populations are more likely to live in floodplains and have reduced capacity to respond to and recover from flood events.

Figure 57 shows the SFHA overlaid with social sensitivity by census tract using the CCVI Social Sensitivity Score. CCVI Social Sensitivity Score shows social vulnerability of 10 x 10-acre grid cells. These grid cells were overlaid with census tract and SFHA GIS data to determine the number of census tracts that include the highest social sensitivity areas (areas with a score of 3 or above) and are located in flood hazard areas. It was determined that there are 150 census tracts in Connecticut that intersect the highest social sensitivity areas and the SFHA. Residents living in areas with high social vulnerability in flood zones may be at higher risk for flood impacts such as damage to homes, power outages, and death or injuries due to flooding.

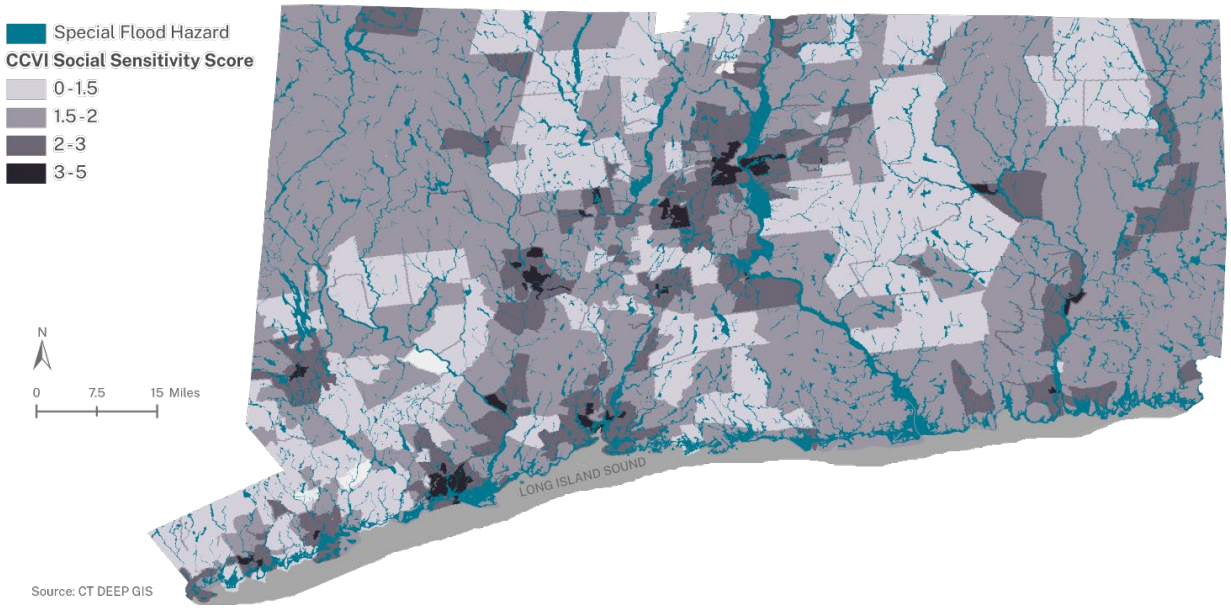


Figure 57. SFHA and Social Sensitivity Scores

Vulnerability from sea level rise is very much a local issue, as sea level rise directly affects communities that border the coast. The impacts of sea level rise are variable and dependent on the climate scenario and mitigation actions implemented. Direct economic losses will occur as a great number of buildings and infrastructure are exposed to flooding. Increased flooding frequency and severity could also result in the displacement of communities and residents, with socio-economically disadvantaged groups being impacted

[107] Lee D, Jung J. 2014. The growth of low-income population in floodplains: a case study of Austin. https://doi.org/10.1007/s12205-014-0205-z

the greatest. As shown in Figure 58, Fairfield and New Haven Counties have the greatest number of social sensitivity areas with a score of 3 or greater.

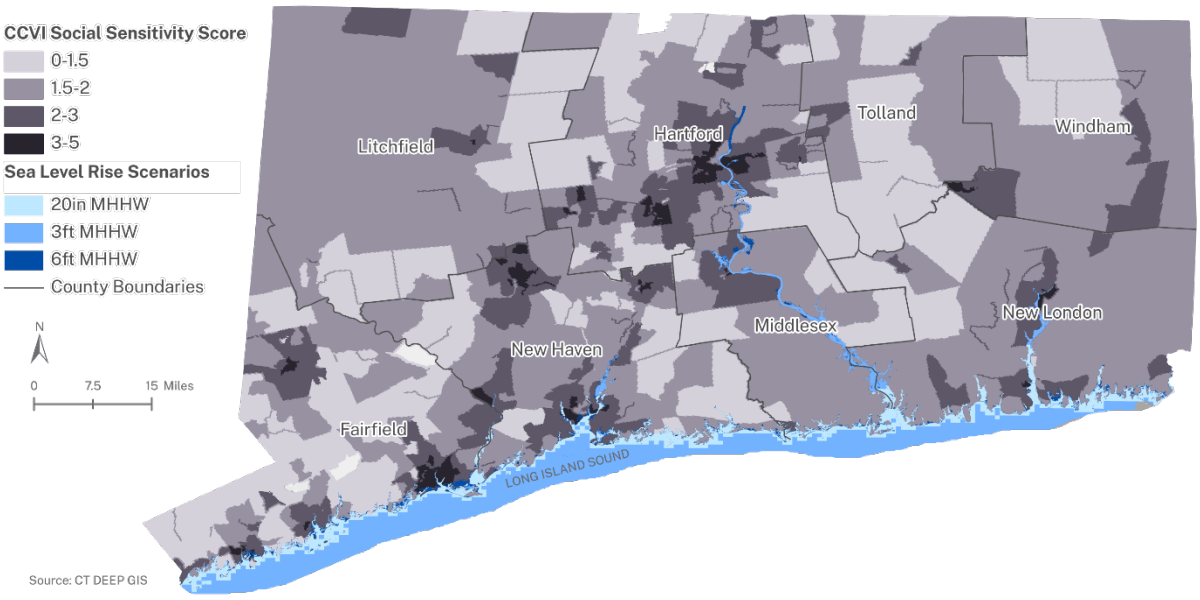


Figure 58. Social Sensitivity scores and RSLR projections

4.3.9.4 Changes in Development

Changes in growth and development can affect loss estimates and vulnerability due to flooding. Population growth in a flood hazard area can increase vulnerability of both people and property. Development located within this area has an increased risk of flooding, which can impact homes, businesses, and transportation in the area. Additionally, developed areas have more impervious surfaces where water cannot be absorbed into the ground and must be managed through stormwater and drainage systems.

FEMA's NFIP is aimed at reducing existing structures and eliminating future development in the floodplain. Communities participating in the NFIP agree to support these efforts at the local level. As of May 2023, all 177 communities in Connecticut participate in the NFIP. Future planning for flood events would benefit from a completely mapped floodplain throughout the state. Unfortunately, not all floodplains have yet been mapped across the state.

Connecticut continues to experience growth in development, with certain Counties growing more quickly than others. Those counties that have had an increase in development as well as a history of significant flood events can be viewed as being potentially the most at risk for future exposure. Table 71 shows building permits issued and historical flood events by County. Total building permits issued in each county in Connecticut between 2018 and 2022 shows areas of the state that have experienced growth in development. Historical events only include those reported from NCEI by county. Many of the historical floods have

occurred in those counties expected to see the highest development growth, such as Fairfield, New Haven, and Hartford Counties.

For all counties, future flood losses can be mitigated by ensuring that all future development avoids flood hazard areas. As development occurs, floodplain ordinances will be essential to ensure that future development and residents within flood zones are able to withstand future flood events.

Table 71. Building permits issued and historical flood events.

County	Building Permits Issued 2018 - 2022	Historical Flood Events
Fairfield	8,315	176
Hartford	4,686	150
Litchfield	299	139
Middlesex	990	49
New Haven	5,045	161
New London	1,295	128
Tolland	1,751	20
Windham	224	27
State Total	**22,605**	**850**

Exposure to floods is expected to intensify across the State of Connecticut between 2015 and 2040 as population increases. As Connecticut's population increases, infrastructure and businesses will follow these population centers. This further adds to the potential future exposure that counties face from flood. As shown in Table 72, Hartford and New Haven Counties are projected to have an increase in population by 2040, and both counties have two of the highest number of historical total flood effects. These counties that have growing populations may putting many people and infrastructure at risk for future flooding if proper flood mitigation measures aren't put into place.

Table 72. Projected population change and historical flood events.

County	Projected Population Change 2015 - 2040	Historical Flood Events
Fairfield	-1%	176
Hartford	5%	150
Litchfield	-10%	139
Middlesex	-2%	49
New Haven	4%	161
New London	0%	128
Tolland	0%	20

County	Projected Population Change 2015 - 2040	Historical Flood Events
Windham	11%	27
State Total	**2%**	**850**

Coastal management in Connecticut is a comprehensive, cooperative program that functions at all levels of government. Connecticut's Coastal Management Program is administered by DEEP and is approved by NOAA under the federal Coastal Zone Management Act.[108] The Coastal Management Program has worked with many of our state's urban communities on redevelopment projects to reclaim their once-active waterfronts. Central to many of these efforts is the revitalization of developed shorefronts to accommodate active water-dependent uses such as waterborne commerce, commercial and recreational fishing, boating and public access.

As shown in Figure 59, across Fairfield, New Haven, Middlesex, and New London, 15,645 building permits have been issued between 2018-2022, with the greatest number occurring in Fairfield (8,315 permits). Given these areas are the most susceptible to future RSLR impacts, building development will need to consider aligning with local floodplain management regulations and flood mitigation measures in these areas.

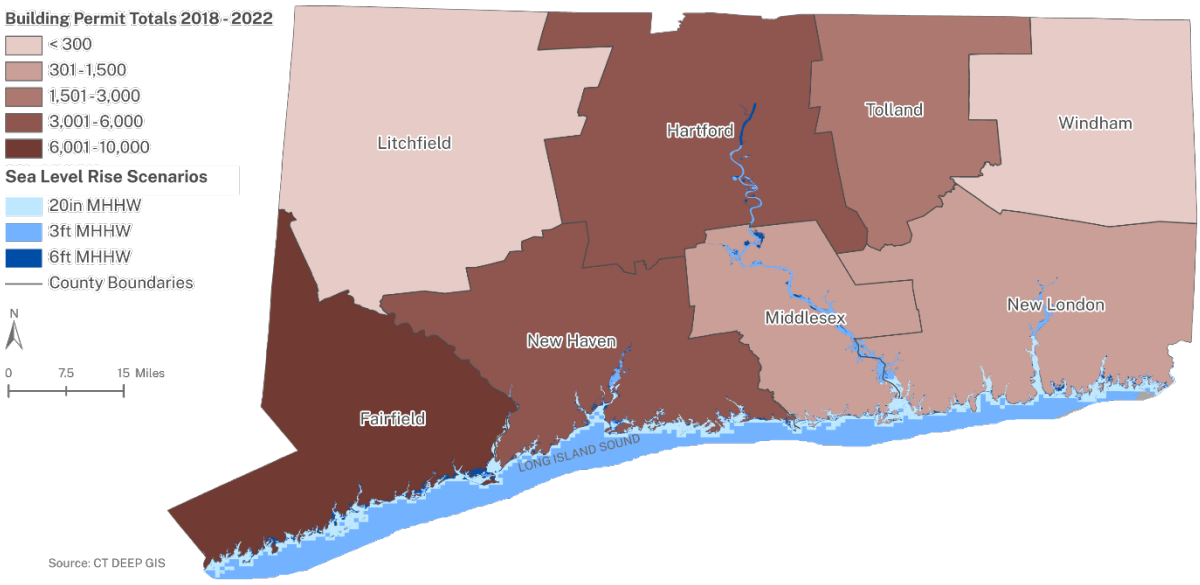


Figure 59. Total building permits issued 2018-2022 by county and exposure to RSLR.

There are several Opportunity Zones located along the coastline in Fairfield, New Haven, and New London Counties, as shown in Figure 60. These areas are particularly vulnerable to sea level rise given both the projected increase in development and existing low-income

[108] CT DEEP. Coastal Management.

neighborhoods that face additional fiscal challenges when preparing for and responding to coastal flooding.

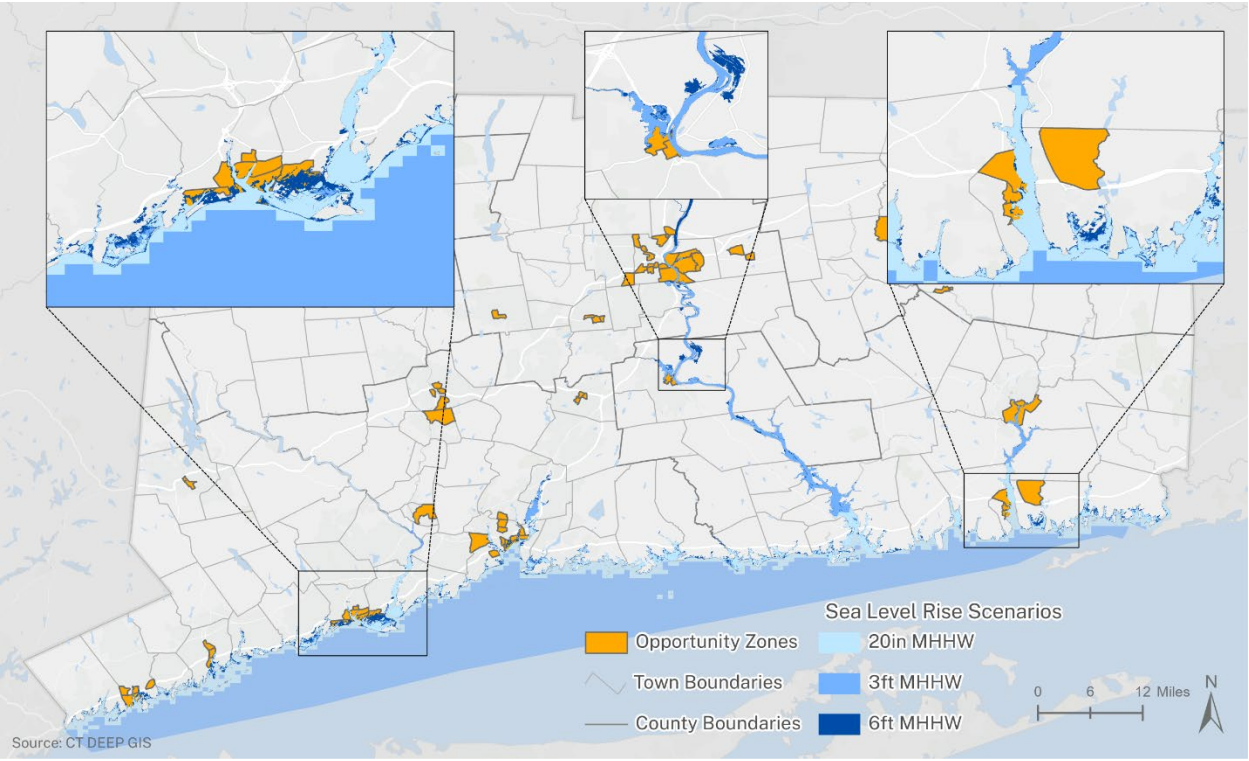


Figure 60. Opportunity Zones exposed to RSLR scenarios.

Population growth also contributes to increased exposure of people to RSRL and flooding impacts. Population projections for 2040 can identify counties and COGs in Connecticut that are likely to have a larger population vulnerable to RSLR and coastal flooding in the future. As shown in Figure 61, New Haven County is the only coastal county projected to experience increased population growth. Planning tools, such as land use and local zoning, can be used to support sustainable development away from areas with the greatest potential exposure to RSLR within the County. Similar considerations can be used for communities farther inland, such as Hartford County, which is projected to have population growth and experience impacts from RSLR under the 3ft and 6ft scenarios.

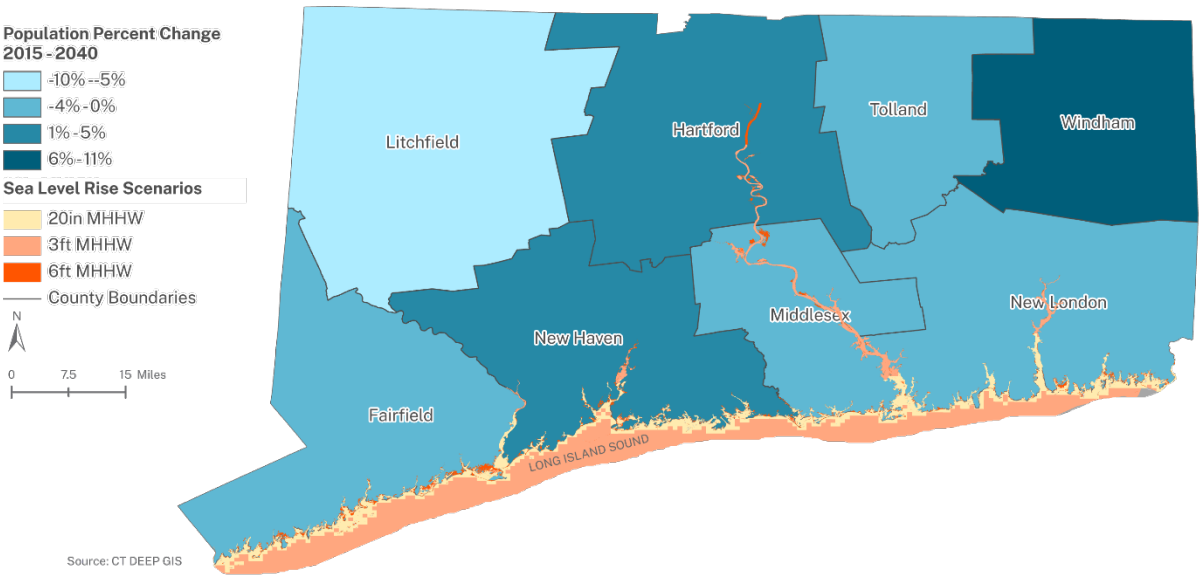


Figure 61. Future population percent change by county with RSLR projections

4.3.10 Conclusion

Flood was ranked on the risk parameters as detailed in Table 24. To summarize the overall risk of flood for each county, each risk parameter score was multiplied by its impact weight and combined into a county composite ranking.

Table 73 shows the flood hazard ranking for each county. The high to low comparison does not mean that a low or medium-low hazard will not occur or will not have some impact on the community. However, it does provide an overview of what hazards may pose the greatest risk to each county given available data. This document should serve as a guide to help planners and officials in managing risk and prioritize mitigation actions.

Table 73. Flood hazard ranking by county.

	Fairfield	Hartford	Litchfield	Middlesex	New Haven	New London	Tolland	Windham
Hazard Concern	M-H	M-H	M-H	M-H	M-H	M-H	M-H	M-H
Local Plan Rating	M-H	M-H	M-H	M-H	M-H	M-H	M-H	M-H
Geographic Extent	M-H	H	M-L	M-L	M-H	M	L	M
Population Density	H	M-H	M	M-L	M-H	M	M-L	L
Future Development	H	M-H	M-L	M-L	M-H	M	M	L

	Fairfield	Hartford	Litchfield	Middlesex	New Haven	New London	Tolland	Windham
Facility Intersect	M	M-L	H	M-H	M	M-H	L	M-L
Future Events	H	M-H	M	M-L	M-H	M	L	M-L
Future Losses	H	M-H	M	L	M	M-H	M-L	M-L
Injury & Death	L	L	L	L	L	L	L	L
Social Sensitivity	M-H	H	M-L	M-L	M-H	M	L	M
Composite	**M-H**	**M-H**	**M**	**M-L**	**M**	**M**	**L**	**M-L**

* Each parameter's weighted score was added together to create a composite rank for each county. A risk determination of high, medium-high, medium, medium-low, and low was then assigned based on percentiles. A summation of all the composite scores for all assessed hazards in each jurisdiction provides an overall risk rank per county. For more information, refer to Section 4.1.1.4.

Connecticut will continue to be at risk for flood events due to the geographic location along the Northeast Atlantic seaboard, abundance of waterways, and future projections by climate change models and studies that project an increase in more intense precipitation events punctuated by periods of drought conditions.[109,110] Published climate change studies discuss an increase in extreme precipitation frequency, and an actual change in precipitation types and intensity throughout the next century. Tools developed by Cornell University, Northeast Regional Climate Center and Natural Resource Conservation Service include interactive data for extreme precipitation and frequency estimates. Using these tools, Hartford and Fairfield counties are have a slightly higher estimate for precipitation extremes, relative to Connecticut.[111]

The Sentinel Monitoring for Climate Change in Long Island Sound Program is a currently collecting, developing and synthesizing SLR products that will be stored on their data clearinghouse website.[112] In 2017, the Connecticut Institute for Resilience and Climate Adaptation released localized sea level rise scenarios for the state and recommended that

[109] M.L. Parry, O.F. Canziani, J.P. Palutikof, P.J. van der Linden and C.E. Hanson (eds) Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, 2007
[110] Rosenzweig, C., G. Casassa, D.J. Karoly, A. Imeson, C. Liu, A. Menzel, S. Rawlins, T.L. Root, B. Seguin, P. Tryjanowski, 2007: Assessment of observed changes and responses in natural and managed systems. Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, M.L. Parry, O.F. Canziani, J.P. Palutikof, P.J. van der Linden and C.E. Hanson, Eds., Cambridge University Press, Cambridge, UK, 79-131.
[111] Cornell Extreme Precipitation in New York and New England. Version 1.12 Joint project between Northeast Regional Climate Center (NRCC) and Natural Resource Conservation Service (NRCS) http://precip.eas.cornell.edu/ Assessed 8/26/2013.
[112] Sentinel Monitoring for Climate Change in Long Island Sound Program http://longislandsoundstudy.net/research-monitoring/sentinel-monitoring/

Connecticut plan for the upper end of the likely range of 20in/50cm of sea level rise by 2050.

4.4 Drought

Drought is a complex and gradual phenomenon in Connecticut. Droughts typically occur slowly, over a multi-year period, and it is often not obvious or easy to quantify when a drought begins and ends. Although droughts can be characterized as emergencies, they differ from other emergency events in that most natural disasters, such as floods or tornadoes, occur relatively rapidly and afford little time for preparing for disaster response. Drought can often be defined regionally based on its effects.

The four types of droughts are described below. The first three types of droughts are physical in nature, while the fourth type of drought is measured by societal impact:[113]

1. Meteorological Drought – Is a measure of departure of precipitation from the normal. It is relatively regional in nature and affects a specific geographic area due to large variability of precipitation and climatic differences between geographic locations.
2. Hydrological Drought – Occurs when surface and subsurface water supplies are below normal. This type of drought is related to the effects of precipitation shortfalls on stream flows and on reservoir and groundwater levels.
3. Agricultural Drought – Refers to a situation where the amount of moisture in the soil no longer meets the needs of a particular crop grown in an area. The key to vulnerability to this type of drought is two-fold — severity and timing. This type of drought tends to be more serious if it occurs when plants are forming or filling their seed (mid-summer in Connecticut).[114]
4. Socioeconomic Drought – The situation that occurs when physical water shortages begin to affect people.

Human actions can increase the risk of water shortage without any change in meteorological conditions. For instance, as the degree of imperviousness and water run-off is increased during land development, recharge of groundwater is reduced. This not only reduces the availability of groundwater to wells, but it also reduces dry weather flows in streams.[115] Although weather condition is a primary contributor to hydrological drought, other factors such as changes in land use, land degradation, and the construction of dams all affect the hydrological characteristics of a water basin and can impact a drought.

The State of Connecticut supports multiple efforts related to monitoring drought and aimed at reducing the impacts of drought.

[113] NOAA National Integrated Drought Information System. Drought Basics. https://www.drought.gov/what-is-drought/drought-basics
[114] Miller, Dr. David. Drought, Forests, and Agriculture in Connecticut, 2002.
[115] National Drought Mitigation Center. Types of Drought. https://drought.unl.edu/Education/DroughtIn-depth/TypesofDrought.aspx

- **2022 Update of the Connecticut Drought Preparedness and Response Plan:** The Connecticut Drought Preparedness and Response Plan ("Drought Plan") provides state and local decision-makers and public water suppliers with a set of formal operating procedures and administrative guidance for proactive drought planning and response.
- **Interagency Drought Advisory Workgroup:** The Interagency Drought Advisory Workgroup (IDW) is responsible for facilitating the planning and response activities of the State's Drought Plan. Comprised of the Commissioners of DPH and the Department of Energy and Environmental Protection (DEEP), and the Chairman of the Public Utility Regulatory Authority (PURA), the group monitors and analyzes water-related data to ensure that Connecticut's water supplies remain stable.
- **CT State Water Plan:** The Connecticut State Water Plan was released in January 2018 to help planners, regulators, and lawmakers make decisions about managing Connecticut's water in a manner that is consistent with stakeholder-defined principles and available scientific data. The overarching goal of the State Water Plan is to "balance the use of water to meet all needs." The Plan enhances awareness of both instream and out-of-stream water needs and provides methods to improve the balance between the two needs.

4.4.1 Location

All areas within the state are vulnerable to drought conditions. The effects of drought vary based on where in the state it occurs, when it happens, and how long the drought persists. Connecticut's general climate has four main characteristics relevant to drought:

- Equitable distribution of precipitation among the four seasons,
- Large ranges of temperature both daily and annually,
- Great differences in the same season or month of different years, and
- Considerable diversity of the weather over short periods of time.

A regional approach using climate divisions allows for determination of drought potential by location within the state. Climate divisions are regions within a state that are climatically homogenous. As the conditions within the climate divisions are homogenous, they can give a relatively better breakdown of drought severity within the state than breaking down by county or COG. NOAA has divided the United States into 359 climate divisions. On the East Coast, boundaries of these divisions typically coincide with county boundaries. There are three climate divisions in Connecticut: Northwest (01), Central (02), and Coastal (03). All three climate divisions have experienced drought conditions periodically, yet the Central and Coastal climate divisions have been more drought-prone historically. Figure 62 shows the climate divisions of Connecticut.

The State is divided into three climate divisions for purposes of computing the Palmer Drought Severity Index:

1. Northwest Climate Division – Consisting of Litchfield County;
2. Central Climate Division – Consisting of parts of Tolland, Windham, Hartford counties and portions of Fairfield, New Haven Middlesex, and New London counties; and
3. Coastal Climate Division – Consisting of the coastal portions of Fairfield, New Haven, Middlesex, and New London counties.

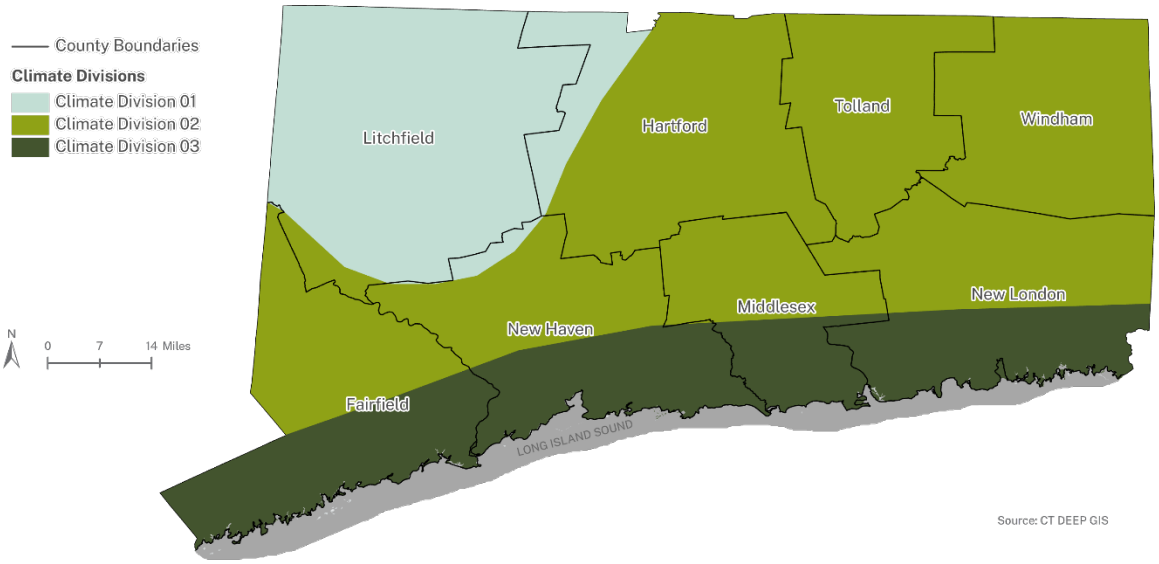


Figure 62. Climate divisions in Connecticut

Areas within the state with high amounts of agricultural land may experience worse impacts of drought due to crop loss. Figure 63 shows the location of agricultural land within the state. The majority of the state's agricultural lands are located in the northern counties, including Litchfield, Hartford, Tolland, and Windham Counties.

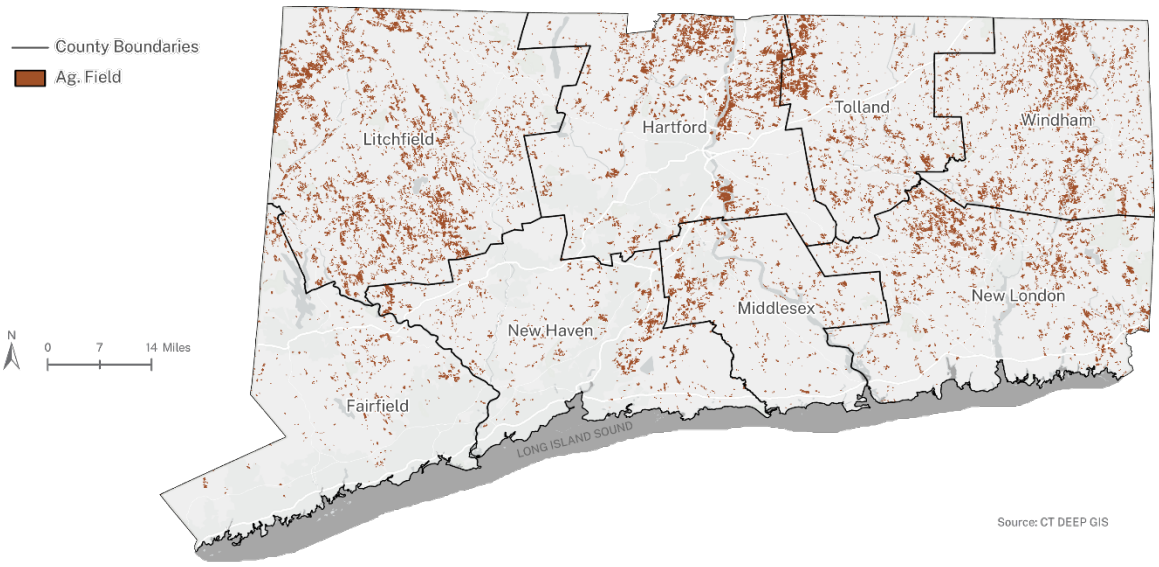


Figure 63. Agricultural land in Connecticut

4.4.2 Intensity

The extent of drought can depend on the duration, intensity, geographic extent, and the regional water supply demands made by human activities and vegetation. The intensity of the impact from drought could range from minor to total damage in a localized area or regional damage affecting human health and the economy. Generally, impacts of drought evolve gradually, and regions of maximum intensity change with time. The severity of a drought is determined by areal extent as well as intensity and duration. The frequency of a drought is determined by analyzing the intensity for a given duration, which allows determination of the probability or percent chance of a more severe event occurring in a given mean return period.

The 2022 Connecticut Drought Preparedness and Response Plan identifies nine criteria for assessing drought:

- Precipitation
- Groundwater
- Streamflow
- Reservoir levels
- Palmer Drought Severity Index (PDSI)
- Crop Moisture
- VegDRI (seasonal)
- Fire Danger

- U.S. Drought Monitor

Drought in the United States is monitored by the National Integrated Drought Information System (NIDIS). The U.S. Drought Monitor is a product produced in partnership between the National Drought Mitigation Center, the United States Department of Agriculture, and the National Oceanic and Atmospheric Administration. The U.S. Drought Monitor map shows areas of the country that are in drought. The map uses five classifications, as shown in Table 74.

Table 74. U.S. Drought Monitor drought classifications

			Ranges				
Category	Description	Possible Impacts	Drought Severity Index (PDSI)	CPC Soil Moisture Model (Percentiles)	USGS Weekly Streamflow (Percentiles)	Standardized Precipitation Index (SPI)	Objective Drought Indicator Blends (Percentiles)
D0	Abnormally Dry	Going into Drought: Short-term dryness slowing planting, growth of crops or pastures Coming out of Drought: Some lingering water deficits; Pastures or crops not fully recovered	-1.0 to -1.9	21 to 30	21 to 30	-0.5 to -0.7	21 to 30
D1	Moderate Drought	Some damage to crops, pastures; Streams, reservoirs, or wells low, some water shortages developing or imminent; Voluntary water-use restrictions requested	-2.0 to -2.9	11 to 20	11 to 20	-0.8 to -1.2	11 to 20
D2	Severe Drought	Crop or pasture losses likely; Water shortages common; Water restrictions imposed	-3.0 to -3.9	6 to 10	6 to 10	-1.3 to -1.5	6 to 10
D3	Extreme Drought	Major crop/pasture losses; Widespread water shortages or restrictions	-4.0 to -4.9	3 to 5	3 to 5	-1.6 to -1.9	3 to 5

			Ranges				
D4	Exceptional Drought	Exceptional and widespread crop/pasture losses; Shortages of water in reservoirs, streams, and wells creating water emergencies	-5.0 or less	0 to 2	0 to 2	-2.0 or less	0 to 2

Along with the US Drought Monitor, the State of Connecticut has identified five stages of drought for their own process in the 2022 Connecticut Drought Preparedness and Response Plan, as shown in Figure 64.

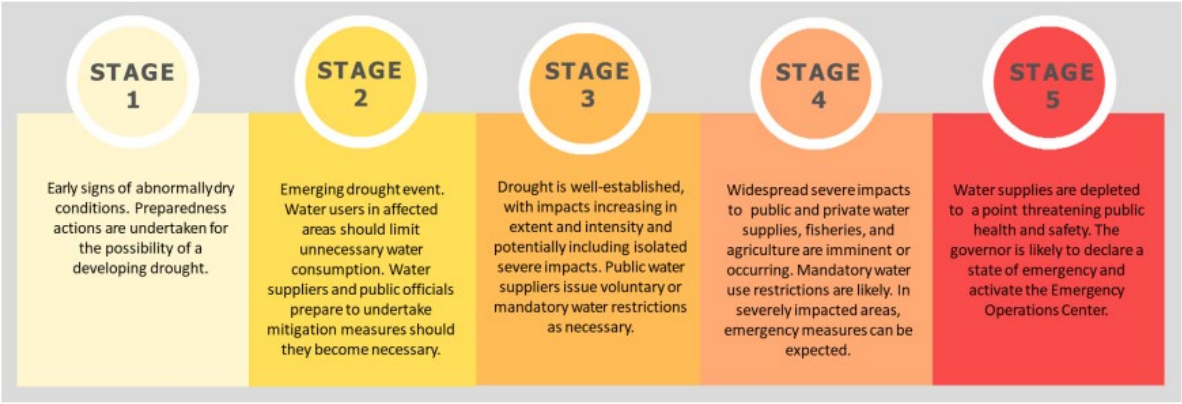


Figure 64. Five stages of drought

Typically, droughts develop over long periods of time relative to other hazards. Only generalized warning can take place due to the numerous variables impacting the timing and severity of a drought that scientists have not pieced together well enough to make accurate and precise predictions.

The National Drought Mitigation Center (NDMC) states that empirical studies conducted over the past century have shown that meteorological drought is never the result of a single cause. It is the result of many causes, often synergistic in nature; these include global weather patterns that produce persistent, upper-level high-pressure systems along the West Coast with warm, dry air resulting in less precipitation.

The National Weather Service Climate Prediction Center can provide seasonal outlooks for droughts that last for 3-month increments. Predicting drought depends on the ability to forecast precipitation and temperature. Anomalies of precipitation and temperature may last from several months to several decades. How long they last depend on interactions between the atmosphere and the oceans, soil moisture and land surface processes, topography, internal dynamics, and the accumulated influence of weather systems on the global scale.

Connecticut uses both the PDSI and the Crop Moisture Index (CMI) as indices for a drought occurrence. The PDSI indicates prolonged and abnormal moisture deficiency or excess and helps climatologists evaluate the scope severity and frequency of prolonged periods of dryness, while the CMI (a derivative of the PDSI) provide information on the short-term or current status of purely agricultural drought or moisture surplus. The PDSI is most effective for determining long-term drought conditions, while the CMI is effective at helping determine short-term droughts.

4.4.3 Impacts

Droughts may have devastating effects on communities and the surrounding environment. The amount of damage caused by drought depends on the strength and duration of a drought event. Impacts of drought events are detailed below.



- All facilities are expected to be operational during a drought event, although facilities dependent on wells for their water supply may face water shortages.
- Drought has minimal impacts on structures, however structural issues could occur if drought impacts building foundations or footings.
- Decreased amounts and quality of water during drought events have the potential to reduce the availability of electricity to power buildings.



- Drier summers and intermittent droughts may strain irrigation water supplies, stress crops, and delay harvests.
- Drought conditions can cause the ground to lose moisture and become unstable. Unstable soils increase the risk of erosion and loss of topsoil.
- Drought conditions reduce water availability for plant and animal species and decrease plant growth and productivity.
- Droughts can exacerbate wildfire conditions, increasing risk of wildfire damage in the State.



- Drought has the potential to impact public health by reducing the quality and quantity of available drinking water.
- Low water flow due to drought can result in decreased sewage flows and subsequent increases in contaminants in the water supply.



- Drought can have economic impacts on the State, including loss of agricultural yield and death of livestock due to lack of water access.
- Regional drought conditions could lead to increased food prices throughout the State.

4.4.4 Previous Occurrences and Losses

Between 1954 and 2022, the State of Connecticut was not included in any FEMA drought-related major disaster (DR) or emergency (EM) declarations. However, severe droughts have occurred periodically in Connecticut, with drought reported in the years 1929-1931, 1957, 1964-1966, 2002, 2007-2008, 2012, 2013, 2015-2017, 2020, and 2022.[116]

The agricultural drought of 1957 was especially disastrous to the State's agricultural interests and was also a severe meteorological drought for small reservoirs in the state. The 1957 drought was categorized as a D4 drought on the US Drought Monitor. Other meteorological droughts of June 1929 through March 1931 and the mid-1960s were also rated very high on the Drought Monitor, with a rating of D3 and D4 respectively.

Connecticut experienced its drought of record during the 1960s with rainfall deficits reaching their highest levels in the spring of 1965. This drought severely limited water resources throughout the state. That year, Connecticut had only 29.45 inches of precipitation, far below the average of 46.15 inches. Towns had declared water emergencies by July of 1965, banning water use outside.

A meteorological drought was declared in 2012 as the result of precipitation that had been approximately one half of normal from January 2012 through April 2012. This drought created a period of very high fire danger. In addition, small pond levels were reduced. While soil moisture was well below normal, this drought occurred prior to the beginning of the growing season. Thus, no agricultural impacts were realized.

Severe drought conditions arose again in 2016, peaking in the summer. Reservoirs, particularly in Greenwich (24% of capacity) and Stamford (34% of capacity), were dangerously low. The state called for a voluntary 15% reductions in water use to mitigate the drought impacts. Private wells dried up, leaving homeowners with no water, and regional water companies struggled to keep water flowing through millions of household taps. Rainfall was at less than 80% of what normally fell statewide.

Most recently, a severe drought warning was declared in Connecticut in the summer of 2022. 87% of the state experienced a severe drought during this time period. A widespread loss of crops and pastures, and shortages in reservoirs, streams, and wells were felt in the state creating water emergencies throughout.

Figure 65 below shows the percent of land area in Connecticut affected by drought from 2000-2023 and the severity of the drought according to the US Drought Monitor.

[116] Northeast Regional Climate Center. Northeast Drought. http://www.nrcc.cornell.edu/regional/drought/drought.html

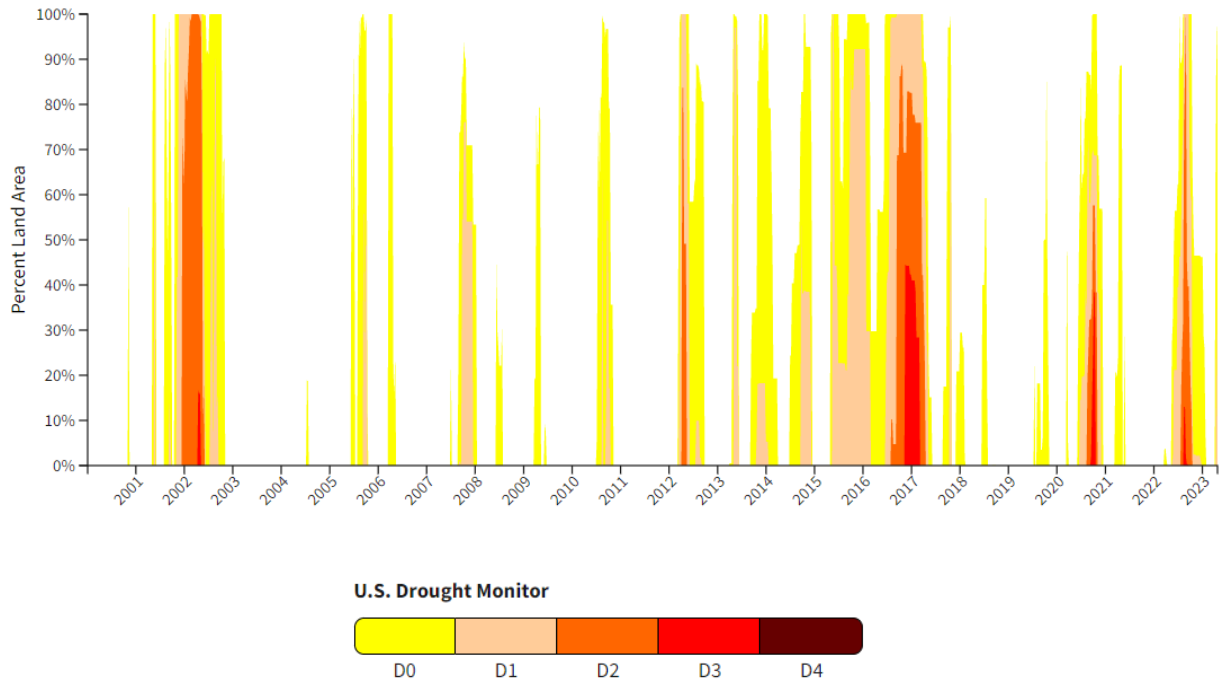


Figure 65. US Drought Monitor historic droughts in Connecticut (2000 - 2023)

From 2017 to 2022, the USDA reported at least one primary drought event in each county in Connecticut with each county also having three or more contiguous drought events. A contiguous county is any county whose boundary touches at any point with that of the primary county. The primary county is the county in which the disaster (in this case a drought) has occurred most significantly. The USDA reported a total of over $407,682 in annualized crop insurance claims between 2017 and 2022 in the State of Connecticut, as shown in Table 75.[117]

Table 75. USDA crop insurance claims by County

County	USDA Number of Events	USDA Number of Primary Events	USDA Number of Contiguous Events	USDA Annualized Insured Crop Losses
Fairfield	4	1	3	$0
Hartford	11	2	9	$213,411
Litchfield	10	2	8	$72,009
Middlesex	6	1	5	$16,445
New Haven	6	1	5	$42,914
New London	10	2	8	$16,435
Tolland	10	1	9	$7,010

[117] USDA. Cause of Loss Historical Data Files. https://www.rma.usda.gov/data/cause.html

County	USDA Number of Events	USDA Number of Primary Events	USDA Number of Contiguous Events	USDA Annualized Insured Crop Losses
Windham	8	2	6	$39,458
State Total	**65**	**12**	**53**	**$407,682**

Agriculture-related drought disasters are quite common in the United States. One-half to two-thirds of the counties in the United States have been designated as drought disaster areas in the past several years. All 9 counties in Connecticut have been designated as drought disaster areas over the past several years. Table 76 presents USDA declared drought events that have impacted the State since the previous plan update. See Appendix 3 for USDA declared drought events from 2013-2022.

Table 76. Drought-Related USDA Declarations (2019-2022)

Year	Approval Date	Designation Number	Description of Disaster*	Counties Affected
2020	10/14/2020	S4803	Drought – Fast Track	Hartford, Middlesex, New London, Tolland, Windham
2020	10/14/2020	S4808	Drought – Fast Track	New London, Windham
2020	10/14/2020	S4814	Drought – Fast Track	Hartford, Litchfield, Middlesex, New Haven, New London, Tolland, Windham
2020	10/14/2020	S4815	Drought – Fast Track	Hartford, Litchfield, Tolland
2020	10/15/2020	S4825	Drought – Fast Track	Fairfield, Hartford, Litchfield, New Haven
2020	10/15/2020	S4827	Drought – Fast Track	Tolland, Windham
2020	10/15/2020	S4832	Drought – Fast Track	New London
2020	10/16/2020	S4836	Drought – Fast Track	Litchfield
2022	8/15/2022	S5255	Drought – Fast Track	Tolland, Windham

Year	Approval Date	Designation Number	Description of Disaster*	Counties Affected
2022	8/15/2022	S5257	Drought – Fast Track	New London, Windham
2022	8/22/2022	S5267	Drought – Fast Track	New London, Windham, Hartford, Middlesex, Tolland
2022	8/22/2022	S5271	Drought – Fast Track	New London, Windham
2022	9/7/2022	S5280	Drought – Fast Track	New London
2022	9/21/2022	S5287	Drought – Fast Track	Hartford, Middlesex, New Haven, New London, Tolland
2022	9/26/2022	S5292	Drought – Fast Track	Hartford, Litchfield, Middlesex, New Haven, New London, Tolland
2022	9/29/2022	S5290	Drought – Fast Track	Hartford, Litchfield, Tolland
2022	10/3/2022	S5300	Drought – Fast Track	Fairfield, Litchfield, Hartford, New Haven
2022	10/3/2022	S5306	Drought – Fast Track	Fairfield, Litchfield
2022	10/11/2022	S5308	Drought – Fast Track	New Haven, Fairfield, Hartford, Litchfield, Middlesex

* Note: Fast track designations for severe droughts provide a nearly automatic designation when, during the growing season, any portion of the county meets the severe drought intensity value for eight consecutive weeks or a higher drought intensity value for any length of time as reported by the U.S. Drought Monitor.

4.4.5 Future Losses

Drought risk is based on four elements:

- Frequency,
- Severity,

- Physical nature of the drought, and
- The affected area's vulnerability to the effects of the drought.

Predicting the future occurrence of a drought within a given time period is difficult. Other factors may also contribute to the degree of droughts and their impacts on Connecticut. These include projections of decreased humidity levels, warmer temperatures, increased heat wave occurrences, increased transpiration rates, increased water demands by the general population and industry sectors.

Based on historical data, Connecticut is likely to experience a drought every two to three years, as shown in Table 77.

Table 77. USDA Annualized Events for Drought Hazards (2017 – 2022)

County	Annualized Events	Total Annualized Crop Damages
Fairfield	0.8	$0
Hartford	2.2	$213,411
Litchfield	2.0	$72,009
Middlesex	1.2	$16,445
New Haven	1.2	$42,914
New London	2.0	$16,435
Tolland	2.0	$7,010
Windham	1.6	$39,458

4.4.6 Climate Change Impacts

Climate projections indicate an increase in the number of dry days and days with extreme heat, which may cause an increase in the severity and length of drought conditions in Connecticut. Projections from the FEMA Climate Mapping for Resilience and Adaptation (CMRA) tool, shown in Figure 66, show climate projections under low and high emission scenarios. Average annual dry days are projected to increase by 1.5 days, and days with max temperature >90 °F is projected to increase by 6.8 days in the lower emission scenario and 7.6 days in the high emission scenario (12.6 and 13.4 days annually respectively).

Days with precipitation are projected to decrease by 3.4 days per year in the low emission scenario and 6.8 days in the high emission scenario. Days per year with maximum temperature >90 °F is projected to increase by 17.5 days in the low emission scenario and 44.2 days in the high emission scenario.

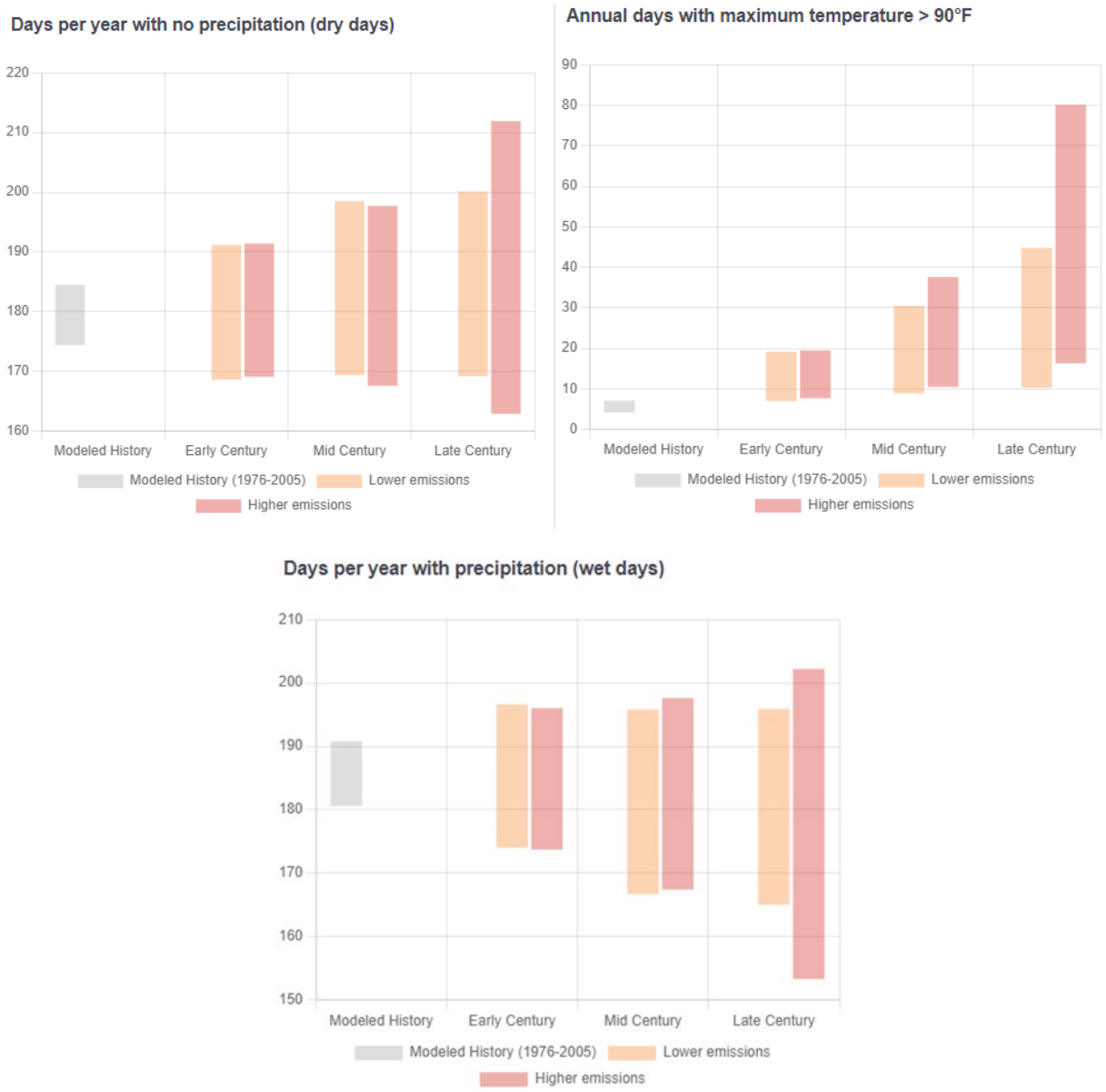


Figure 66. CMRA climate projections

These climate forecasts suggest that increased temperatures coupled with increased dry days generally correspond to increased risk of more frequent and intense periods of drought. Connecticut's small reservoir systems could be very sensitive to such changes in water availability and have the potential to dry out.

Demands for water could similarly be impacted, with increasing demands for water due to higher temperatures, but with changes tempered slightly by increased rainfall. The timing of water availability and stream flows will also be impacted, with less snowpack and earlier melt. Lastly, river water quality could be negatively impacted by the higher temperatures;

higher water temperatures can lead to increased growth rates of both algae and bacteria, and lower dissolved oxygen saturation levels.[118]

Climate change impacts on drought are summarized in Table 78.

Table 78. Climate impacts on drought events and projected changes

Impact	Projected Change
Location	Climate science does not indicate movement in the location of drought.
Intensity	There are projected longer dry periods in the summer months which would create more frequent and/or intense droughts.
Frequency	Annual days with extreme heat are projected to become more frequent, increasing frequency of droughts.
Duration	Longer dry periods are projected.
Model Confidence	Moderate confidence.

4.4.7 Vulnerability Assessment

The entire State of Connecticut is exposed to drought. This section assesses vulnerability of state and local assets by identifying exposed facilities and estimating potential losses due to drought.

4.4.7.1 State Vulnerability

All state-owned facilities are exposed to drought. State-owned facilities and critical facilities that are related to agriculture are more vulnerable drought than other state-owned facilities. These facilities rely on potable water supply, which can be depleted during droughts. There are 86 agriculture-related state-owned facilities located in Connecticut. These state-owned facilities are farm storage facilities, livestock facilities, or utilities that make use of water. All of 86 of these state-owned facilities are in Tolland County, making it highly vulnerable to drought events.

Droughts can also contribute to conditions conducive to wildfires. Risk to life and property is greatest in areas where forested areas adjoin urbanized areas (high-density residential, commercial, and industrial), known as the wildland-urban interface (WUI). Therefore, all state buildings, critical facilities and infrastructure within the WUI zone are considered vulnerable to wildfire. **Section 4.9** describes the wildland fire hazard in the State.

[118] National Climate Assessment. Chapter 18: Northeast. https://nca2018.globalchange.gov/chapter/18/

4.4.7.2 Councils of Government Vulnerability

To give a further breakdown of expected loss due to drought using the National Risk Index (NRI), agriculture value exposed and expected annual loss due to drought for the different COGs in Connecticut was calculated and shown in Table 79, Figure 67, and Figure 68.

Table 79. NRI agriculture value exposed and expected annual loss due to drought by COG

COG	Agriculture Value Exposed to Drought	Expected Annual Loss Due to Drought
Western Connecticut	$40,593,269	$692,285
Northwest Hills	$37,407,687	$937,845
Metropolitan	$12,186,135	$44,694
Naugatuck Valley	$48,909,062	$1,098,774
Capitol Region	$166,393,154	$3,873,784
South Central Regional	$23,699,500	$397,744
Lower Connecticut River Valley	$37,125,219	$714,660
Southeastern Connecticut	$66,832,303	$349,230
Northeastern Connecticut	$45,709,868	$306,037
Total	**$478,856,197**	**$8,415,053**

Capital Region COG sees both the greatest agriculture value exposed to drought, along with the highest expected annual loss due to drought. These higher values are expected as there is a large portion of the state's agricultural land and a high percentage of the state's population located in the Capital Region. The Capital Region includes Hartford County along with Tolland County. Along with the large amount of agricultural land in Hartford County, the county is also home to a high social sensitivity score which will create a greater impact from potential drought. The Capital Region has the highest vulnerability of state-owned facilities in drought conditions, with the majority of agriculture-related state-owned facilities in Tolland County which helps further to explain the greater expected annual loss in the COG.

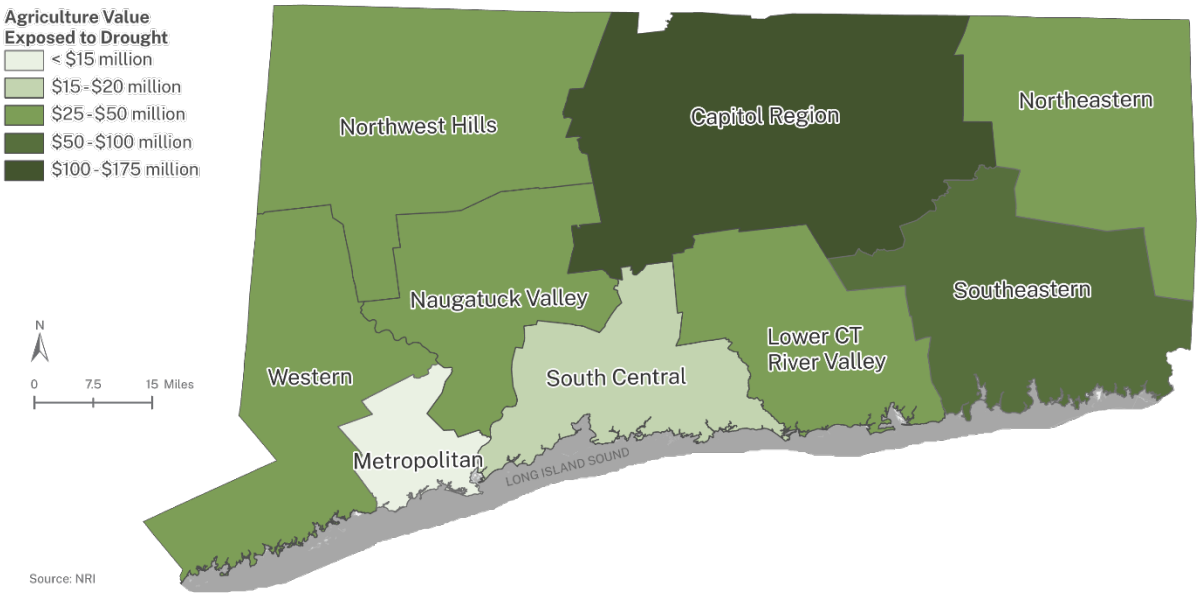


Figure 67. Agriculture value exposed to drought by COG

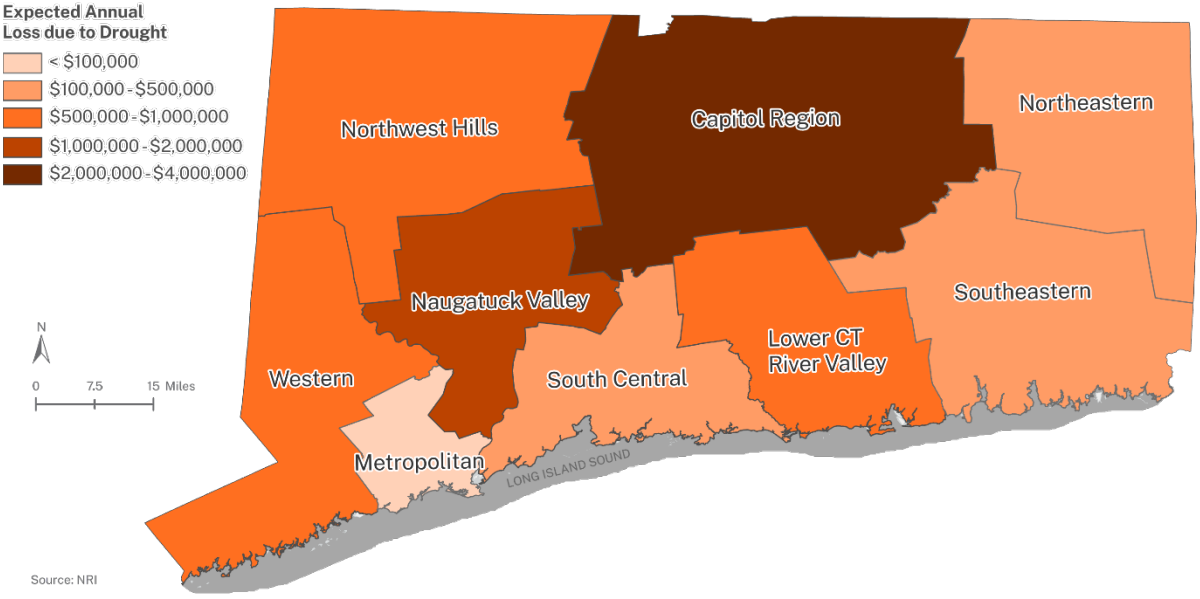


Figure 68. Expected annual loss due to drought by COG

4.4.7.3 Local Vulnerability

Drought impacts cross jurisdictional boundaries and primarily impact the population's water supply and the agricultural industry. All buildings are expected to be operational during a drought event.

According to the NRI, a total of $313,367,519 of agricultural value is exposed to drought in Connecticut, as shown in Table 80. All counties in Connecticut have crops that are vulnerable to drought conditions. Hartford and New London County have the highest value of vulnerable crops in the State. Hartford County also has the highest expected annual loss due to drought, indicating high vulnerability to drought events.

Table 80. NRI agriculture value exposed and expected annual loss due to drought

County	Agriculture Value Exposed to Drought	Historic Loss Ratio Rating	Expected Annual Loss Due to Drought (Rating)
Fairfield	$23,119,598	Relatively Moderate	$46,663 (Relatively Low)
Hartford	$95,894,397	Relatively High	$2,739,630 (Relatively Moderate)
Litchfield	$19,500,890	Relatively High	$393,776 (Relatively Moderate)
Middlesex	$27,698,965	Very High	$532,772 (Relatively Moderate)
New Haven	$36,243,608	Very High	$899,044 (Relatively Moderate)
New London	$58,802,420	Relatively High	$318,688 (Relatively Moderate)
Tolland	$34,506,211	Very High	$689,572 (Relatively Moderate)
Windham	$17,601,430	Relatively High	$111,396 (Relatively Low)
Total	**$313,367,519**		**$5,731,541**

To estimate vulnerability of land exposed to drought in each county, agricultural land acreage per county was analyzed. Table 81 lists the agricultural statistics, by county, for the State of Connecticut. The counties with the greatest acreage of farmland are Litchfield and New London.

Table 81. USDA agricultural statistics

County	Number of Farms	% of Farms in State	Acres in Farms	Market Value of Products Sold	% of State Total
Fairfield	402	7.28%	55,245	$42,069,000	7.25%
Hartford	786	14.24%	47,858	$93,912,000	16.19%
Litchfield	1,217	22.04%	90,322	$41,135,000	7.09%
Middlesex	441	7.99%	16,417	$57,077,000	9.84%

County	Number of Farms	% of Farms in State	Acres in Farms	Market Value of Products Sold	% of State Total
New Haven	686	12.43%	26,938	$111,626,000	19.24%
New London	823	14.91%	60,122	$135,786,000	23.41%
Tolland	520	9.42%	35,647	$53,417,000	9.21%
Windham	646	11.70%	51,990	$45,091,000	7.77%

The agricultural industry is most at risk during drought events. Damaged and dead crops are also vulnerable to wildland fires which can spread during periods of drought. A prolonged drought event could have significant impacts to the State's economy due to lack of agricultural productivity, particularly in counties that have large amounts of agricultural lands, such as Litchfield, New London, and Hartford counties. According to the 2017 USDA Agricultural Census, the market value of agricultural products sold from all farms in the State total over $580 million, with total sales averaging $105,074 per farm. It is evident that damage or complete loss of a crop due to drought will have significant economic impacts throughout the State.

Residents in Connecticut who rely on wells have high vulnerability to drought events. According to the most recent data on well usage, there are approximately 322,578 private residential wells in Connecticut that serve approximately 23% of the state's population of 3,626,205 persons (2010 census).[119] About 822,575 people are served by their own private residential well. Residents who rely on well water may experience a decrease in water supply during times of drought. As development continues in Connecticut, the demand for water will increase as well. While the State is not particularly prone to extreme instances of drought, increased demand has the potential to exacerbate moderate or severe droughts.

The Food, Water, Shelter FEMA Community Lifeline will be the most impacted by drought events. The parts of the state that have high amounts of agricultural land and where residents rely on well water are the most vulnerable to impacts to the Food, Water, Shelter Lifeline. The components of this lifelines that are directly impacted by drought include animals and agriculture and drinking water utilities. The food supply chain may also be impacted due to reduced crop production during drought events.

Social vulnerability can also contribute to overall vulnerability to drought conditions. Vulnerable populations include people who rely on water for their economic livelihood (e.g. farmers, landscapers, horticulturists, recreational facility operators) and people with allergies, asthma, or other respiratory conditions who are more susceptible to particulate matter or allergens in the air. Additionally, the population susceptible to extreme

[119] Connecticut State Department of Public Health. Private Wells.

temperatures, including the elderly and children may be more vulnerable to drought due to extreme heat.[120]

To determine the counties with high vulnerability to drought and high density of socially vulnerable populations, CCVI Social Sensitivity scores were overlaid with areas of high or moderate drought risk. As shown in Figure 69, the most vulnerable populations reside in pockets within Hartford County, New Haven County, and Fairfield County. Hartford County also has the most agriculture value exposed to drought with $95,894,397 exposed and an expected annual loss due to drought of $2,739,630. Hartford's expected losses paired with a more socially sensitive population may result in greater impacts to the population within Hartford County during drought conditions.

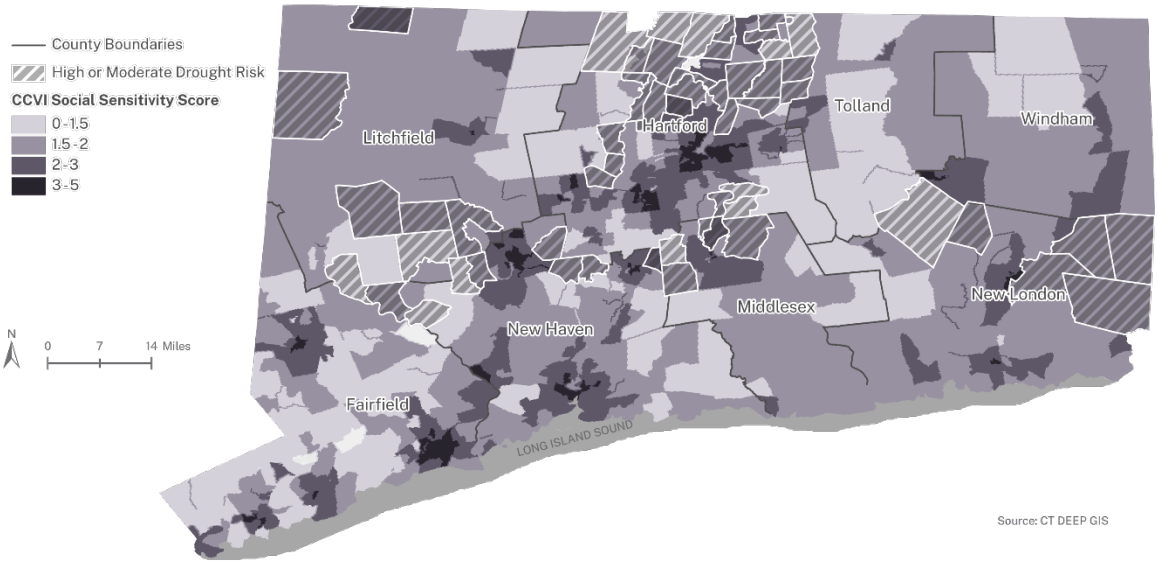


Figure 69. Social Sensitivity scores and areas of high or moderate drought risk

4.4.7.4 Changes in Development

Drought vulnerability will generally increase as population and development increases in the State with future development, as there will be increased demands for limited water resources. Water conservation and improving water recycling methods will become increasingly important as the population and development increases in the state, in order to avoid depleting the water supply.

To determine areas within the state that may become more vulnerable to drought due to increased development, total building permits issued in each county in Connecticut between 2018 and 2022 were overlaid with NRI areas of high or moderate drought risk. As shown in Figure 70, the majority of high or moderate drought risk census tracts can be found in Hartford and New Haven counties, which have the second highest amount of

[120] DHS Wisconsin. Vulnerable Populations and Drought-Related Issues. https://www.dhs.wisconsin.gov/publications/p0/p00884e.pdf

building permits issued. Hartford County has a majority of the high or moderate drought risk areas within its boundaries. New London and Litchfield Counties also have areas of higher drought risk, but the increased development along with higher social vulnerability (seen in Figure 69 above), puts Hartford County at a higher risk for drought. Fairfield County has had the highest number of building permits issued between 2018 and 2022 but does not overlap with any areas of high or moderate drought risk. Although Fairfield County does not have significant overlap with the high or moderate drought risk area, there have been 4 USDA reported drought events in the county since 2017, indicating that there is still a risk of a drought occurrence in the county, which could cause a significant amount of damage to the people and land in the county. If recent trends in development continue, these counties will continually increase their vulnerability to drought through increasing development and population.

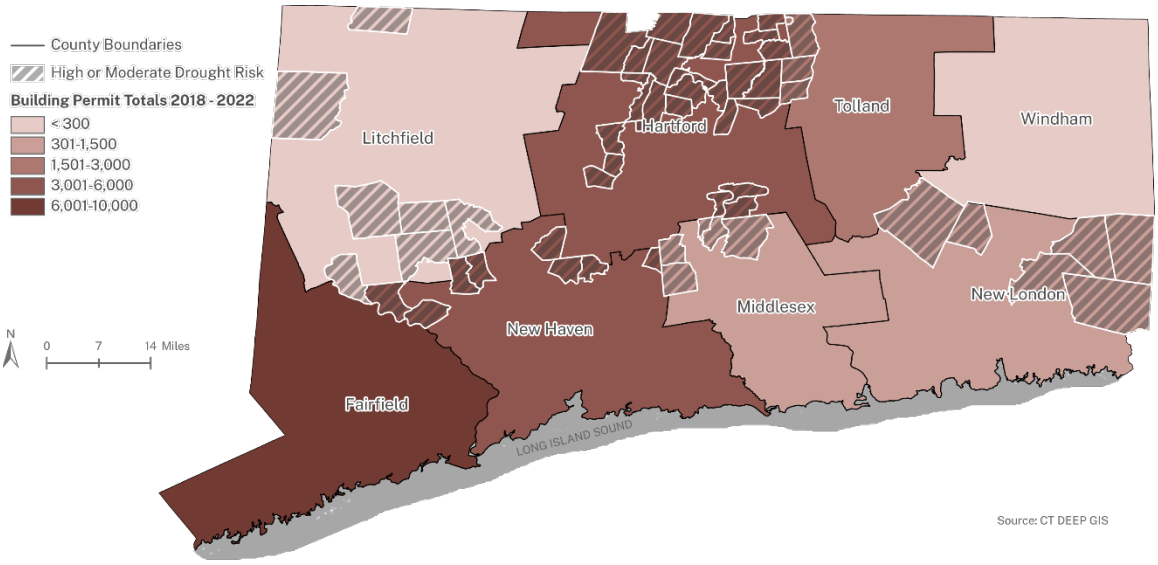


Figure 70. Building permit totals 2018-2022 with areas of high or moderate drought risk

4.4.8 Conclusion

Drought was ranked on the risk parameters as detailed in Table 24. To summarize the overall risk of drought for each county, each risk parameter score was multiplied by its impact weight and combined into a county composite ranking.

Table 82 shows the drought hazard ranking for each county. The high to low comparison does not mean that a low or medium-low hazard will not occur or will not have some impact on the community. However, it does provide an overview of what hazards may pose the greatest risk to each county given available data. This document should serve as a guide to help planners and officials in managing risk and prioritize mitigation actions.

Table 82. Drought hazard ranking by county.

	Fairfield	Hartford	Litchfield	Middlesex	New Haven	New London	Tolland	Windham
Hazard Concern	M	M	M	M	M	M	M	M
Local Plan Rating	M	M	M	M	M	M	M	M
Geographic Extent	L	M-H	M-H	M	M	H	M-L	M-L
Population Density	H	M-H	M	M-L	M-H	M	M-L	L
Future Development	H	M-H	M-L	M-L	M-H	M	M	L
Facility Intersect	H	H	H	H	H	H	H	H
Future Events	L	H	M-H	M-L	M-L	M-H	M-H	M
Future Losses	L	H	M-H	M	M-H	M-L	M-L	M
Injury & Death	L	L	L	L	L	L	L	L
Social Sensitivity	M-H	H	M-L	M-L	M-H	M	L	M
Composite*	**M-L**	**M-H**	**M**	**M-L**	**L**	**M**	**M-L**	**M-L**

* Each parameter's weighted score was added together to create a composite rank for each county. A risk determination of high, medium-high, medium, medium-low, and low was then assigned based on percentiles. A summation of all the composite scores for all assessed hazards in each jurisdiction provides an overall risk rank per county. For more information, refer to Section 4.1.1.4.

4.5 Tropical Cyclone

A tropical cyclone is a rotating, organized system of clouds and thunderstorms that originates over tropical or sub-tropical waters and has a closed low-level circulation. There are several environmental conditions which must be present for a tropical cyclone to form:[121]

- Warm ocean waters (at least 80oF) throughout a depth of about 150 feet;
- An atmosphere which cools fast enough with height such that it is potentially unstable to moist convection;
- Relatively moist air near the mid-level of the troposphere;
- A minimum 300-mile distance from the equator;
- A pre-existing near surface disturbance; and
- Low values of vertical wind shear (change in wind speed with height) between the surface and the upper troposphere.

Tropical depressions, tropical storms, and hurricanes are all considered tropical cyclones. Almost all tropical storms and hurricanes in the Atlantic basin (which includes the Gulf of Mexico and Caribbean Sea) form between June 1 and November 30 (hurricane season). August and September are peak months for hurricane development. September is typically the most active month for tropical cyclones in Connecticut. The average wind speeds for tropical storms and hurricanes are listed below:

- A **tropical depression** has a maximum sustained wind speeds of 38 miles per hour (mph) or less
- A **tropical storm** has maximum sustained wind speeds of 39 to 73 mph
- A **hurricane** has maximum sustained wind speeds of 74 mph or higher. In the western North Pacific, hurricanes are called typhoons; similar storms in the Indian Ocean and South Pacific Ocean are called cyclones.

Figure 71 shows a diagram of the anatomy of a tropical cyclone (hurricane) which consists of:

- An **eye** – the center of a hurricane which is the calmest part of the storm, and is typically 20-40 miles across;
- An **eye wall** – surrounds the eye and consists of a ring of tall thunderstorms that produce heavy rains and usually the strongest winds; and

[121] NOAA National Hurricane Center. Tropical Cyclone Climatology. https://www.nhc.noaa.gov/climo/

- **Rain bands** – curved bands of clouds and thunderstorms that rail away from the eye wall in a spiral fashion. Rain bands are capable of producing high winds, heavy outburst of rain and tornadoes.

As warm, moist air rises from the ocean's surface and cools, clouds form in bands around the eye. The system of clouds and wind spins in a counterclockwise direction if formed north of the equator.

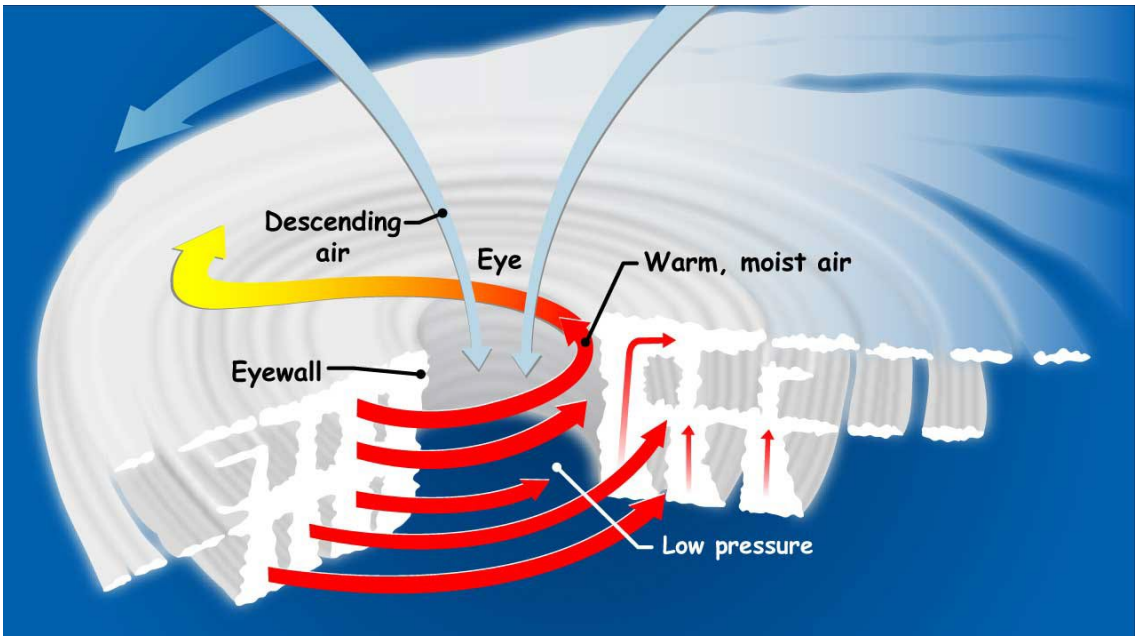


Figure 71. Diagram of a tropical cyclone (NASA)

Tropical cyclones are typically accompanied by heavy rain, strong winds, and storm surge. Storm surge is an abnormal local rise in sea level caused be several factors, including:

- Storm intensity (wind speed)
- Storm size (radius of the wind field)
- Storm speed (forward motion)
- Storm direction (at what angle a storm makes landfall)
- Bathymetry (shelves and channels in the coastal sea floor)
- Coastal features (shape of the coastline)
- Barometric pressure (interaction between low pressure at the core of a storm and higher pressure in surrounding area)

Barometric pressure has often been identified as the primary cause of storm surge. However, it is only responsible for around 5% of the storm surge value.[122] Because of the variety of factors that can influence storm surge, stronger hurricanes do not always correlate with larger storm surges and even weaker systems can result in dramatic storm surge events.

Regardless of the cause and other factors of storm surge, the result is that water is pushed onto a coastline. The height of the surge is measured as the deviation from predicted astronomical tides and can reach over 25 feet in extreme circumstances. NOAA coastal flooding forecasts are expressed as feet above ground, with the most severe category reaching over 9ft above ground. As shown in Figure 72, storm surge can result in normally dry ground being inundated.

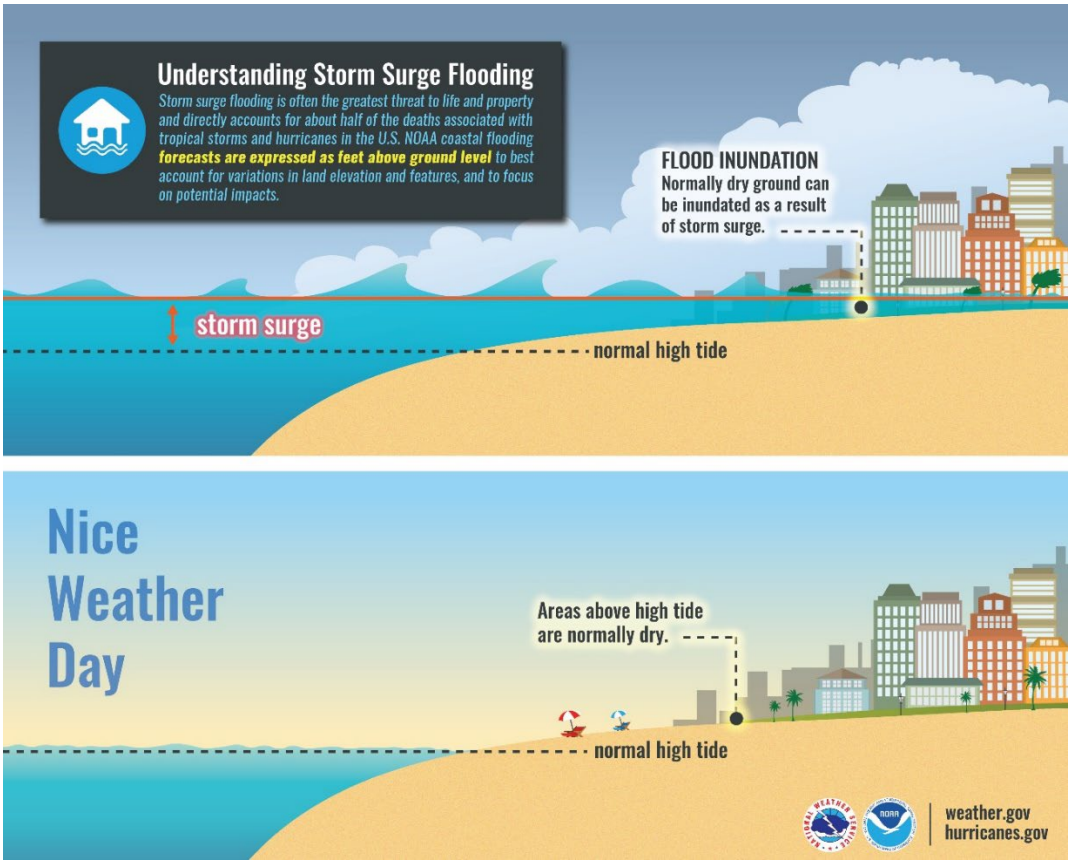


Figure 72. Comparison of normal weather conditions to storm surge conditions

4.5.1 Location

Connecticut is located along the Atlantic coastline and has experienced all three types of tropical cyclone systems including some of the worst hurricanes to make landfall within the United States. NOAA's Historical Hurricane Tracks tool is a public interactive mapping

[122] National Hurricane Center. Introduction to Storm Surge. https://www.nhc.noaa.gov/surge/surge_intro.pdf

application that displays Atlantic Basin and East-Central Pacific Basin tropical cyclone data. This interactive tool catalogs tropical cyclones that have occurred from 1842 to 2021 (latest date available from data source). Between 1842 and 2021, Connecticut experienced 76 tropical cyclone events, shown in Figure 73. These events tracked within 50 nautical miles of the State.

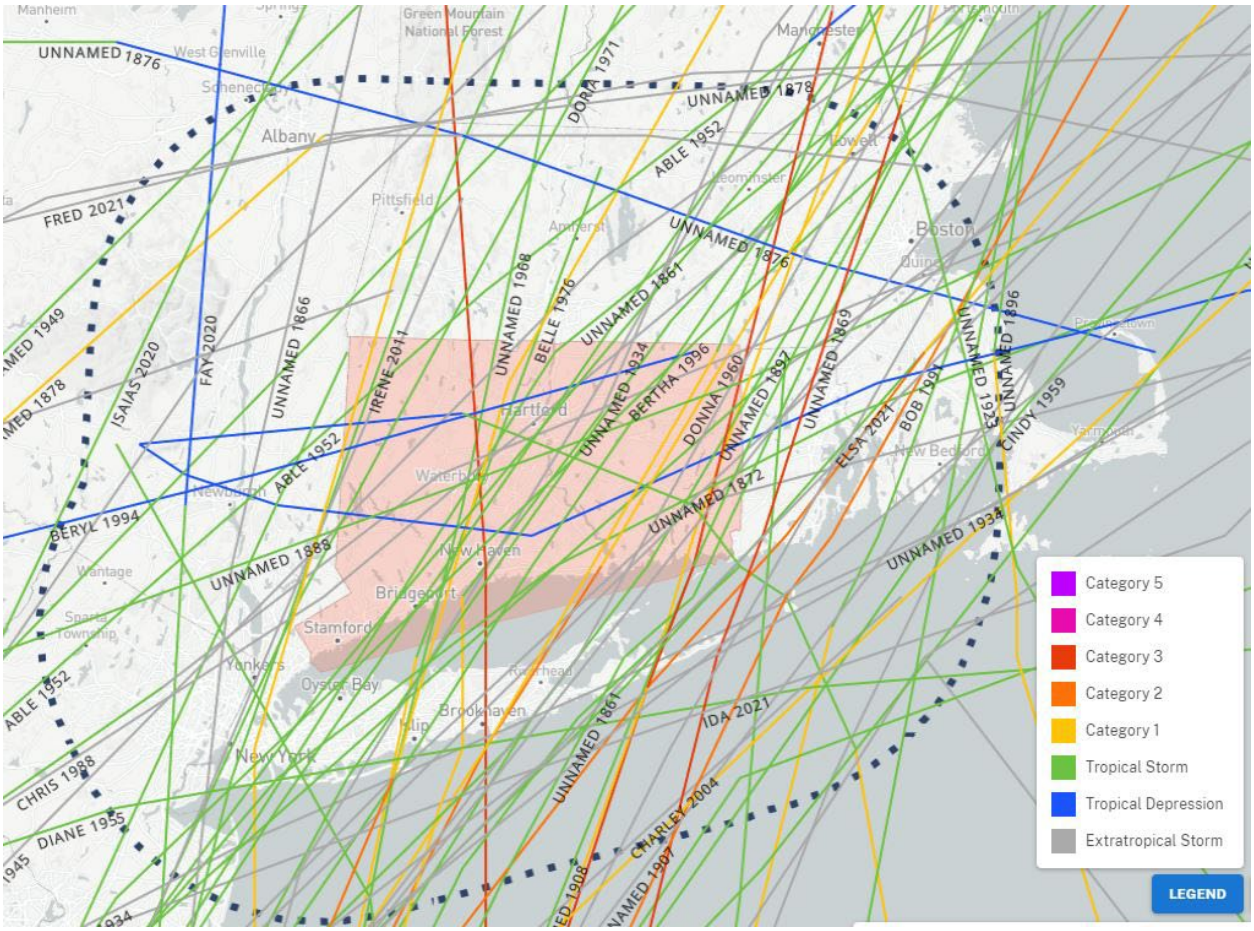


Figure 73. Tropical cyclone tracks (1842 – 2021)[123]

The location of the damage varies greatly depending on the track, intensity, and duration of the tropical cyclone. While storm surge and wave impacts are limited to low elevations near the coast, damaging winds and heavy rain associated with tropical cyclones can impact the entire state. Riverine flooding caused by heavy rain can impact the state's rivers. Storm surge can also affect tidal rivers and creeks.

The extent and impact of storm surge can be evaluated using the U.S. Army Corps of Engineers' (USACE) Sea, Lake, and Overland Surges from Hurricanes (SLOSH). The SLOSH computer program is a numerical computer model, developed by the NWS, for the USACE, and designed to forecast the rise in water level caused by the wind and pressure forces of a hurricane. The SLOSH model computes the storm surge over water and along the coastline

[123] NOAA Historical Hurricane Tracks tool. https://coast.noaa.gov/hurricanes/#map=4/32/-80

and extends the computations inland over the coastal floodplain. The results of the model can be utilized along with topographic information to determine four hurricane flood inundation zones. The four zones correspond to Hurricane Categories 1, 2, 3, and 4 respectively on the Saffir/Simpson scale. Emergency managers use data from SLOSH to identify at-risk populations and determine evacuation areas. The potential inland extent of storm surge as a function of hurricane category is shown in Figure 74 . These storm surge extents are based on the SLOSH Maximum of the Maximum Envelope of Waters (MEOWs) (MOM), which have estimated water depths ranging from a maximum of 14ft for Category 1 to greater than 20ft for Category 4. For additional information on the storm surge risk assessment, see the Flood hazard section (**section 4.3**).

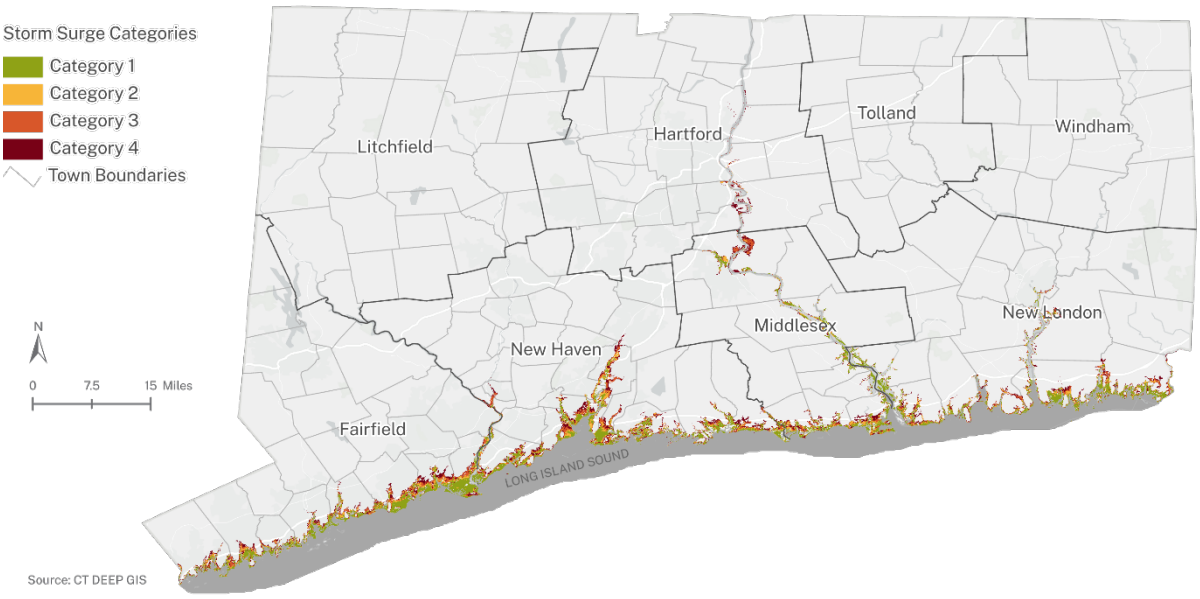


Figure 74. Storm surge flooding extents for Categories 1-4

4.5.2 Intensity

A tropical cyclone strike to Connecticut has the potential to cause moderate to extensive damage within the State. The severity of the damage varies greatly depending on the track, intensity, and duration of the tropical cyclone. Hazards associated with tropical cyclones include:

- **Storm Surge:** Storm surge is the leading cause of deaths from hurricanes in the United States.[124] Storm surge of up to 10ft reached the Connecticut coastline from the Long Island Sound during Super Storm Sandy in October 2012.[125]
- **Wind:** Connecticut has been impacted by Category 3 hurricanes in the past which can have sustained winds as high as 130 mph and higher gusts. Hurricanes often

[124] National Weather Service. Hurricane Hazards.
[125] NBC Connecticut. Superstorm Sandy – A Look Back on Its Impact 10 Years Later.

spawn weak tornados in outer rain bands, creating additional high wind threats. Tornados are discussed in **section 4.8**.

- **Rain:** Intense and heavy rainfall from tropical cyclones leads to flash flooding and riverine flooding.
- **Waves:** Large and dangerous waves caused by tropical cyclone winds can batter coastlines even when a storm is 1,000 miles offshore.[126] These waves can cause erosion, rip currents, and damage to structures.

The Saffir/Simpson scale was developed in 1971 by Herbert Saffir and Dr. Robert Simpson to classify hurricanes. The scale rates the intensity of hurricanes based on wind speed and barometric pressure measurements. The scale gives an indication of the potential flooding and wind damages associated with each hurricane category. Prior to 2009 hurricane season, hurricanes were categorized by the Saffir-Simpson Hurricane Scale that incorporated central pressure and storm surge as components of the categories. Due to criticisms and confusion regarding this practice, in 2009, the scale was revised and is now called the Saffir-Simpson Hurricane Wind Scale (Table 83).[127] This modified scale, which is more scientifically defensible, is predicated on maximum sustained wind speeds and removed both storm surge and central pressure as factors.

Table 83. Saffir/Simpson Hurricane Wind Scale

Category	Sustained Winds	Types of Damage Due to Hurricane Winds
1	74-95 mph (64-82kt)	Very dangerous winds will produce some damage: Well-constructed frame homes could have damage to roof, shingles, vinyl siding and gutters. Large branches of trees will snap and shallowly rooted trees may be toppled. Extensive damage to power lines and poles likely will result in power outages that could last a few to several days.
2	96-110 mph (83-95kt)	Extremely dangerous winds will cause extensive damage: Well-constructed frame homes could sustain major roof and siding damage. Many shallowly rooted trees will be snapped or uprooted and block numerous roads. Near-total power loss is expected with outages that could last from several days to weeks.
3 (major)	111-129 mph (96-112kt)	Devastating damage will occur: Well-built framed homes may incur major damage or removal of roof decking and gable ends. Many trees will be snapped or uprooted, blocking numerous roads. Electricity and water will be unavailable for several days to weeks after the storm passes.

[126] National Weather Service. Hurricane Safety Tips and Resources. https://www.weather.gov/safety/hurricane
[127] National Hurricane Center. Saffir-Simpson Hurricane Wind Scale. http://www.nhc.noaa.gov/aboutsshws.php

Category	Sustained Winds	Types of Damage Due to Hurricane Winds
4 (major)	130-156 mph (114-135kt)	Catastrophic damage will occur: Well-built framed homes can sustain severe damage with loss of most of the roof structure and/or some exterior walls. Most trees will be snapped or uprooted and power poles downed. Fallen trees and power poles will isolate residential areas. Power outages will last weeks to possibly months. Most of the area will be uninhabitable for weeks or months.
5 (devastating)	Greater than 155 mph (>135kt)	Catastrophic damage will occur: A high percentage of framed homes will be destroyed, with total roof failure and wall collapse. Fallen trees and power poles will isolate residential areas. Power outages will last for weeks to possibly months. Most of the area will be uninhabitable for weeks or months.

Source: NOAA National Hurricane Center and Central Pacific Hurricane Center

The National Hurricane Center is responsible for forecasting and tracking tropical cyclones. While forecasting accuracy has increased in recent years, the ability of meteorologists to reliably predict tropical cyclone formation, tracks, and impacts beyond one week remains extremely limited. The National Hurricane Center and National Weather Service issue alerts leading up to possible and expected impacts from a tropical cyclone. These types of alerts are described in Table 84.

Table 84. National Hurricane Center alerts

Alert Type	Description
Hurricane Watch	Hurricane conditions (sustained winds of 74 mph or greater) are possible within the specified area. Because it may not be safe to prepare for a hurricane once winds reach tropical storm force, the NHC issues hurricane watches 48 hours before it anticipates tropical storm-force winds.
Tropical Storm Watch	Tropical storm conditions (sustained winds of 39 to 73 mph) are possible within the specified area within 48 hours.
Hurricane Warning	Hurricane conditions (sustained winds of 74 mph or greater) are expected somewhere within the specified area. NHC issues a hurricane warning 36 hours in advance of tropical storm-force winds to allow time to complete preparations.
Tropical Storm Warning	Tropical storm conditions (sustained winds of 39 to 73 mph) are expected within the specified area within 36 hours.
Extreme Wind Warning	Extreme sustained winds of a major hurricane (115 mph or greater), usually associated with the eyewall, are expected to begin within an hour.

Source: National Weather Service

The National Hurricane Center also provides forecasting information on areas where tropical cyclone development is likely, a forecast cone for the probable path of the center

of the cyclone, various storm surge products, and other mapping and discussion products that describe the anticipated evolution of systems and their associated hazards.

4.5.3 Impacts

Tropical cyclones can disrupt the individual lives of Connecticut residents and create costly interruptions to businesses and commerce within the state. The impacts from tropical cyclones can be physical (injury/death), emotional (stress), and/or economic in nature.



- Tropical cyclones can result in building damages, contents damages, and inventory losses.
- High winds often result in extensive power outages threatening critical infrastructure services.



- Flooding from heavy rain and storm surge can severely damage roadways, rail lines, and other infrastructure.
- Debris resulting from high winds can result in roadway obstructions.



- Secondary impacts of tropical cyclones can lead to include increased risk of fire hazards, coastal erosion, compromise of dams or levees, increased risk of landslides, and other environmental impacts.



- Tropical cyclone impacts can result in physical injury or death.
- Cascading events following a tropical cyclone may include health issues related to mold and mildew. Hazardous materials may also be impacted leading to potentially greater risk of exposure.
- Lingering stress from disasters such as hurricanes have been acknowledged by many, including FEMA.[128] Relocation costs and wage losses can also place fiscal stress on individuals and families, especially socially vulnerable populations.



- In addition to direct building, contents, and inventory damage, tropical cyclones can lead to indirect economic impacts of capital-related losses, rental income losses, and supply-chain disruption.

History has shown, and current evidence implies, that it is vital for state and local officials to plan and prepare for tropical cyclone events, and to implement effective mitigation

[128] FEMA. Coping with Disaster. https://www.fema.gov/coping-disaster

procedures and post-event procedures to reduce, to the extent possible, loss of life and property.

4.5.4 Previous Occurrences and Losses

Tropical cyclone systems are common in Connecticut and New England. To date, a Category 3 hurricane was the most severe tropical cyclone that impacted Connecticut. However, many Category 3 hurricanes which have come up the Atlantic coast into the cooler waters off New England were downgraded to a Category 2 hurricane or lower when they made landfall in/near Connecticut.

The Northeast States Emergency Consortium reports that since 1900, 39 tropical systems have impacted New England. This includes 25 hurricanes and 14 tropical storms.[129] Of the 25 hurricanes, 9 made landfall along the Southern New England coast, 7 of which were either category 2 or 3 intensity based on the Saffir-Simpson Hurricane Scale. While the primary threat to New England is during August and September, the region has been affected as early as June and as late as mid-October.

The NCEI Storm Events Database reports 28 tropical cyclone or tropical depression events between the years of 1950 and 2022. There have been no reported injuries and 2 reported deaths due to tropical cyclones or tropical depressions. A breakdown of these events by county is shown in Table 85.

Table 85. NCEI reported tropical cyclones and tropical depressions (1950 - 2022)

County	Events	Injuries	Deaths	Property Damages (2022 USD)
Fairfield	3	0	0	$ 9,004,000
Hartford	4	0	0	$ 28,902,300
Litchfield	3	0	0	$ 0
Middlesex	4	0	0	$ 1,304,000
New Haven	3	0	2	$ 10,004,000
New London	5	0	0	$ 1,504,000
Tolland	4	0	0	$ 21,273,500
Windham	2	0	0	$ 20,562,000
Total*	**28**	**0**	**2**	**$ 92,553,800**

*Note: event totals may reflect a storm event that has affected multiple counties that have been counted as individual events in each affected county.

Some of the most notable hurricane and tropical storm occurrences in recent history in the state of Connecticut in terms of deaths, injuries, and/or property damages are summarized in Table 86 (dollar values listed in the descriptions below are not adjusted for inflation). It

[129] NESEC. Hurricanes. https://nesec.org/hurricanes/

should be noted that many sources provided historical information regarding previous occurrences and losses associated with hurricanes and tropical storms that impacted the State of Connecticut. With many sources reviewed for the purpose of this HMP update, loss and impact information could vary depending on the source. Therefore, accuracy of monetary figures discussed is based only on the available information identified during research for this HMP update.

Table 86. Summary of significant tropical cyclone impacts to Connecticut

Event	Description
1938 Unnamed (unofficially the Great New England Hurricane of 1938 or the Long Island Express).	The most intense hurricane to strike Connecticut occurred on September 21, 1938. The Category 3 Hurricane made landfall in Milford, with the eye of the hurricane observed in New Haven. The storm downed power lines in many areas of Connecticut and resulted in catastrophic fires in New London and Mystic, CT. Storm tides of 14 to 18 feet were reported along the Connecticut coast, and 3 to 6 inches of rain fell throughout most of Connecticut with 14 to 17 inches reported in Central Connecticut. An estimated $38,000,000 (in 1938 dollars) in damages occurred to property in Connecticut, and an estimated 564 deaths and 1,700 injuries occurred.
1960 Hurricane Donna	Hurricane Donna was a Category 1 storm when it reached Connecticut on September 12, 1960. The hurricane produced 4 to 8 inches of rain and up to 10 ft of storm surges along the coast. The Connecticut Post reported the storm caused $387 million in damage in the U.S.[130]
1985 Hurricane Gloria	Hurricane Gloria was a Category 1 Hurricane by the time it made landfall in Connecticut near Bridgeport in September 1985. The hurricane struck at low tide and therefore had low to moderate storm surges. The hurricane produced up to 6 inches of rain in some areas. Heavy winds resulted in widespread debris and widespread power outages impacting over 500,000 people.[131]
2011 Hurricane Irene	Hurricane Irene occurred on August 28, 2011 and weakened to a tropical storm as it made landfall. The storm hit the coast at high tide, which caused a storm surge that flooded roads and homes from Fairfield to New London. The storm produced high winds (maximum wind gusts were 66 mph, while the average wind gust for the entire state was 52.3 mph), heavy rains and flash flooding, and left ten people dead in Connecticut. It is estimated the storm caused over $10 million in fiscal impacts to State infrastructure.[132]

[130] Connecticut Post. Connecticut's Worst Hurricanes. 2012. https://www.ctpost.com/news/article/Connecticut-s-worst-hurricanes-3984238.php
[131] WestCOG. Multi-Jurisdiction Hazard Mitigation Plan Update. 2021. https://westcog.org/wp-content/uploads/2021/08/HMP-2021.pdf
[132] The New York Times. State-by-State Guide to Hurricane Sandy. 2010. https://archive.nytimes.com/thelede.blogs.nytimes.com/2012/10/29/state-by-state-guide-to-hurricane-sandy/

Event	Description
2012 Super Storm Sandy	Super Storm Sandy occurred October 29-30, 2012, causing storm surges, wind and rain and devastating the Jersey Shore, Southern NYC, parts of Long Island and the Connecticut and Rhode Island coastlines. Coastal residents and business owners suffered from storm surge and its damage, and more than 360,000 people were evacuated from low-lying areas along the coast from Old Saybrook to Fairfield. Inland cities and towns saw widespread power failures. A travel ban was issued on state highways, and commuter rail and Amtrak service was canceled. In Connecticut, all 8 counties saw damages, with more than $360 million in total damage, and at least 5 storm-related deaths were reported.
2020 Tropical Storm Isaias	Tropical Storm Isaias moved through the northeast on August 4, 2020. The Tropical Storm resulted in 1 to 3 inches of rain in some areas of Connecticut. Wind gusts of up to 70 mph led to severe tree and powerline damage, resulting in over 632,000 power outages. NWS confirmed an EF1 tornado touched down in the Town of Westport.
2021 Hurricane Henri	Henri moved onto the Connecticut coast as a tropical storm on August 22, 2021. Tropical Storm Henri, with maximum sustained winds of 60 mph, made landfall on the Rhode Island coast and then continued turning to the west as the storm weakened over Connecticut becoming a depression by evening. Tropical storm force winds, limited mainly to southeast Connecticut, resulted in a few reports of tree limbs being downed and power outages. The worst flash flooding occurred in northeast Connecticut, and the highest rainfall totals over the two-day period ranged from 5 to 6 inches in Hartford and Tolland Counties in northern Connecticut.[133]

Since the 2018 plan update, there have been four federal disaster declarations for hurricane disaster types, as shown in Table 87.

Table 87. Connecticut hurricane Federal Disaster Declarations since 2018

Disaster	Year	Incident Period	Disaster Types	Title	Counties*	IA$	PA $
EM-3535	2020	August 4	Hurricane	Tropical Storm Isaias	Fairfield, Hartford, Litchfield, Middlesex, New Haven, New London, Tolland, Windham,	N/A	TBD

[133] Adapted from NOAA NCEI database event description.

Disaster	Year	Incident Period	Disaster Types	Title	Counties*	IA$	PA $
DR - 4580	2020	August 4	Hurricane	Tropical Storm Isaias	Fairfield, Hartford, Litchfield, Middlesex, New Haven, New London, Tolland, Windham		$38.3 27
EM - 3564	2021	August 21 – August 24	Hurricane	Hurricane Henri	Fairfield, Hartford, Litchfield, Middlesex, New Haven, New London, Tolland, Windham	N/A	$0.21 M

* Note that the Mashantucket Pequot Indian Reservation and Mohegan Trust Lands were included in all four disaster declarations

4.5.5 Future Losses

In general, it is challenging to predict when and where a hurricane will occur. Some scientists have developed forecasts and probabilities of landfall strikes for the annual Atlantic hurricane season that are revised throughout the season.[134] Other researchers and federal agencies, including NOAA do not make such landfall predictions because hurricane landfalls are largely determined by local weather in the days immediately preceding the storm. NOAA does issue a seasonal hurricane outlook that provides a general guide to the expected overall nature of the upcoming hurricane season. The outlook combines the impacts of three climate factors to analyze an expected level of activity for the season:

- The tropical multi-decadal signal,
- The El Niño/La Niña (ENSO – El Niño Southern Oscillation) cycle, and
- The tropical Atlantic Sea surface temperatures.

Hurricanes have the greatest destructive potential of all natural disasters in Connecticut, due to the potential combination of high winds, storm surge and coastal erosion, heavy rain, and flooding which can accompany this hazard. While the Atlantic hurricane season runs

[134] Philip J. Klotzbach and William M. Gray run the Tropical Meteorology Project at Colorado State University. Information about and the actual hurricane season forecasts can be downloaded from website https://tropical.colostate.edu/forecasting.html

June 1 through November 30, the greatest risk of a hurricane impacting New England within this six-month period is from late August to mid-October, when the greatest frequency of hurricanes and tropical storms has occurred historically, as shown in Figure 75.

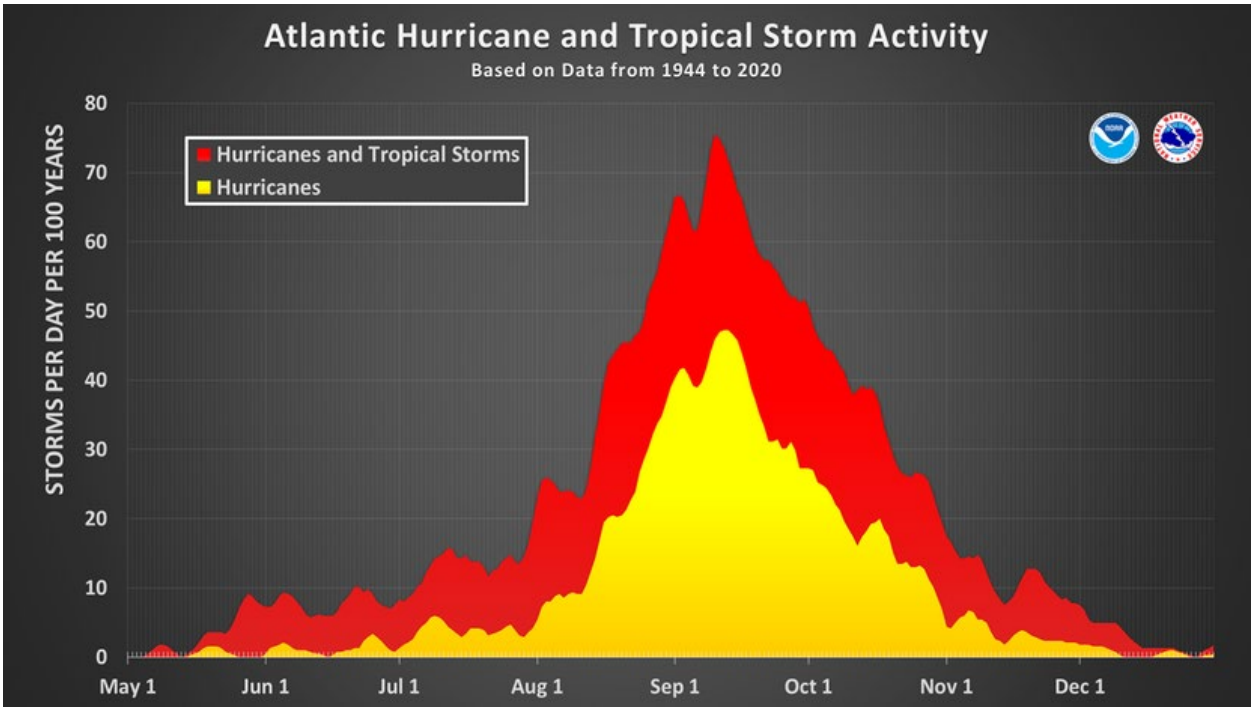


Figure 75. Atlantic hurricane and tropical storm activity[135]

The number of named storms passing through the Atlantic basin in September during a 100-year period is illustrated in Figure 76. Connecticut falls within the 10-49 named storms per 100-year range. Normalized values are based on data from 1944 to 2020.

[135] NHC NOAA. Tropical Cyclone Climatology. https://www.nhc.noaa.gov/climo/#hrhm

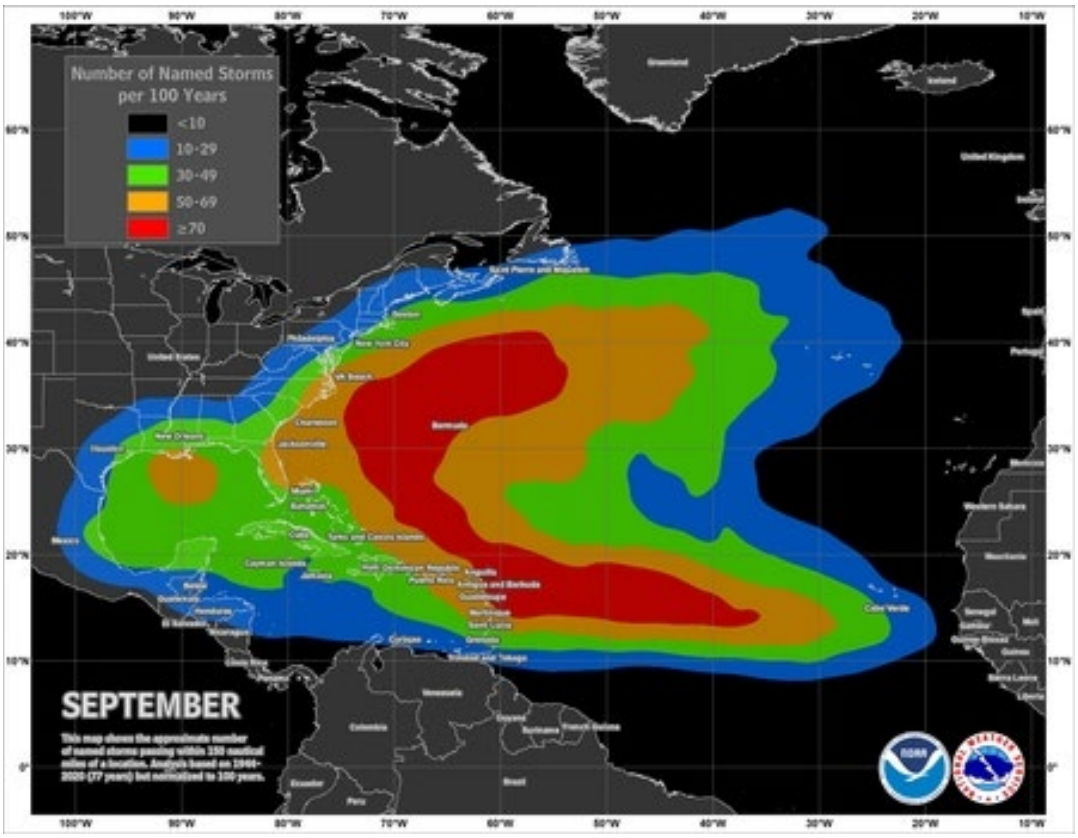


Figure 76. Number of named storms per 100 years in the Atlantic Basin

Researchers have recently analyzed data that has indicated that the intensity of tropical cyclones (hurricanes and typhoons) has increased over the last thirty-five years. NOAA developed a series of hurricane return periods for the northeast based on historical data of events within 65 nautical miles of the storm tracks. NOAA methodology for this is as follows:

"Hurricane return periods are the frequency at which a certain intensity of hurricane can be expected within a given distance of a given location…In simpler terms, a return period of 20 years for a major hurricane means that on average during the previous 100 years, a Category 3 or greater hurricane passed within 50 nautical miles (58 miles) of that location about five times. We would then expect, on average, an additional five Category 3 or greater hurricanes within that radius over the next 100 years."

As shown in Figure 77, a Category 3 hurricane has a calculated return period of 63 to 120 years along the coastline of Connecticut. For hurricanes more generally, the calculated return period ranges from 17-24 for Connecticut. Based on historical data for hurricane tracks within 50 miles of Connecticut, it is reasonable to assume that the state has a medium-low probability of future events (less than 1 event per year). However, it should be noted that this probability is based on the historical hurricane tracks since 1900 and does not account for changing climate conditions in the future.

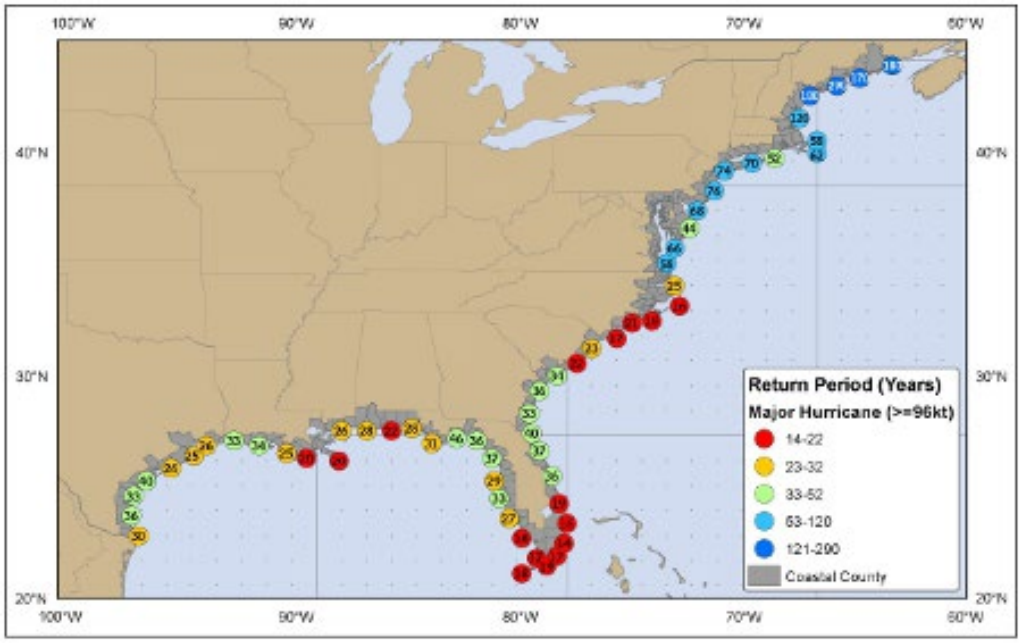


Figure 77. Estimated return period in years for major hurricanes passing within 50 nautical miles of various locations on the U.S. Coast[136]

As shown in Table 88. Hartford, Middlesex, New London, and Tolland counties have the highest annualized events, while Hartford, Tolland, and Windham counties have the greatest annualized damages based on the NCEI database of tropical storm and tropical depression events between 2008-2022. New Haven County is the only county with reported deaths in the NCEI database for tropical events. It is important to note that the NCEI data did not have any tropical cyclones reported between 1950 and 2007, indicating there are substantial gaps in the data.

Table 88. NCEI annualized events and reported injuries, deaths, and damages, 2008-2022

County	Annualized Events	Annualized Deaths	Annualized Injuries	Annualized Damages (2022 Dollars)
Fairfield	0.21	0.00	0.00	$643,143
Hartford	0.29	0.00	0.00	$2,064,450
Litchfield	0.21	0.00	0.00	$0
Middlesex	0.29	0.00	0.00	$93,143
New Haven	0.21	0.14	0.00	$714,571
New London	0.36	0.00	0.00	$107,429
Tolland	0.29	0.00	0.00	$1,519,536
Windham	0.14	0.00	0.00	$1,468,714

[136] NHC NOAA. Tropical Cyclone Climatology. https://www.nhc.noaa.gov/climo/#hrhm

County	Annualized Events	Annualized Deaths	Annualized Injuries	Annualized Damages (2022 Dollars)
Total	*2	0.14	0.00	$6,610,986

*Note: event totals may reflect a storm event that has affected multiple counties that have been counted as individual events in each affected county.

4.5.6 Climate Change Impacts

Tropical cyclones rely on warm surface waters to develop and thrive. With increasing global temperatures, an increase to the frequency and severity of tropical cyclones is likely. However, climactic changes beyond surface water temperatures make predicting the impacts of climate change on tropical cyclones difficult. Given the history of major storms and a reasonable estimate of likely future scenarios, it would be prudent for Connecticut to expect that there will be forthcoming hurricanes which make landfall in or near Connecticut and they will be of a greater intensity and longer duration than in the past. This may mean a potential increase in all categories of hurricanes normally experienced in New England. Anticipated climate change impacts on tropical cyclones are summarized in Table 89 based on information from the Fourth National Climate Assessment and Connecticut Institute for Resilience and Climate Adaptations (CIRCA).

Storm surge impacts are likely to worsen in the future as a result of sea level rise. For example, a storm surge of 3 feet today will have the impact of a surge of 5 feet if sea levels rise 2 feet (3 feet of storm surge + 2 feet of sea level rise = 5 feet of flooding). For more information on sea level rise refer to **section 4.3** and **section 3.4**.

Table 89. Summary of projected climate change impacts on tropical cyclones

Impact	Projected Change
Location	Climate science currently does not report a conclusive change in location of tropical cyclone activity.
Intensity	Climate model simulations indicate an increase in global tropical cyclone intensity in a warmer world, as well an increase in the number of very intense tropical cyclones. The amount of rainfall associated with a given storm is projected to increase. (NCA, 2018)
Frequency	Over the past century, there has not been a significant trend in tropical cyclone activity in the North Atlantic Basin (CIRCA, 2019). In the future, the total number of tropical storms is generally projected to remain steady, or even decrease, but the most intense storms are generally projected to become more frequent. (NCA, 2018)
Duration	Climate science currently does not report a conclusive change in tropical cyclone duration (NCA, 2018).
Model Confidence	High confidence.

4.5.7 Vulnerability Assessment

In evaluating the potential for hazard events of a given magnitude, a mean return period (MRP) is often used. The MRP provides an estimate of the magnitude of an event that may occur within any given year based on past recorded events. MRP is the average period of time, in years, between occurrences of a particular hazard event, equal to the inverse of the annual frequency of exceedance.[137] Using the Hazards U.S. Multi-Hazard (Hazus) software (v 6.0), various MRPs (10-yr, 20-yr, 50-yr, 100-yr, 200-yr, 500-yr, and 1000-yr) of tropical cyclones were simulated to estimate associated losses.

The estimated maximum three-second gust wind speeds that can be anticipated in the study area associated with the 100- and 1,000-year MRP events are shown in Figure 78 and Figure 79. These peak wind speed projections were generated using the Hazus model runs. The maximum three-second gust wind speeds for the State equate to mostly Category 1 hurricane speeds for the 100-year MRP event. In the southeast corner of the state, wind speeds correspond with a Category 2 hurricane for the 100-year MRP event. The maximum three-second gust wind speeds for the State range from Category 2 to Category 3 hurricane speeds for the 1,000-year MRP event.

[137] Dinicola 2009 MRPFederal Emergency Management Agency (FEMA). 2013. "Disaster Declarations." http://www.fema.gov/disasters

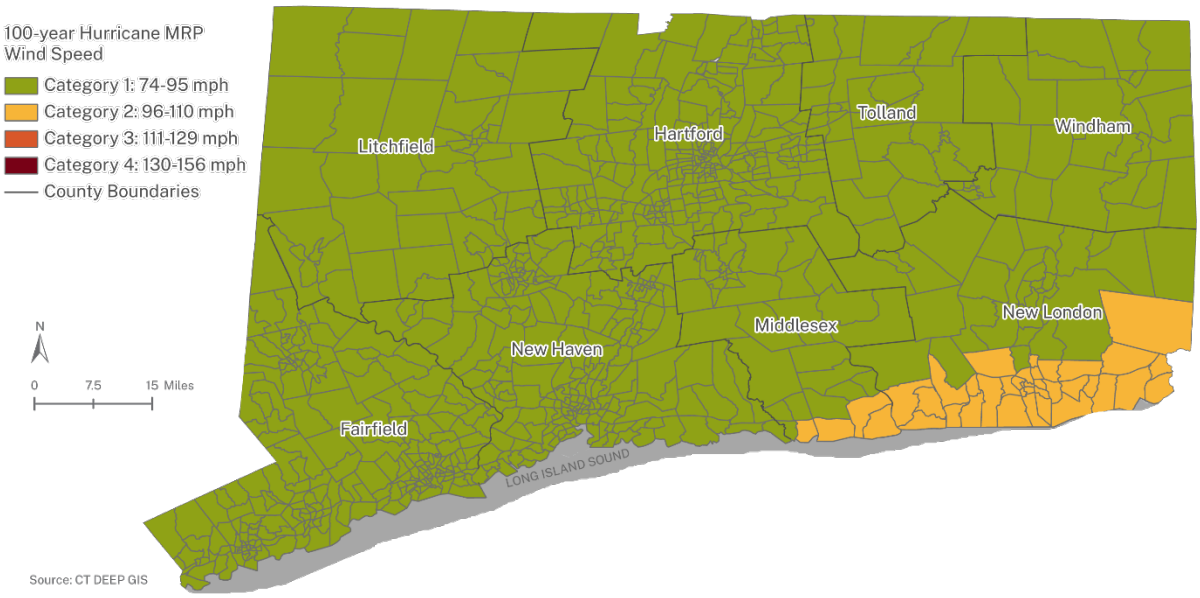


Figure 78. Wind speeds for the 100-year MRP event

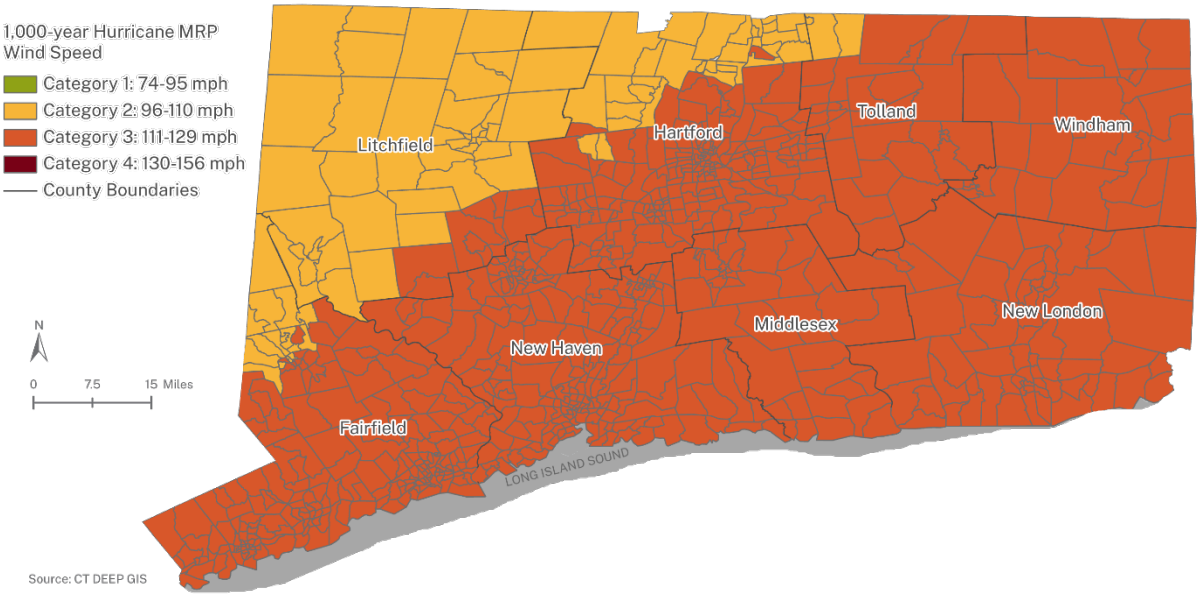


Figure 79. Wind speeds for the 1,000-year MRP event

Simulations for several historical storms and their associated storm tracks were also run using Hazus. The results of these simulations help to estimate potential maximum damages that would occur in the present day given the same track and characteristics of an individual event. The following historic storms were selected to represent a range of time periods and severity of conditions: the Unnamed storm of 1938 (unofficially the Great New England Hurricane of 1938 or the Long Island Express), 1960 Hurricane Donna, 1985 Hurricane Gloria, 2012 Superstorm Sandy, and 2020 Tropical Storm Isaias. The storm tracks of these storms and their associate wind speeds are shown in Figure 80.

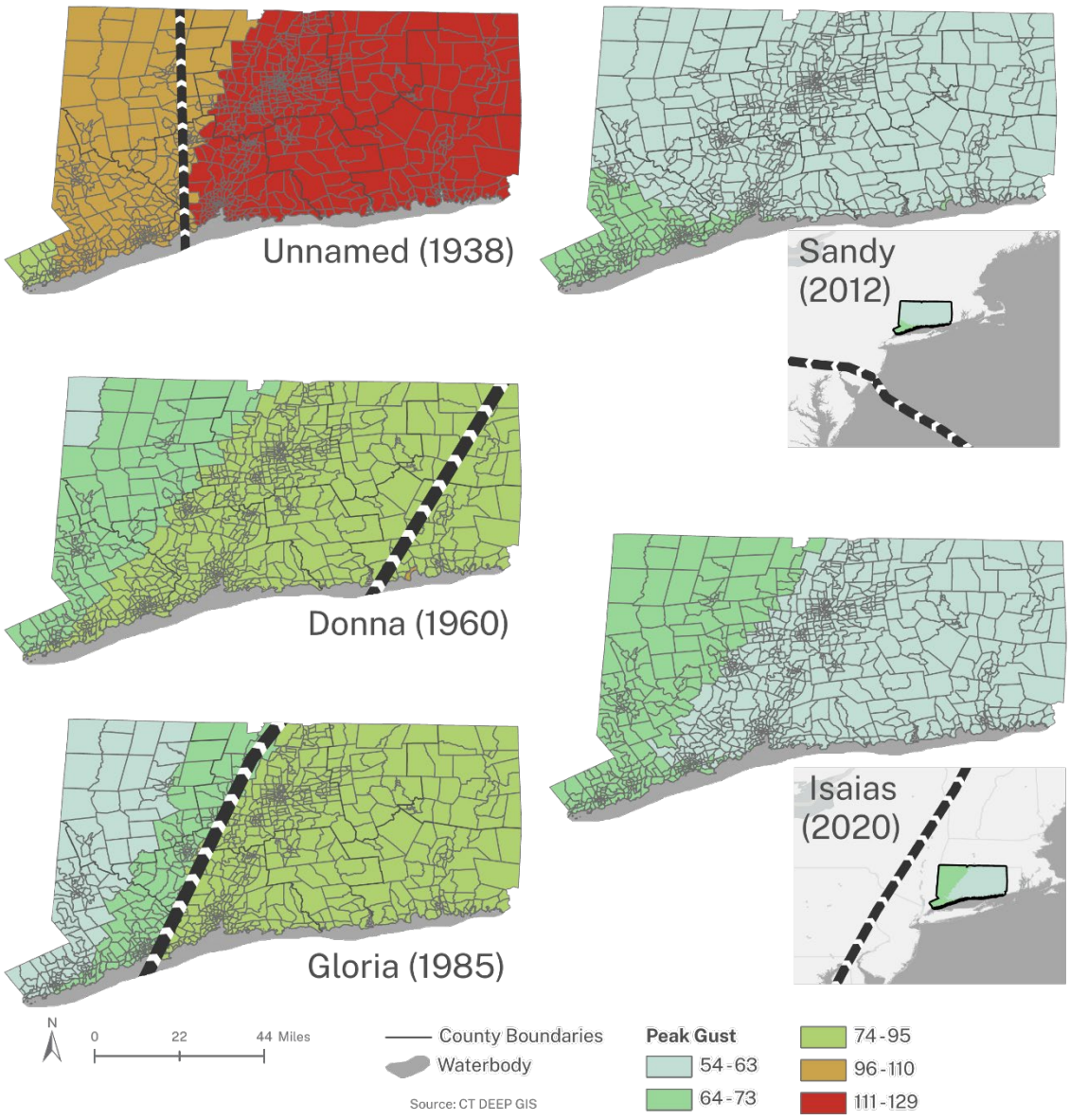


Figure 80. Hurricane path and peak gusts for five historic storm events

It should be noted that Hazus only considers wind damage for its hurricane simulation and does not account for rain and flooding effects. This is important to note because much of the historic impacts of hurricanes experienced by the state have come in the form of severe rain and flooding. Therefore, the damage estimations and shelter/displacement estimates have the potential of being higher for each scenario when one considers the potential threat of flooding that is associated with hurricanes.

4.5.7.1 State Vulnerability

All state-owned facilities and critical facilities are exposed to tornado events. In any given year, facilities could be exposed to multiple tropical cyclone events of varying severity. To

assess the vulnerability of state-owned facilities to tropical cyclone events, state-owned buildings were overlaid with the maximum peak gust wind speeds of 100-year and 1,000-year MRP events. Counts of state-owned buildings and the value of the buildings exposed to Category 1, 2, and 3 strength winds are summarized in Table 90 and Table 91. For an assessment of vulnerability and potential losses because of storm surge from a tropical cyclone, refer to **section 4.3.9**.

Table 90. State-owned buildings exposed to Category 1, 2, or 3 strength winds

Jurisdiction	Total State-Owned Buildings	100-yr Category 1	100-yr Category 2	1,000-yr Category 2	1,000-yr Category 3
Fairfield	267	267	0	53	214
Hartford	688	688	0	207	481
Litchfield	261	261	0	236	25
Middlesex	312	301	11	0	312
New Haven	605	605	0	0	605
New London	493	194	299	0	493
Tolland	885	885	0	24	861
Windham	186	186	0	0	186
Totals	**3,697**	**3,387**	**310**	**520**	**3,177**

Table 91. Value of state-owned buildings exposed to Category 1, 2, or 3 strength winds

Jurisdiction	Value of Buildings	100-yr Category 1	100-yr Category 2	1,000-yr Category 2	1,000-yr Category 3
Fairfield	$676,987,820	$676,987,820	$0	$81,033,510	$595,954,310
Hartford	$2,667,622,713	$2,667,622,713	$0	$301,104,150	$2,366,518,563
Litchfield	$73,771,410	$73,771,410	$0	$72,030,750	$1,740,660
Middlesex	$381,707,210	$314,781,220	$3,925,990	$0	$318,707,210
New Haven	$1,152,697,030	$1,152,697,030	$0	$0	$1,152,697,030
New London	$341,074,970	$140,513,650	$200,561,320	$0	$341,074,970
Tolland	$625,590,980	$625,590,980	$0	$111,010,900	$514,580,080
Windham	$197,291,993	$197,291,993	$0	$0	$197,291,993
Totals	**$8,353,073,536**	**$5,849,265,816**	**$2,503,816,720**	**$565,179,310**	**$7,787,894,226**

4.5.7.2 Councils of Government Vulnerability

Vulnerability to tropical cyclones is also summarized at the Council of Governments (COG) region scale. The estimated total losses by COG for each tropical cyclone MRP event are

shown in Table 92. The two COGs estimated to have the greatest losses across all MRP events are the Capitol Region and the South Central Region. The Capitol region is estimated to have $2.8 million in total losses for the 100-year event and $16.5 million in total losses for the 1,000-year event. The South Central Region is estimated to have $3.1 million in total losses for the 100-year event, and $17.7 million in losses for the 1,000-year event.

Table 92. Total estimated losses for cyclone events by COG (in thousands of dollars)

Jurisdiction	10-yr	20-yr	50-yr	100-yr	200-yr	500-yr	1,000-yr
Capitol Region	$20,051	$219,173	$1,104,687	$2,858,016	$6,948,205	$8,027,356	$16,502,781
Metropolitan	$1,975	$106,402	$170,048	$1,383,519	$2,735,277	$6,715,269	$9,032,938
Naugatuck Valley	$160	$92,408	$159,580	$1,094,598	$2,108,421	$6,517,548	$9,522,721
Northeastern Connecticut	$6,899	$14,868	$477,144	$242,032	$283,931	$110,896	$159,428
Northwest Hills	$907	$48,732	$29,255	$246,980	$422,647	$1,587,975	$2,757,434
Lower Connecticut River Valley	$5,301	$34,342	$632,049	$920,445	$1,800,555	$2,215,615	$2,573,241
South Central Regional	$6,957	$162,145	$755,933	$3,147,096	$6,378,173	$13,217,170	$17,720,094
Southeastern Connecticut	$8,467	$37,136	$2,314,197	$1,168,070	$955,782	$952,579	$782,576
Western Connecticut	$7,665	$197,471	$159,067	$2,172,220	$3,088,004	$8,795,276	$12,950,464
Total	**$58,382**	**$912,678**	**$5,801,960**	**$13,232,975**	**$24,720,997**	**$48,139,684**	**$72,001,677**

While all critical facilities across Connecticut are at risk of exposure to hurricane-force winds, a summary of the critical facilities located within Category 1, 2, or 3 wind speeds under the 100-year or 1,000-year MRP event by COG region is shown in Table 93. The COG region with the most critical facilities vulnerable to Category 3 wind speeds is the Capitol Region, followed by Southeastern, South Central Regional, and Western Connecticut areas. The most vulnerable community lifelines served by these critical facilities are Energy, Hazardous Materials, Health and Medical, and Safety and Security. A more detailed table of critical facilities by COG and community lifeline can be found in Appendix 3.

Table 93. Critical facilities exposed to Category 1, 2, or 3 wind speeds by COG Region

Jurisdiction	Total Critical Facilities	100-yr Category 1	100-yr Category 2	1,000-yr Category 2	1,000-yr Category 3
Capitol Region	446	446	0	83	363
Metropolitan	120	120	0	0	120
Naugatuck Valley	211	211	0	6	205

Jurisdiction	Total Critical Facilities	100-yr Category 1	100-yr Category 2	1,000-yr Category 2	1,000-yr Category 3
Northeastern Connecticut	125	125	0	0	125
Northwest Hills	137	137	0	127	10
Lower Connecticut River Valley	171	140	31	0	171
South Central Regional	254	254	0	0	254
Southeastern Connecticut	275	171	104	0	275
Western Connecticut	285	285	0	50	235
Total	**2,024**	**1,889**	**135**	**266**	**1,758**

Populations continue to grow in existing urban areas exposed to hurricane and tropical storm hazards. To estimate the population vulnerable to tropical cyclone events in each county, the total population of census tracts anticipated to have high damage from a 1,000-yr storm event was summarized by COG. This analysis used 2020 Census data for population. As shown in Table 94, the COG region with the greatest percentage of population located in high damage areas is the South Central Regional COG.

Table 94. COG population associated with estimated damages of greater Than $100K for the 1,000-year storm event

COG Region	Population of COG Census Tracts with >$100K in estimated loss	Percent of the COG Population
Capitol Region	264,200	23%
Metropolitan	105,505	26%
Naugatuck Valley	130,660	37%
Northeastern Connecticut	0	0%
Northwest Hills	31,299	20%
Lower Connecticut River Valley	57,222	30%
South Central Regional	193,564	40%
Southeastern Connecticut	3,747	2%
Western Connecticut	190,293	34%
State Total	**976,490**	**30%**

4.5.7.3 Local Vulnerability

Historically, hurricanes and tropical storms have impacted all eight Connecticut counties. The location of areas with high CCVI Social Sensitivity are shown in comparison to areas with high estimated losses from wind speeds associated with a 1,000-yr storm event in Figure 81. The greatest overlap of high losses and socially sensitive populations occurs in Fairfield, New Haven, and Hartford counties. Socially vulnerable populations, including those with functional needs or over the age of 65, may be more vulnerable to the effects of tropical cyclones given the financial burden and feasibility of evacuation without assistance in the case of a major storm event. Populations located in communities where access to advanced warnings and evacuation orders may not be available in their spoken language are also at a higher risk due to lack of warning time and advance preparations.

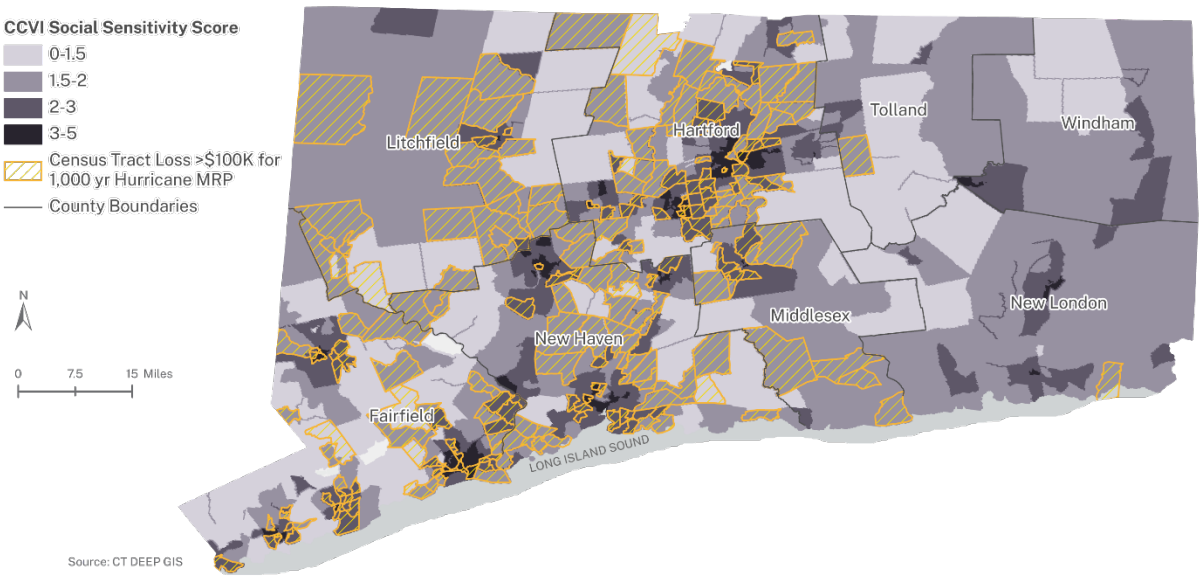


Figure 81. Social Sensitivity scores and census tracts With high estimated losses (>$100K) for the 1,000-year storm event

While all critical facilities in the state are exposed to hurricane wind speeds, county summaries of the critical facilities exposed to Category 1, 2, or 3 wind speeds under the 100-yr or 1,000-yr MPR event is shown in Table 95. The counties with the greatest number of critical facilities exposed to Category 3 wind speeds for the 1,000-yr storm event include New Haven (395 facilities) and Fairfield (371 facilities). A more detailed table of critical facilities by county can be found in Appendix 3.

Table 95. Count of critical facilities exposed to Category 1, 2, or 3 wind speeds by county

Jurisdiction	Total Critical Facilities Present	100-yr Category 1	100-yr Category 2	1,000-yr Category 2	1,000-yr Category 3
Fairfield	400	400	0	29	371
Hartford	365	365	0	73	292

Jurisdiction	Total Critical Facilities Present	100-yr Category 1	100-yr Category 2	1,000-yr Category 2	1,000-yr Category 3
Litchfield	180	180	0	151	29
Middlesex	150	132	18	0	150
New Haven	395	395	0	0	395
New London	285	168	117	0	285
Tolland	117	117	0	13	104
Windham	132	132	0	0	132
Totals	**2,024**	**1,889**	**135**	**266**	**1,758**

To estimate the population exposed to tropical cyclone events in each county, a summary was produced at the county scale for the total population of the census tracts associated with the highest estimated damage (>$100K). As shown in Table 96, the county with the greatest percent of their population aligning with high damage areas is Litchfield. Fairfield, Hartford, Middlesex, and New Haven also have greater than 30% of their county population based in the high damage areas.

Table 96. Population within each county associated with estimated damages of greater than $100K for the 1,000-year storm event

County	Population of County Census Tracts with >$100K in estimated loss	Percent of the County Population
Fairfield	295,984	31%
Hartford	269,574	30%
Litchfield	89,277	48%
Middlesex	57,222	35%
New Haven	255,828	30%
New London	3,747	1%
Tolland	4,858	3%
Windham	0	0%
Total	**976,490**	**30%**

The estimated total losses for all hurricane return periods are shown in Table 97. This shows that Fairfield, New Haven and Hartford counties have the highest estimated total losses for all hurricane return periods combined, $48.6 billion, $54.0 billion, and $35.4 billion respectively.

Table 97. Estimated total losses for each hurricane return period (in thousands of dollars)

Jurisdiction	10-yr	20-yr	50-yr	100-yr	200-yr	500-yr	1,000-yr
Fairfield	$9,642	$309,240	$347,649	$3,660,574	$6,012,752	$15,861,711	$22,367,131
Hartford	$15,098	$208,836	$819,082	$2,612,884	$6,256,992	$8,455,134	$17,079,074
Litchfield	$78	$61,513	$37,090	$349,959	$600,787	$2,609,565	$4,333,466
Middlesex	$4,466	$31,900	$540,934	$841,821	$1,716,972	$2,106,076	$2,492,055
New Haven	$6,991	$219,554	$862,828	$3,865,008	$7,763,887	$17,503,113	$23,809,111
New London	$8,818	$37,232	$2,344,735	$1,184,888	$925,278	$1,013,879	$794,356
Tolland	$6,099	$27,560	$315,852	$417,691	$1,054,205	$433,504	$902,292
Windham	$7,190	$16,843	$533,790	$300,149	$390,124	$156,700	$224,191
Totals	**$58,382**	**$912,678**	**$5,801,960**	**$13,232,974**	**$24,720,997**	**$48,139,682**	**$72,001,676**

The estimated 100-year hurricane return period losses by census tract are shown in Figure 82, and the estimated 1,000-year hurricane return period losses by census tract are shown in Figure 83. The number of census tracts with greater than $100K in damage substantially increases from 15 census tracts with the 100-yr event to 222 census tracts with the 1,000-year event.

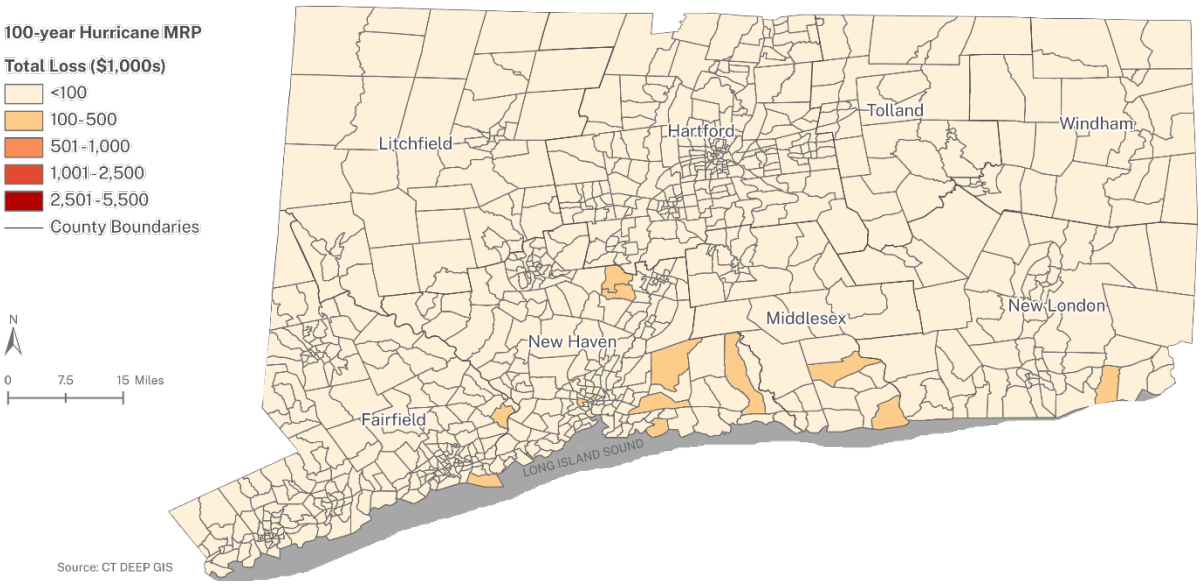


Figure 82. Estimated total losses by census tract for the 100-year hurricane event

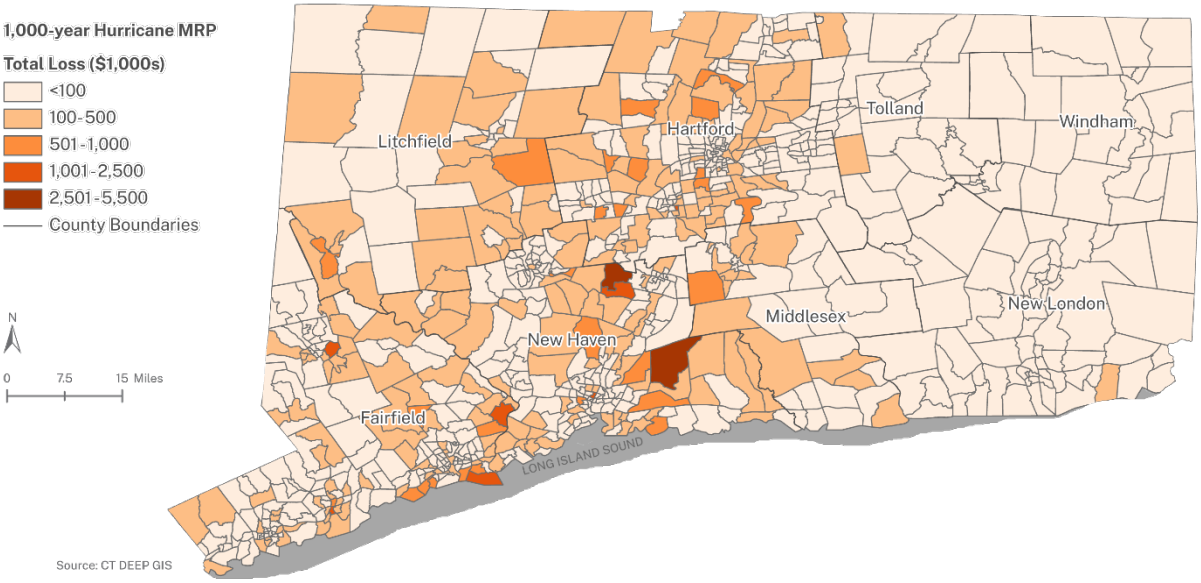


Figure 83. Estimated total losses by census tract for the 1,000-year hurricane event

For each of the historic storm scenario events, the estimated tonnage of debris, estimated building damage, estimated sheltering needs, and estimated direct economic total losses were calculated.

According to the HAZUS Hurricane User Manual: "The Eligible Tree Debris columns provide estimates of the weight and volume of downed trees that would likely be collected and disposed at public expense." As discussed in the Hazus Hurricane Model Technical Manual, the eligible tree debris estimates produced by the Hurricane Model tend to underestimate reported volumes of debris brought to landfills for a number of events that have occurred

over the past several years. This indicates that that there may be other sources of vegetative and non-vegetative debris that are not currently being modeled in Hazus. For landfill estimation purposes, it is recommended that the Hazus debris volume estimate be treated as an approximate lower bound. Based on actual reported debris volumes, it is recommended that the HAZUS results be multiplied by three to obtain an approximate upper bound estimate. It is also important to note that the Hurricane Model assumes a bulking factor of 10 cubic yards per ton of tree debris. If the debris is chipped prior to transport or disposal, a bulking factor of 4 is recommended. Thus, for chipped debris, the eligible tree debris volume should be multiplied by 0.4'.

The historic analysis indicates debris estimates range from 5K tons (Isaias) to over 1.9M tons (Unnamed 1938) of brick and wood debris, as shown in Table 98. For reinforced concrete and steel debris, only impacts were projected under the Unnamed 1938 storm conditions and Hurricane Donna conditions. Tree debris estimates range from 49K tons (Sandy) to 7M tons (Unnamed 1938). Overall, the Unnamed 1938 storm conditions are projected to result in the greatest amount of debris.

Table 98. Estimated debris from wind damage by material type per Hazus storm scenario

Storm Scenario	Brick, Wood and Other (tons)	Reinforced Concrete and Steel (tons)	Eligible Tree Debris (tons)	Total (tons)
Unnamed (1938)	1,907,747	9,227	7,056,529	8,973,503
Donna (1960)	103,203	4	814,124	917,331
Gloria (1985)	112,440	0	889,206	1,001,646
Sandy (2012)	5,503	0	49,390	54,893
Isaias (2020)	5,407	0	55,062	60,469

Statewide estimates for property damages, economic losses, and sheltering needs of state residents as a result of a hurricane making landfall in Connecticut are shown in Table 99, Table 100, and Table 101. The counties with the greatest need for sheltering, hospital needs, emergency food and water requirements, and property damage (both in estimated values and total number of structures damaged) coincide with the figures showing the peak wind gusts and hurricane storm tracks. The damage estimates from Hazus are based on wind damage by a hurricane and do not include damages and shelter needs from damages and property losses by flooding. This is important because depending on the characteristics of a potential hurricane (i.e., does it make landfall at low or high tide, does if pick up strength at the last moments before landfall, is there a stalled weather pattern and the storm produces more rain than anticipated, etc.), state and local officials will need to be aware and anticipate potential flooding that may accompany such a storm event. For estimates of damage resulting from coastal storm surge associated with hurricanes and tropical storms, refer to **section 4.3.9**.

As shown in Table 99, all historic storm scenarios are projected to result in at least minor damage to structures from wind. The only historic storms anticipated to result in complete destruction of structures are the Unnamed 1938 storm, Hurricane Donna, and Hurricane Gloria.

Table 99. Total estimated buildings with damages per storm scenario statewide (number of structures)

Storm Scenario	None	Minor	Moderate	Severe	Destruction
Unnamed (1938)	1,525,762	564,080	174,675	25,576	10,659
Donna (1960)	2,264,768	32,941	2,909	123	10
Gloria (1985)	2,257,763	39,309	3,534	139	9
Sandy (2012)	2,298,305	2,350	93	5	0
Isaias (2020)	2,298,233	2,421	93	5	0

Capital Stock Losses from wind include the subcategories of building damages, contents damages, and inventory losses. Income losses from wind include the subcategories of relocation costs, capital related losses, wage losses, and rental income losses. Total estimated losses ranged from $318K (Isaias) to $61.6M (Unnamed 1938) as shown in Table 100.

Table 100. Estimated Direct Economic Losses for Buildings Statewide in Thousands of Dollars

Storm Scenario	Capital Stock Losses	Income Losses	Total Estimated Losses
Unnamed (1938)	$27,342,396	$3,467,270	$30,809,666
Donna (1960)	$1,346,258	$63,907	$1,410,165
Gloria (1985)	$1,367,154	$79,367	$1,446,521
Sandy (2012)	$141,296	$1,696	$142,992
Isaias (2020)	$156,671	$1,742	$158,413

Across all five historic storm scenarios, the Unnamed 1938 Storm resulted in the greatest damage and estimated sheltering needs. The Unnamed 1938 storm and Hurricane Gloria conditions are estimated to impact Hartford County most significantly in terms of sheltering needs as shown in Table 101. New London County is projected to be most severely impacted in terms of sheltering needs by Hurricane Donna conditions.

Table 101. Estimated sheltering needs for historic storm simulations

Storm Scenario	Total number of Displaced Households	Total Number of People Requiring Short Term Shelter	County with the Greatest Number Displace Households and People Requiring Shelter
Unnamed (1938)	26,953	18,069	Hartford (8,312 households, 5,567 people needing temp. shelter)
Donna (1960)	276	165	New London (173 households, 106 people needing temp. shelter)
Gloria (1985)	440	261	Hartford (141 households, 97 people needing temp. shelter)
Sandy (2012)	0	0	N/A
Isaias (2020)	0	0	N/A

4.5.7.4 Changes in Development

Given that the entire state is exposed to hurricanes and tropical storm events, any new development and increases in population will be vulnerable to the impacts from these hazard events. Total building permits issues in each county in Connecticut between 2018 and 2022 illustrates areas where the State has experienced development growth. As shown in Figure 84, Fairfield, New Haven, and Harford Counties have greater than 3,000 total building permits issues and contain a substantial number of census tracts with high estimated losses for the 1,000-yr storm event. If these recent development trends continue, the estimated damages within these census tracts for hurricane and tropical storms events will continue to increase.

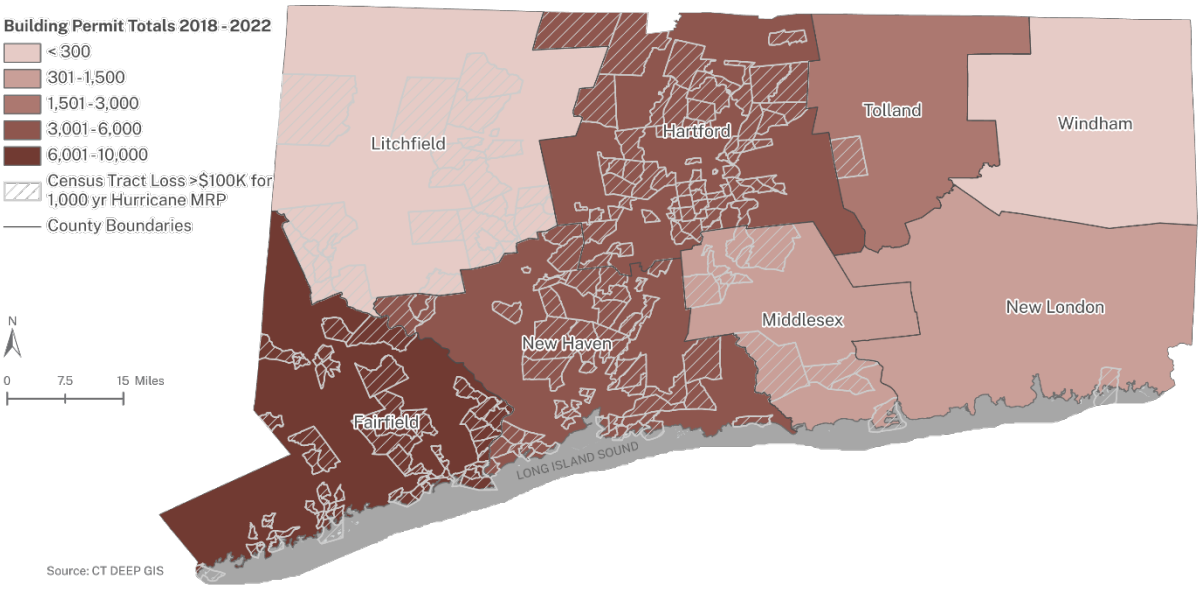


Figure 84. Total building permits issued 2018-2022 by county and areas of high estimated damages from the 1,000-year storm event

Opportunity Zones, defined as federally designated areas that encourage investment in development in low-income communities provide further insights into where future development is likely to occur.[138] Connecticut has 27 Opportunity Zones, and as shown in Figure 85, nearly all of these Opportunity Zones are predicted to be exposed to Category 3 winds for the 1,000-yr hurricane event. These areas are particularly vulnerable to higher future impacts from storm events considering both the projected increase in development and existing low-income neighborhoods that face additional fiscal challenges when preparing for and responding to hurricane events.

[138] US IRS. Opportunity Zones.

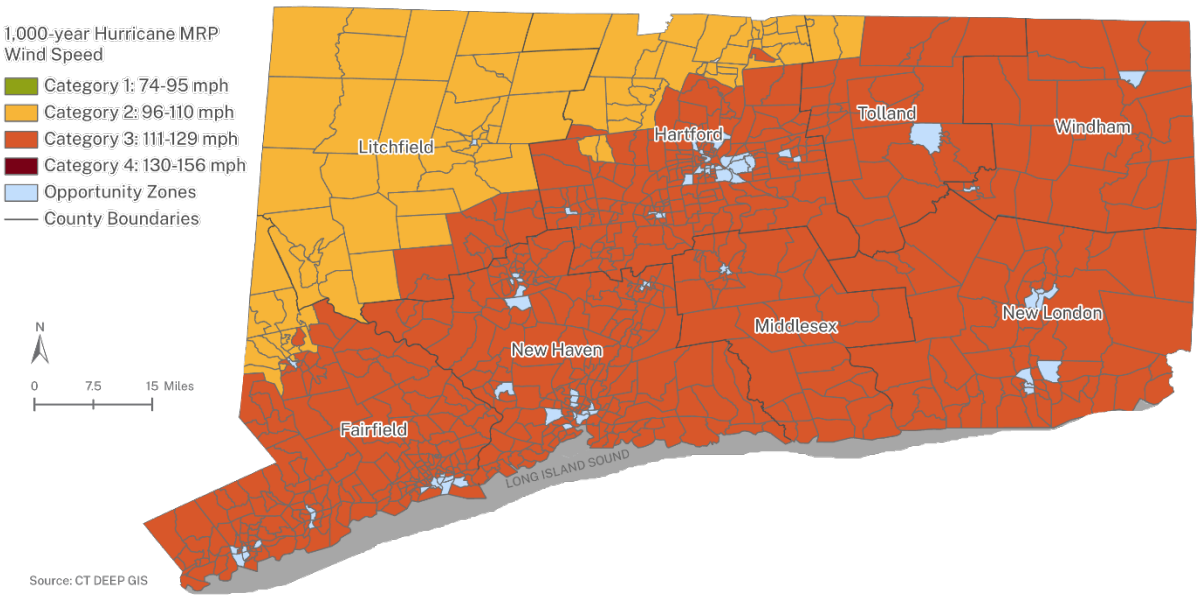


Figure 85. Opportunity zones and wind speeds associated with the 1,000-year storm event

Population growth also contributes to increased exposure of people to tropical cyclones and their related impacts. Population projections for 2040 can identify counties and COGs in Connecticut that are likely to have a larger population vulnerable to tropical cyclones in the future. As shown in Figure 86, the counties with the highest projected population growth (greater than 1%) are Windham, Hartford, and New Haven. Hartford and New Haven counties also have a substantial number of census tracts with projected damage of greater than $100K for the 1,000-yr hurricane event. In contrast, Fairfield County also has a substantial number of estimated high damage census tracts, but the population is expected to decline in population by 2040. While Windham County currently does not have any census tracts with high damage under the 1,000-yr storm event, this could change in the future as the population grows and associated infrastructure to meet population demands is developed.

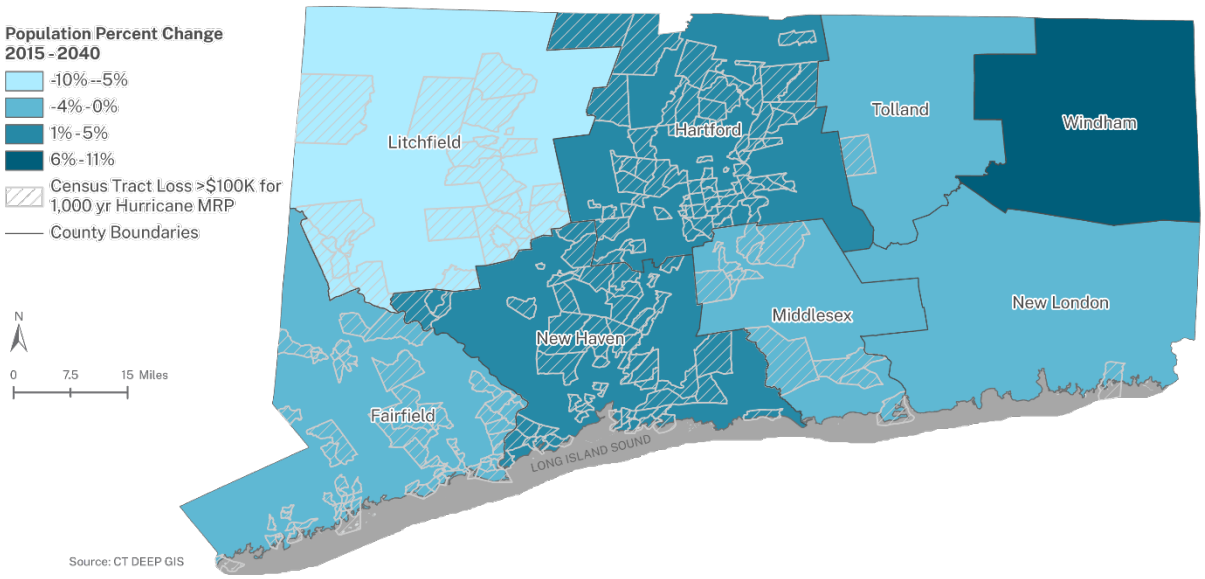


Figure 86. Future population percent change by county and high estimated loss areas for the 1,000-year hurricane event

Building Codes & Future Resilience Development

Connecticut has taken a proactive approach to reduce the risks to newly constructed buildings to enhance resilience as changes in development occur. Connecticut uses the International Code Council's International Building Code and International Residential Code as the base documents for the CT State Building Code and CT Residential Code. The ICC's revisions over the past several code cycles have enhanced the ability of structures to be more resilient to tropical cyclones. Specifically, the newer versions of the code require a more robust reinforcement of the structural frame to resist the uplift from the winds from the storm, more robust windows that are more resistant to breakage from wind driven objects and more stringent installation requirements of roofing materials to prevent the materials to be blown off the roof and allowing rain to enter the structure. Enhanced resiliency will ensure a quicker recovery and improve the life safety for any occupants that choose to remain in these newer constructed buildings.

4.5.8 Conclusion

Tropical cyclone was ranked on the risk parameters as detailed in Table 24. To summarize the overall risk of tropical cyclone for each county, each risk parameter score was multiplied by its impact weight and combined into a county composite ranking.

Table 102 shows the tropical cyclone hazard ranking for each county. The high to low comparison does not mean that a low or medium-low hazard will not occur or will not have some impact on the community. However, it does provide an overview of what hazards may

pose the greatest risk to each county given available data. This document should serve as a guide to help planners and officials in managing risk and prioritize mitigation actions.

Table 102. Tropical Cyclone hazard ranking by county.

	Fairfield	Hartford	Litchfield	Middlesex	New Haven	New London	Tolland	Windham
Hazard Concern	M-H	M-H	M-H	M-H	M-H	M-H	M-H	M-H
Local Plan Rating	H	H	H	H	H	H	H	H
Geographic Extent	M	M-H	M	M-H	M	H	M-H	L
Population Density	H	M-H	M	M-L	M-H	M	M-L	L
Future Development	H	M-H	M-L	M-L	M-H	M	M	L
Facility Intersect	H	M-H	M	M-L	M-H	M	L	M-L
Future Events	M	M-H	M	M-H	M	H	M-H	L
Future Losses	M-H	M-H	M-L	M	H	M	M-L	L
Injury & Death	L	L	L	L	H	L	L	L
Social Sensitivity	M-H	H	M-L	M-L	M-H	M	L	M
Composite*	**M-H**	**M-H**	**M-L**	**M**	**H**	**M-H**	**M-L**	**L**

* Each parameter's weighted score was added together to create a composite rank for each county. A risk determination of high, medium-high, medium, medium-low, and low was then assigned based on percentiles. A summation of all the composite scores for all assessed hazards in each jurisdiction provides an overall risk rank per county. For more information, refer to Section 4.1.1.4.

4.6 Thunderstorm

Thunderstorms are storms capable of producing high winds, heavy rains, lightning, and hail. Lightning is a luminous, electrical discharge in the atmosphere caused by the electric-charge separation of precipitation particles within a thunderstorm. The sudden burst of heat caused by these discharges results in the expansion of air, causing a sound wave known as thunder.[139] Thunderstorms are formed when atmospheric conditions combine to provide moisture, lift, and warm unstable air that can rise rapidly. Thunderstorms occur any time of the day and in all months of the year but are most common during summer afternoons and evenings and in conjunction with frontal boundaries. A frontal boundary occurs when two air masses are separated, and clouds and precipitation appear between the air masses, causing thunderstorms. Frontal boundaries can be categorized into cold fronts, warm fronts, stationary fronts, and occluded fronts.[140]

Thunderstorms can be extremely destructive. Storms can form in less than 30 minutes, giving very little warning. Thunderstorms have the potential to produce lightning, hail, tornadoes, powerful straight-line winds, and heavy rains that cause flash flooding. Thunderstorms can contribute to other hazard events, such as flooding (**section 4.3**), strong straight-line winds, tornadoes (**section 4.8**), hail, and lightning, as well as the possibility of lightning-initiated wildland fires (**section 4.9**).

Lightning often strikes outside of areas where it is raining and may occur as far as 10 miles away from rainfall. It can strike from any part of the storm and may even strike after the storm has seemed to pass. Hundreds of people across the nation are injured annually by lightning, most commonly when they are moving to a safe place but have waited too long to seek shelter. Lightning strike victims often suffer long-term effects such as memory loss, sleep disorders, weakness and fatigue, chronic pain, depression, and muscle spasms.

Hail forms inside a thunderstorm where there are strong updrafts of warm air and downdrafts of cold water. If a water droplet is picked up by the updrafts, it can be carried well above the freezing level. Water droplets freeze when temperatures reach 32°F or colder. As the frozen droplet begins to fall, it may thaw as it moves into warmer air toward the bottom of the thunderstorm. However, the droplet may be picked up again by another updraft and carried back into the cold air and re-freeze. With each trip above and below the freezing level, the frozen droplet adds another layer of ice. The frozen droplet, with many layers of ice, falls to the ground as hail. Most hail is small and typically less than two inches in diameter but can be as large as 4.5 inches in diameter.[141]

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[139] NWS. Understanding Lightning Science. https://www.weather.gov/safety/lightning-science-overview#:~:text=Lightning%20is%20a%20giant%20spark,the%20atmosphere%20and%20the%20ground
[140] Weather.gov. Thunderstorm Ingredients. https://www.weather.gov/source/zhu/ZHU_Training_Page/thunderstorm_stuff/Thunderstorms/thunderstorms.htm#:~:text=Storms%20tend%20to%20be%20strongest,thus%20realize%20more%20convective%20energy
[141] NWS. 2010. "Hail Awareness." On-Line Address: http://www.weather.gov/cae/hail.html

High winds due to thunderstorms are experienced in all parts of the United States. Wind begins with differences in air pressures. It is a rough horizontal movement of air caused by uneven heating of the earth's surface. Wind occurs at all scales, from local breezes lasting a few minutes to global winds resulting from solar heating of the earth. Effects from high winds can include downed trees and power lines, and damages to roofs and windows Table 103 provides the descriptions of winds classified by the NWS.[142]

Table 103. NWS Wind Descriptions

Descriptive Term	Sustained Wind Speed
Damaging High Wind	≥58 mph
High Wind	40-57 mph
Very Windy	26-39 mph
Windy	21-25 mph
Breezy to Windy	20 mph
Non-Threatening	0-19 mph

Another widespread thunderstorm wind event is known as a derecho. Derechos are associated with lines of fast-moving thunderstorms that may vary in length and have the potential to travel hundreds of miles. Winds in these types of events can rival those of "weaker" tornadoes with gusts of 80 to 100 mph covering a wide area.

Typical thunderstorms are 15 miles in diameter and last an average of 30 minutes. An estimated 100,000 thunderstorms occur each year in the United States, with approximately 10% of them classified as severe. During the warm season, thunderstorms are responsible for most of the rainfall.[143]

4.6.1 Location

Thunderstorms can occur anywhere in Connecticut. These types of storms often cover large areas that can affect entire towns, cities, and counties. Larger systems and lines of storms can affect the entire state in the right conditions. Thunderstorms can produce damaging winds, hail, and lightning that can cause damage over a wide area, with severe localized affects.

Figure 87 shows the average number of thunderstorm days throughout the United States. Connecticut can expect to experience between 18 and 27 thunderstorm days each year.[144]

[142] Rosenstiel School of Marine & Atmospheric Science. 2005. "Katabatic Winds." University of Miami. December 1. On-Line Address: http://www.rsmas.miami.edu/personal/milicak/katabatic/node3.html
[143] NSSL NOAA. Severe Weather 101- Thunderstorms. https://www.nssl.noaa.gov/education/svrwx101/thunderstorms/
[144] NOAA. JetStream. https://www.weather.gov/jetstream/tstorms_intro

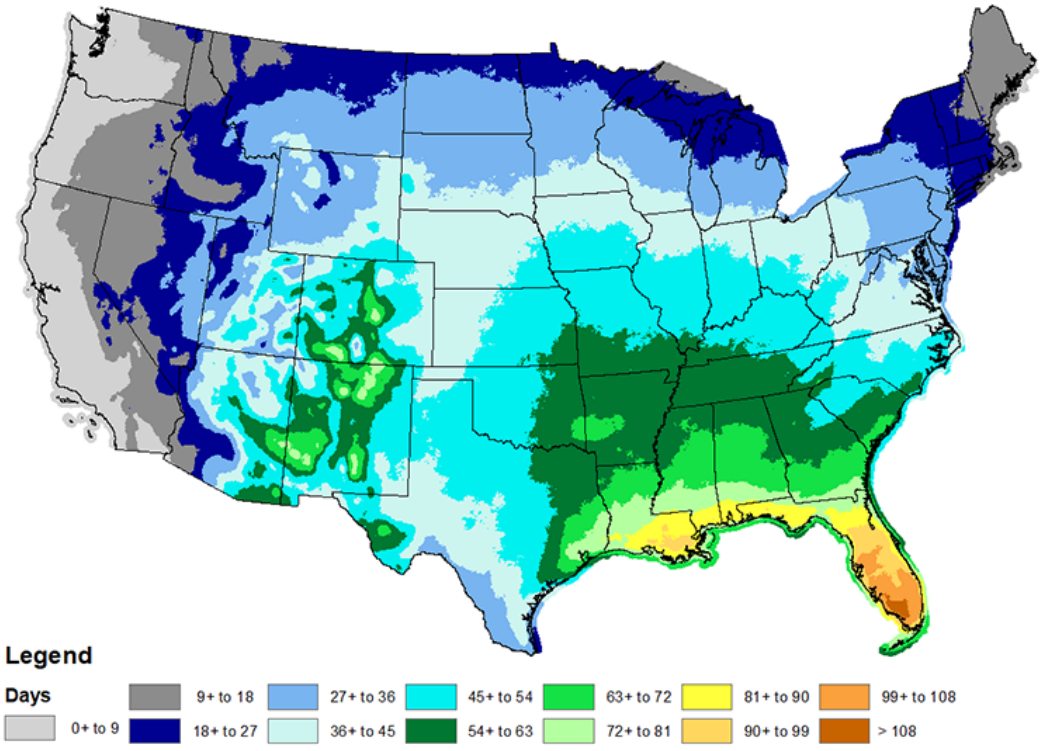


Figure 87. Annual average number of thunderstorm days in the United States (NOAA)

Lightning has emerged as one of the greatest weather hazards associated with thunderstorms and can occur anywhere there is a thunderstorm. Lightning flash data compiled by Vaisala, Inc. with data from 2015 through 2020 shows total lightning density per county, shown in Figure 88. Counties in Connecticut range from 0.5 to 1 to 32 to 64 lightning density events/km2/year, with a statewide average of 9.34 events/km2/year.[145] The location with the highest density of lightning strikes is in the north central portion of the State, across Hartford and Tolland counties.

[145] Vaisala, Inc. Total lightning statistics. https://www.vaisala.com/sites/default/files/documents/WEA-MET-2021-Annual-Lightning-Report-B212465EN-A.pdf

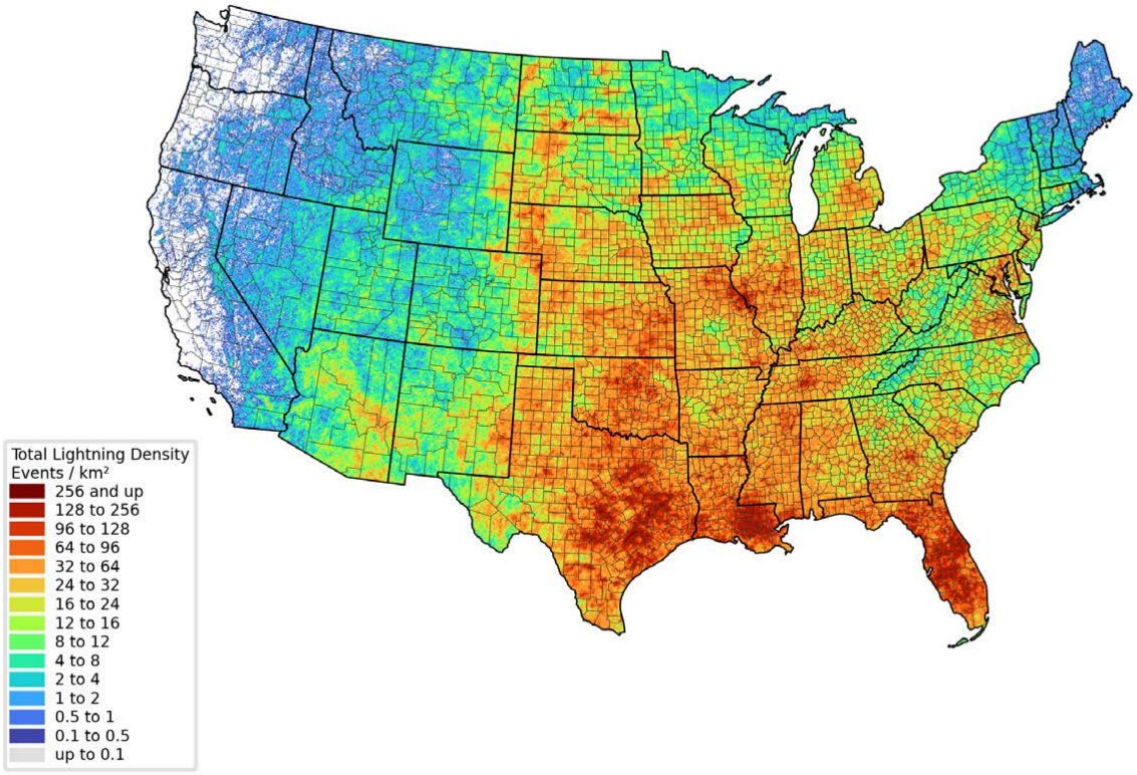


Figure 88. Vaisala, Inc. total lightning density (2015-2020)

Hail causes nearly $2 billion in crop and property damages, on average, each year in the United States. Hail occurs most frequently in the southern and central plain states; however, since hail occurs with thunderstorms, the possibility of hail damage exists throughout the entire United States.[146] Figure 89 indicates that Connecticut experiences between three and four severe hail days a year, on average.

[146] Flash. Hail. https://flash.org/peril/hail/

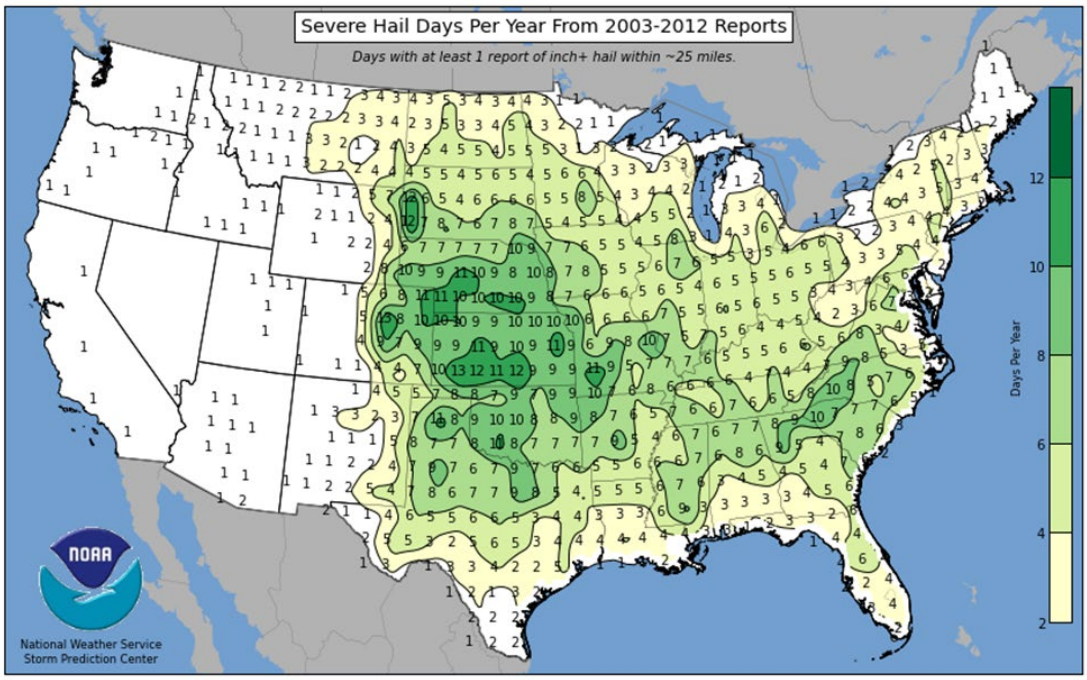


Figure 89. Annual Frequency of Hailstorms in the United States (NOAA)

Wind associated with thunderstorms can occur across the entire state. Figure 90 shows the wind zones in the United States, indicating the general location of the most wind activity. The map is based on 40 years of tornado data and 100 years of hurricane data, collected by FEMA. Ranked from highest to lowest, states located in Wind Zone IV have experienced the greatest number of tornadoes and the strongest tornadoes. Connecticut is located within Wind Zone II, which may experience wind speeds up to 160 mph.

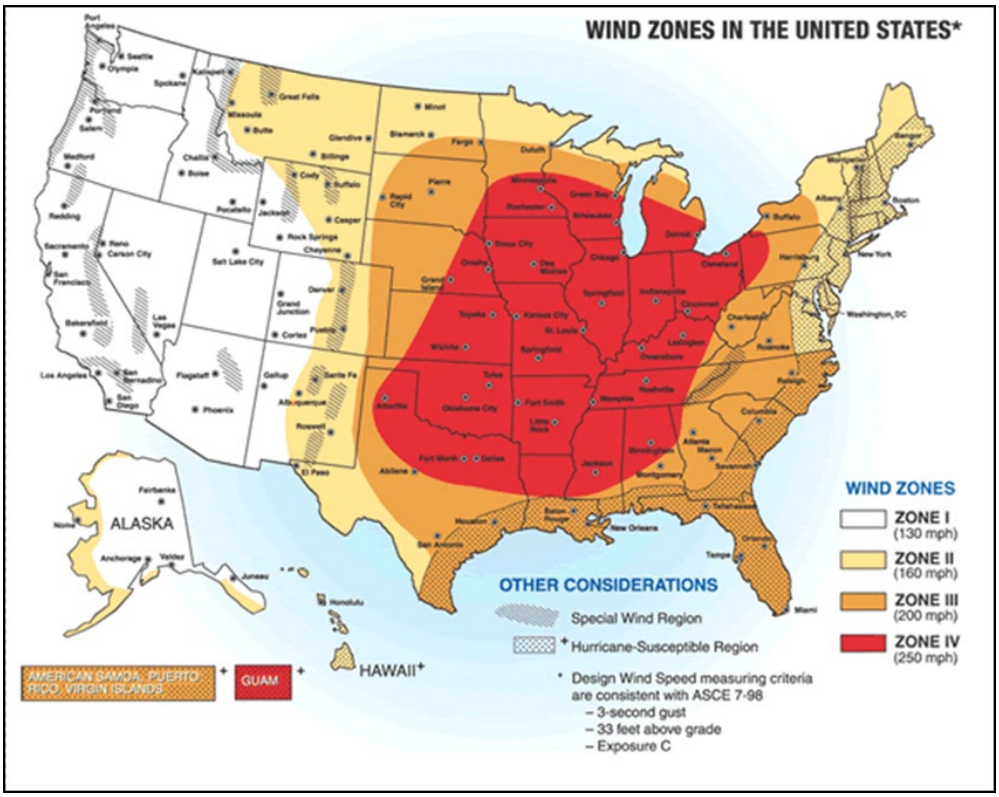


Figure 90. Wind Zones in the United States (FEMA)

4.6.2 Intensity

Each year there are an estimated 100,000 thunderstorms in the United States. 10% of these storms reach severe levels.[147] A Severe Thunderstorm is defined by the National Weather Service as a thunderstorm that produces a tornado, winds of at least 58 mph, and/or hail at least 1" in diameter. Structural wind damage may imply the occurrence of a severe thunderstorm. A thunderstorm wind equal to or greater than 40 mph and/or hail of at least 1" is defined as approaching severe.[148] The National Weather Service provides two levels of public notification for severe thunderstorms: watch and warning.[149]

- **Severe Thunderstorm Watch: Be Prepared!** Severe thunderstorms are possible in and near the watch area. Stay informed and be ready to act if a severe thunderstorm warning is issued. The watch area is typically large, covering numerous counties or even states.
- **Severe Thunderstorm Warning: Take Action!** Severe weather has been reported by spotters or indicated by radar. Warnings indicate imminent danger to life and

[147] NOAA NSSL. Severe Weather 101- Thunderstorms. https://www.nssl.noaa.gov/education/svrwx101/thunderstorms/
[148] NOAA NWS. Glossary. http://w1.weather.gov/glossary/index.php?letter=s
[149] NWS. Understand Severe Weather Alerts. https://www.weather.gov/safety/thunderstorm-ww

property. Take shelter in a substantial building. Get out of mobile homes that can blow over in high winds. Warnings typically encompass a much smaller area (around the size of a city or small county) that may be impacted by a large hail or damaging wind identified by an NWS forecaster on radar or by a trained spotter/law enforcement who is watching the storm.

The NWS classifies a thunderstorm as severe if it produces hail at least one inch in diameter, winds of 58 mph or greater, or a tornado. About 10% of the estimated 100,000 annual thunderstorms that occur nationwide are classified as severe.[150]

Cloud-to-ground lightning is the most threatening risk from thunderstorms due to its ability to cause death, injury, wildfires, and damage to property. The extent of lightning is dependent upon a multitude of factors, including ground elevation, ground humidity, and wind currents.

Hail typically occurs with thunderstorm events. The severity of hail is measured by duration, hail size, and geographic extent. The size of hail is estimated by comparing it to a known object. Most hailstorms are made up of a variety of sizes of hail, and only the very largest hail stones pose serious risk to people, when exposed. Table 104 shows the different sizes of hail and the comparison to real-world objects.

Table 104. Hail Size

Size	Inches in Diameter
Pea	0.25 inch
Mothball/Peanut	0.50 inch
Penny	0.75 inch
Nickel	0.875 inch
Quarter	1.0 inch
Half Dollar	1.25 inches
Ping-Pong Ball	1.5 inches
Golf Ball	1.75 inches
Lime	2 inches
Tennis Ball	2.5 inches
Baseball	2.75 inches
Teacup	3.0 inches
Softball	4.0 inches
Grapefruit	4.5 inches

[150] National Oceanic and Atmospheric Administration, http://www.nws.noaa.gov/om/severeweather/resources/ttl6-10.pdf

Source: NOAA Storm Prediction Center

Straight-line winds, winds that come out of a thunderstorm, in extreme cases, can cause wind gusts exceeding 100 mph. These winds are most responsible for hailstorm and thunderstorm wind damage. Windstorms have been known to cause damage to utilities. The predicted wind speed given in wind warnings issued by the NWS is for a one-minute average; gusts may be 25% to 30% higher.

The NWS issues advisories, watches, and warnings for winds. A wind advisory is defined as sustained winds 31 to 39 mph and/or gusts of 46 to 57 mph. Issuance is normally site-specific. The National Weather Service issues public notifications for dangerous wind: warning, watch, and advisory.[151]

- **High Wind Warning: Take Action!** Sustained, strong winds with even stronger gusts are happening. Seek shelter. If you are driving, keep both hands on the wheels and slow down. NWS offices issue this product based on local criteria.
- **High Wind Watch: Be Prepared!** Sustained, strong winds are possible. Secure loose outdoor items and adjust plans as necessary so you're not caught outside. NWS offices issue this product based on local criteria.
- **Wind Advisory: Take Action!** Strong winds are occurring but are not so strong as to warrant a High Wind Warning. Objects that are outdoors should be secured and caution should be taken if driving. NWS offices issue this product based on local criteria.

4.6.3 Impacts

Severe thunderstorms are often accompanied by strong winds and hail. Both of these hazards have the potential to damage critical infrastructure. Additionally, flash flooding, particularly in low lying areas, is a secondary effect of thunderstorms as intense rain often accompanies thunderstorms.



- Lightning from thunderstorms can cause structural damage to state-owned buildings and critical facilities. Lightning can also create fires, which can further damage structures and lead to interruptions in above-ground power and communication systems.
- Flooding resulting from heavy rain during thunderstorms can cause structural damage.
- Hail and strong winds can also cause damage to buildings and utility systems.

[151] NWS. Wind Warnings, Watches, and Advisories. https://www.weather.gov/safety/wind-ww



- Hail can impact traffic routes and may lead to transportation accidents due to reduced visibility or damage to vehicles.
- High wind due to thunderstorms can lead to a higher rate of traffic accidents that may occur when power to traffic control devices is disrupted.
- Flooding can cause road closures and traffic accidents.



- Lightning is the leading cause of farm fires. If struck by lightning, livestock can be killed or injured.



- Lightning produced by thunderstorms can cause injury or fatality due to electrocution or fires.
- Hail poses the threat of personal injury, particularly for hail stones of larger sizes.
- Residents in the state that live in remote areas with limited road or transportation access may be temporarily isolated and cut off from critical facilities if roads become impassable due to debris or fallen trees or extended power outages occur, putting their health at risk in case of an emergency.



- A major storm event can cause damages associated with property, debris generation, and loss of power.
- Delivery of services may also be slowed or halted in affected areas as a result of momentary losses in power and communications.

4.6.4 Previous Occurrences and Losses

The entire State of Connecticut is vulnerable to thunderstorms and their impacts. The NCEI Storm Events database was used to identify thunderstorms that occurred in the State between January 1950 and December 2022. It should be noted that the database does not categorize thunderstorms as storm events, but it does categorize thunderstorm characteristics. To determine the number of previous thunderstorm occurrences, events categorized under the following thunderstorm characteristics were identified: hail, high wind, lightning, strong wind, and thunderstorm wind. According to NCEI storm events records, there were 3,503 thunderstorm event, which led to 29 fatalities and 168 injuries reported within the state between January 1950 and December 2022. The thunderstorm related hazards used in this analysis are defined as:

- **Hail** - Frozen precipitation in the form of balls or irregular lumps of ice.
- **High wind** - Sustained non-convective winds of 40 mph or greater lasting for 1 hour or longer, or gusts of 58 mph or greater for any duration (or otherwise locally/regionally defined).
- **Lightning** - A sudden electrical discharge from a thunderstorm, resulting in a fatality, injury, and/or damage.
- **Strong wind** - Non-convective winds gusting less than 58 mph, or sustained winds less than 40 mph, resulting in a fatality, injury, or damage.
- **Thunderstorm Winds** - Winds, arising from convection (occurring within 30 minutes of lightning being observed or detected), with speeds of at least 58 mph, or winds of any speed (non-severe thunderstorm winds below 58 mph) producing a fatality, injury, or damage.

Table 105 provides a summary of historic thunderstorm events, by county, that occurred in the State.

Table 105. NCEI Total Thunderstorm Events, 1950 – 2022, Adjusted to 2022 Dollars

County	Number of Events	Number of Injuries*	Number of Deaths	Property Damages	Crop Damages
Fairfield	619	62	15	$18,286,237	$0.00
Hartford	639	35	3	$15,612,412	$0.00
Litchfield	775	17	2	$4,443,360	$57,950
Middlesex	189	4	3	$1,539,879	$0.00
New Haven	475	20	2	$5,195,221	$0.00
New London	263	22	3	$3,998,133	$0.00
Tolland	302	5	1	$2,896,056	$0.00
Windham	241	3	0	$2,193,819	$0.00
Total†	**3,503**	**168**	**29**	**$54,165,117**	**$57,950**

* Note: Number of Injuries and Deaths are reported by NWS as zonal events and as a result the individual jurisdiction totals are not cumulative for the state.
† Note: event totals may reflect a storm event that has affected multiple counties that have been counted as individual events in each affected county.

Notable thunderstorm events that have impacted Connecticut within the past five years in terms of deaths, injuries, and/or property damages include the following (dollar values listed in the descriptions below are not adjusted for inflation):

- **May 15, 2018:** A cold front triggered numerous severe thunderstorms over southern Connecticut. These storms produced 2 tornadoes in the Lower Hudson Valley. One

death was reported as a tree fell on a truck in Candlewood Lake area killing a man Two severe injuries were reported as well as a dugout roof collapsed on a baseball field resulting in one serious injury, and a large tree fell on a house, injuring one person inside.

- **June 30, 2019:** A strong upper-level disturbance triggered severe thunderstorms across Southern Connecticut. A fallen tree into a car resulted in a fatality and another person having to be extracted from the car on Sturges Road in the Mill Plain section of Fairfield.
- **August 27, 2020:** A pair of supercell thunderstorms tracked through Litchfield County along a warm front during the afternoon of the 27th. These storms resulted in numerous damage reports, especially in the area from Kent to Woodbury. Eighty percent of the town of Roxbury was without power because of the storms. In addition, two brief EF0 tornadoes occurred in Kent and Woodbury. Tornadoes also occurred in New Haven County.
- **June 29, 2021:** Oppressive heat and humidity and strong low-level lapse rates created the environment for scattered severe thunderstorms to form in the late afternoon and evening hours across portions of Massachusetts and northern Connecticut. In Enfield, a large tree was down on a house. Two people had to be freed from the house and were transported to a hospital.
- **July 14, 2022:** A weak cold front triggered isolated severe thunderstorms in eastern Connecticut during the early evening. The 911 Call Center in Willimantic reported that a chimney fell into a roof, utility poles were damaged, and numerous trees and electrical wires were downed due to heavy winds. Reports were relayed to NWS via amateur radio operators.

Between 1954 and 2022, the State of Connecticut was included in 11 severe storm-related major disasters (DR) or emergency (EM) declarations classified as one or a combination of the following disaster types: severe storm, flooding, and tornadoes. Generally, these disasters cover a wide region of the State; therefore, they can impact many counties. However, not all counties were included in the disaster declarations as determined by FEMA. Since the 2019 State HMP, Connecticut has had 6 additional DR declarations that include thunderstorm related impacts (Table 106).

Table 106. FEMA Disaster Declarations (2018-2023)

Disaster Number	Program Type	Declaration Date	Incident Type	Title	Declared County Area
4385	DR	8/20/2018	Tornado	Severe Storms, Tornadoes, and Straight-Line Winds	Fairfield, New Haven

Disaster Number	Program Type	Declaration Date	Incident Type	Title	Declared County Area
4410	DR	12/5/2019	Severe Storm	Severe Storms and Flooding	New London, Middlesex
3535	EM	8/6/2020	Hurricane	Tropical Storm Isaias	All Counties
4580	DR	1/12/2021	Hurricane	Tropical Storm Isaias	All Counties
3564	EM	8/22/2021	Hurricane	Hurricane Henri	All Counties
4629	DR	10/30/2021	Hurricane	Remnants of Hurricane Ida	Fairfield, New London, New Haven, Middlesex, Litchfield

4.6.5 Future Losses

Historically, thunderstorm events have occurred throughout the state, with Western Connecticut experiencing the greatest number of events. Table 107 shows the annualized number of the combined thunderstorm categories by jurisdiction based on the NCEI historical record. Litchfield County has the highest probable number of thunderstorm events per year, followed by Fairfield and Hartford Counties.

Table 107. Annualized Events and Losses for Thunderstorms

County	Annualized Events	Annualized Damages
Fairfield	9.10	$268,915
Hartford	9.40	$229,594
Litchfield	11.40	$65,344
Middlesex	2.78	$22,645
New Haven	6.99	$76,400
New London	3.87	$58,796
Tolland	4.44	$42,589
Windham	3.54	$32,262
Total	*	**$796,546**

* Annualized event totals were not included because NCEI events may be counted more than once if one storm event affects multiple counties. This duplication renders totals inaccurate.

It is reasonable to assume that Connecticut will continue to experience multiple thunderstorms per year. It is worth noting that the differences in the number of reported events may be significantly related to population and population density. Regardless, based on this analysis, thunderstorms are a significant hazard to Connecticut.

4.6.6 Climate Change Impacts

Connecticut's climate is changing. The state has warmed 2-3oF in the last century. Storms have become more intense in recent decades, and a number of scientific studies have shown that this trend is likely to continue as temperatures continue to warm. The reason, in large part, is that the atmosphere can hold more water as it gets warmer, thereby generating heavier rain. Climate change projections show that major clusters of summertime thunderstorms in North America will grow larger, more intense, and more frequent later this century in a changing climate, unleashing far more rain and posing a greater threat of flooding across wide areas.[152] By the end of the century, the number of summertime storms that produce extreme downpours could increase by more than 400% across parts of the United States. In addition, the intensity of individual extreme rainfall events could increase by as much as 70% in some areas.[153]

Climate modeling also suggests that the eastern United States will see more of an increase in days favorable to severe thunderstorm formation than the western part of the country, as shown in Figure 91.[154]

[152] NCAR UCAR. North American Storm Clusters Could Produce 80% More Rain. https://www2.ucar.edu/atmosnews/news/130085/north-american-storm-clusters-could-produce-80-percent-more-rain
[153] NCAR UCAR. Extreme Downpours Could Increase Fivefold Across Parts of the US. https://www2.ucar.edu/atmosnews/news/124334/extreme-downpours-could-increase-fivefold-across-parts-us
[154] NASA. Severe thunderstorms and climate change. 2013. https://climate.nasa.gov/news/897/severe-thunderstorms-and-climate-change/

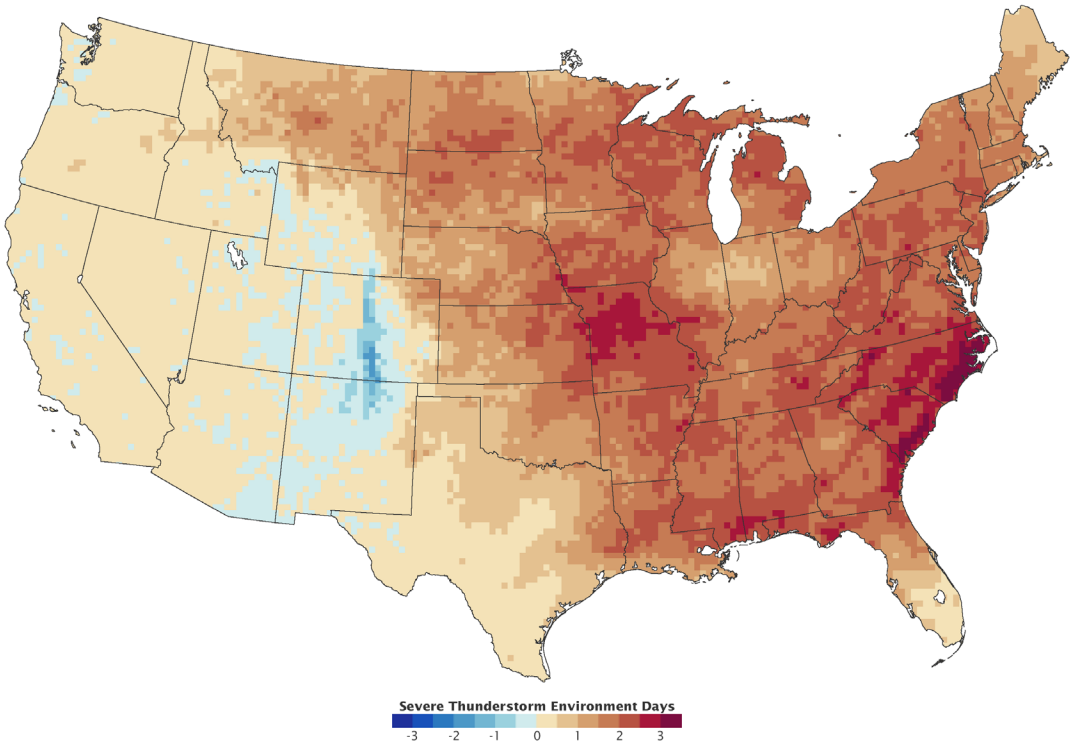


Figure 91. Severe Thunderstorm Environment Days

Thunderstorms and other heavy rainfall events are estimated to cause more than $20 billion of economic losses annually in the United States. Particularly damaging, and often deadly, are mesoscale convective systems (MCSs): clusters of thunderstorms that can extend for many dozens of miles and last for hours, producing flash floods, debris flows, landslides, high winds, and/or hail.[155] Modeling has found that the number of severe MCSs in North America more than tripled by the end of the 21st century. Moreover, maximum rainfall rates became 15 to 40% heavier, and intense rainfall reached farther from the storm's center. As a result, severe MCSs increased throughout North America, particularly in the northeastern states, where they are currently uncommon. Projected climate change impacts are detailed in Table 108.

Table 108. Climate Impacts with Projected Change

Impact	Projected Change
Location	Climate science does not indicate a change in thunderstorm location.
Intensity	The intensity of individual thunderstorms is projected to increase, with more severe lightning, hail, and potential tornadoes.

[155] NCAR UCAR. North American Storm Clusters Could Produce 80% More Rain. https://www2.ucar.edu/atmosnews/news/130085/north-american-storm-clusters-could-produce-80-percent-more-rain

Impact	Projected Change
Frequency	Days favorable to severe thunderstorm formation will increase in the Eastern United States, which may cause more frequent thunderstorms.
Duration	Climate science does not indicate changes in duration of thunderstorms.
Model Confidence	Low to medium confidence.

4.6.7 Vulnerability Assessment

To understand risk, the assets exposed to hazards must be identified. Certain areas in Connecticut are more vulnerable to thunderstorm-related events than others due to geographic location, population, and number of structures present.

Thunderstorms typically cause damage due to hail, strong winds, and lightning. Damages associated with hail during thunderstorms are primarily due to hail stones, which can damage the exterior of buildings and cars. The extent of damage depends on the size of hail stones and intensity of the storm.

Thunderstorm-related wind poses a threat to Connecticut in many forms, including wind-blown debris, interruptions in elevated power and communications utilities and structural damage. Structural vulnerability to thunderstorm-related wind events depends on building construction type. Residential structures are generally more susceptible to wind damage than commercial and industrial structures. Wood and masonry buildings in general, regardless of their occupancy class, tend to experience more damage than concrete or steel buildings. High-rise buildings are also vulnerable structures. Mobile homes are the most vulnerable to wind damage, even if tied down, and offer little protection to people inside.

Individual building vulnerability to lightning strike is heavily influenced by building construction, location, and proximity to nearby trees or other tall structures. In general, buildings are more likely to be struck by lightning if they are located on high ground or if they have tall protrusions such as steeples or poles. Electrical and communications utilities are also vulnerable to direct lightning strikes. Damage to these lines has the potential to cause power and communications outages for businesses, residencies, and critical facilities.

In 2021, more than $1 billion in lightning-caused homeowners insurance claims were paid out to 60,000 policy holders. Lightning can cause severe damage to appliances, electronics, computers and equipment, phone systems, electrical fixtures, and the

electrical foundation of a home. In addition, lightning can result in deadly fires causing structures to collapse.[156]

Human vulnerability to thunderstorms is largely determined by the warning time for the approach of severe storms, and by the availability of nearby shelter. Individuals who immediately seek shelter in a sturdy building or vehicle are much safer than those who remain outdoors.

4.6.7.1 State Vulnerability

All state-owned buildings are vulnerable to thunderstorms. Losses related to thunderstorms are primarily due to structural impacts, caused by lightning strikes, hail stones, and strong winds.

State owned buildings throughout the state may be vulnerable to strong winds associated with thunderstorms. Wind damage to buildings is dependent upon several factors including wind speed and duration and building construction. In particular, structures that were built before building codes and use of construction design wind speeds and corresponding wind zones (Figure 90) may be vulnerable to wind damage. Structures should be designed to withstand the total wind load of the zone in which they are located. The State Building Code includes standards for constructing buildings to withstand wind pressures and wind forces on roofs. Vulnerability to wind-related hazards is discussed in the Tropical Cyclone Vulnerability Assessment (**section 4.5.7**).

Vulnerability of state assets from thunderstorm-related hazards was determined by a geospatial analysis of state-owned buildings and areas of high or moderate thunderstorm risk. To determine areas with high or moderate thunderstorm risk, National Risk Index (NRI) risk rating values of high or moderate for thunderstorm-related hazards- hail, strong wind, and lightning- were evaluated by census tract. Table 109 shows the number of state-owned buildings exposed to high or moderate thunderstorm hazard areas, as well as the value of exposed buildings. Overall, state-owned buildings located in Fairfield and Middlesex counties have the highest vulnerability to thunderstorms, followed by Tolland county. New Haven County has the highest state-owned building value exposed to thunderstorm hazards, followed by Fairfield County. The most common types of state-owned building exposed to thunderstorms are education and transportation.

Table 109. State owned buildings exposed to thunderstorm hazard

County	State Owned Buildings Exposed to Thunderstorm	Percent of Total State-Owned Buildings	Value of State-Owned Buildings Exposed ($)
Fairfield	267	100%	629,154,560

[156] Insurance Information Institute. Triple-I: Lightning Caused $1.3 Billion In U.S. Homeowners Claim Payouts In 2021; Supply Chain Issues Exacerbate Losses. 2022. https://www.iii.org/press-release/triple-i-lightning-caused-13-billion-in-us-homeowners-claim-payouts-in-2021-supply-chain-issues-exacerbate-losses-062122

County	State Owned Buildings Exposed to Thunderstorm	Percent of Total State-Owned Buildings	Value of State-Owned Buildings Exposed ($)
Hartford	145	21%	370,337,509
Litchfield	134	51%	44,675,600
Middlesex	312	100%	177,782,640
New Haven	464	77%	811,248,390
New London	335	68%	211,317,950
Tolland	807	91%	217,979,290
Windham	72	39%	146,761,093
State Total	**2536**	**69%**	**2,609,257,032**

4.6.7.2 Councils of Government Vulnerability

To assess COG vulnerability to thunderstorm events, NRI risk values for hail, lightning, and strong winds were assessed to determine the most vulnerable COG regions in the State for thunderstorm-related hazards. The majority of the state is rated at very low risk for hail. Figure 92 shows the breakdown by COG. Parts of Capitol Region, South Central, Lower Connecticut River Valley, Southeastern Connecticut, Northeastern Connecticut, and a small portion of Naugatuck Valley have census tracts with relatively low risk to hail, but otherwise the risk rating is very low. Northwest Hills, Western Connecticut, and Metropolitan COGs are as a whole, at a very low risk to hail according to the NRI.

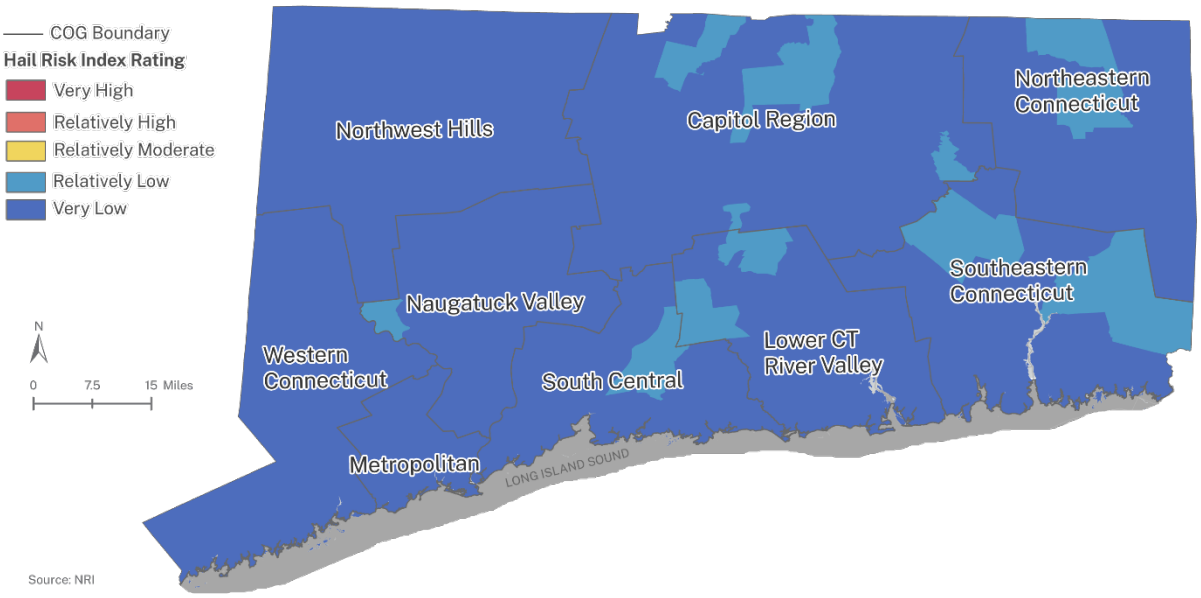


Figure 92. NRI Hail Risk by COG

There is a larger discrepancy in risk due to lightning by COG than hail. Figure 93 shows the risk rating for lightning by COG. Southeastern COG is at the highest risk for lightning strikes with the majority of the COG being at either relatively high or relatively moderate risk for lightning. Lower Connecticut River Valley also finds itself at a similar risk level. The southern COGs in Connecticut are at the highest risk for lightning.

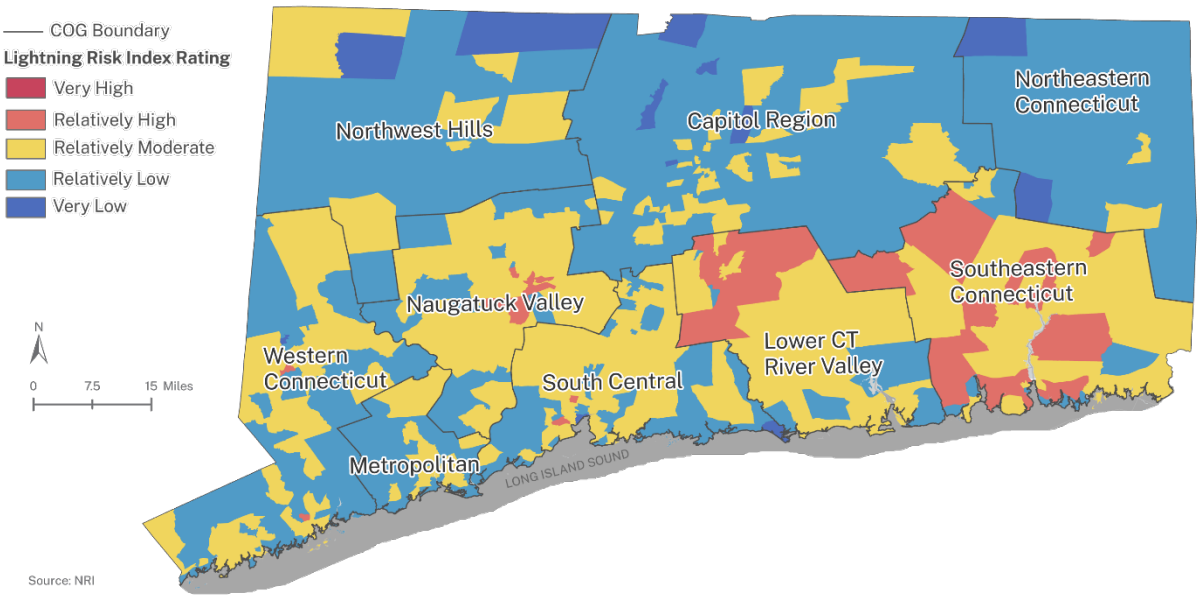


Figure 93. NRI Risk for Lightning by COG

NRI risk due to strong wind is shown in Figure 94. The Western Connecticut and Metropolitan COGs are both at the highest risk for strong winds. Both have the majority of

the COG being either relatively high or relatively moderate risk levels. The Northeastern Connecticut COG is at the lowest risk overall for strong winds.

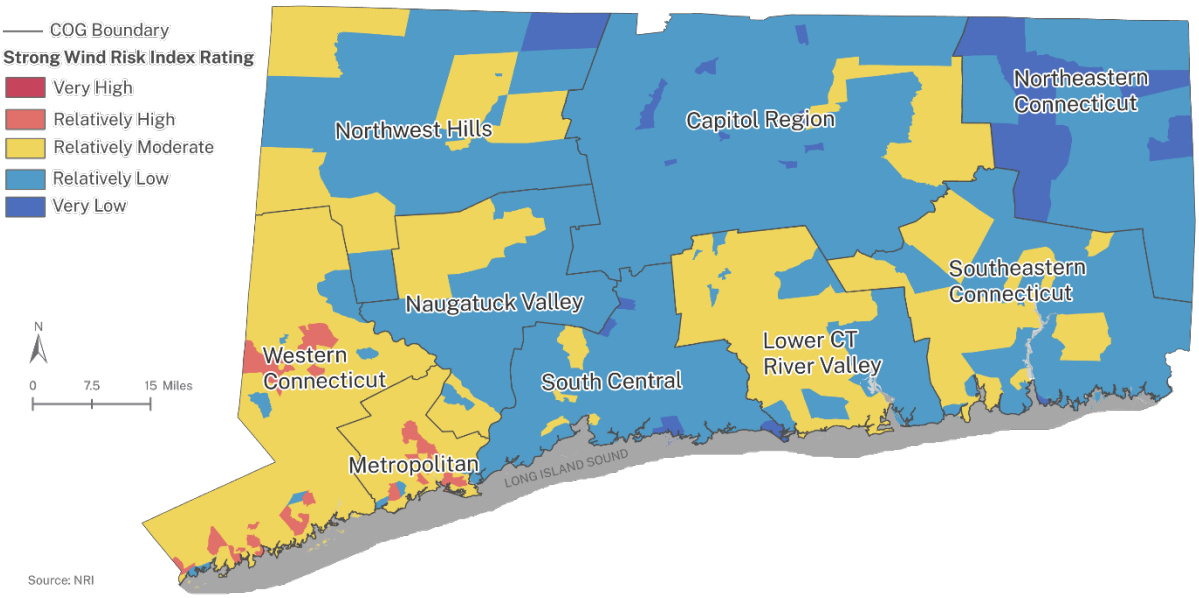


Figure 94. NRI Risk for Strong Wind by COG

Potential losses due to thunderstorm-related hazards for each COG are shown in Table 110. Expected annual loss due to thunderstorm-related hazards is the sum of the expected annual loss due to hail, lightning, and strong winds. Each of these individual hazards can occur during a thunderstorm event. Western Connecticut COG is expected to have the largest loss due to thunderstorm events, with over $5 million expected loss. The Capitol Region COG has the second highest expected annual loss, with approximately $3 million. Overall, the largest portion of total expected annual loss in a thunderstorm event is due to strong winds, which can cause the costliest damage.

Table 110. NRI Expected Annual Loss by COG

COG	Loss Due to Hail	Loss Due to Lightning	Loss Due to Strong Winds	Loss due to Thunderstorms
Capitol Region	$153,930	$1,253,008	$1,779,568	$3,186,506
Metropolitan	$7,772	$468,860	$2,494,026	$2,970,658
Naugatuck Valley	$31,378	$892,122	$1,447,758	$2,371,258
Northeastern Connecticut	$26,306	$183,330	$171,469	$381,105
Northwest Hills	$20,885	$276,560	$746,270	$1,043,715
Lower Connecticut River Valley	$40,499	$708,304	$933,318	$1,682,121
South Central	$37,928	$1,022,087	$1,226,767	$2,286,782
Southeastern Connecticut	$37,980	$889,458	$813,633	$1,741,071

COG	Loss Due to Hail	Loss Due to Lightning	Loss Due to Strong Winds	Loss due to Thunderstorms
Western Connecticut	$19,174	$952,117	$4,742,217	$5,713,508
Total	**$375,852**	**$6,645,846**	**$14,355,026**	**$21,376,724**

4.6.7.3 Local Vulnerability

Total property damage reported from thunderstorms in Connecticut is over $54 million over the last 72 years. Significant crop damage is also reported from thunderstorm events, totaling about $58,000 in the same timeframe.[157] Thunderstorms not only impact property but can put the entire population of the state at risk. Thunderstorm events in Connecticut have caused a reported 168 injuries and 29 deaths.

To determine thunderstorm risk, hail, lightning, and strong wind NRI data was analyzed at a county level (Figure 95, Figure 96, and Figure 97). All counties except Hartford have a very low risk of hail.

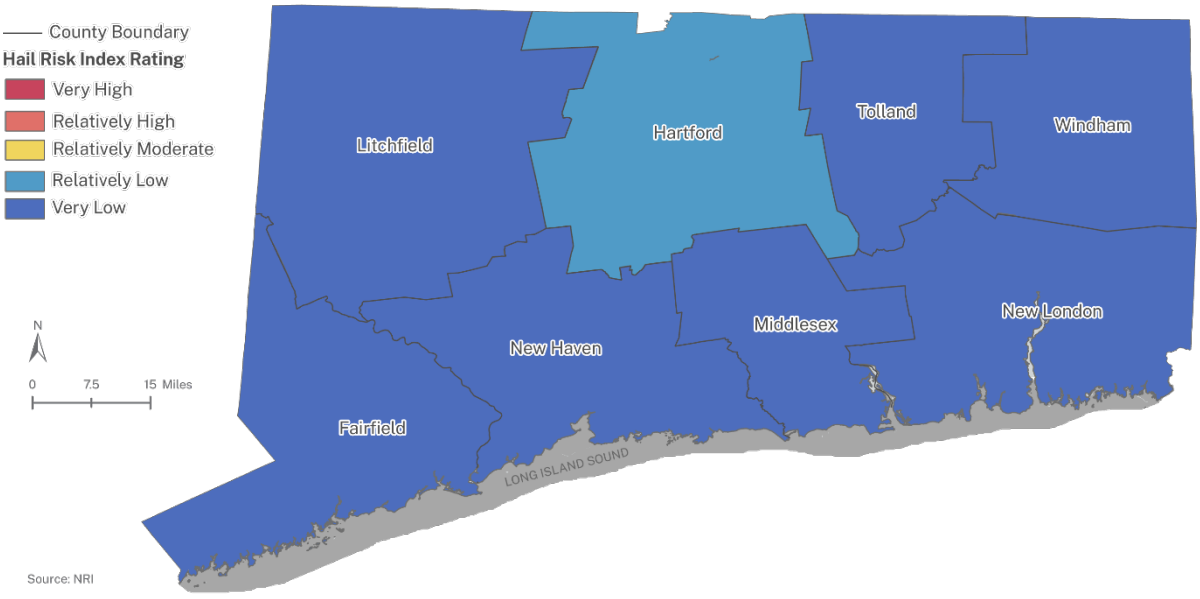


Figure 95. NRI Hail Risk by County

Connecticut has a much higher relative risk to lightning when compared to hail. Fairfield, New Haven, Hartford, and New London counties each have relatively high risk to lightning. Windham and Tolland counties have relatively low risk, and Middlesex and Litchfield counties are relatively moderate.

[157] NCEI Storm Events Database

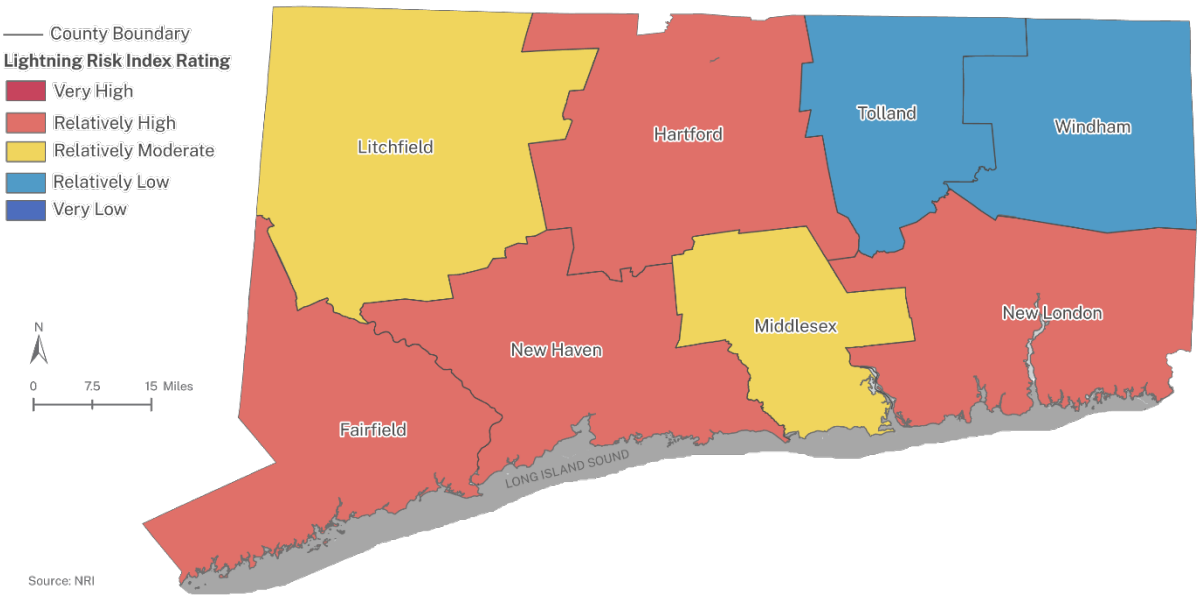


Figure 96. NRI Lightning Risk by County

Strong wind risk is relatively moderate the majority of counties in the state. The exceptions at a county level are Windham county with a very low risk to strong wind, Tolland county with a relatively low risk to strong wind, and Fairfield county with a very high risk to strong wind.

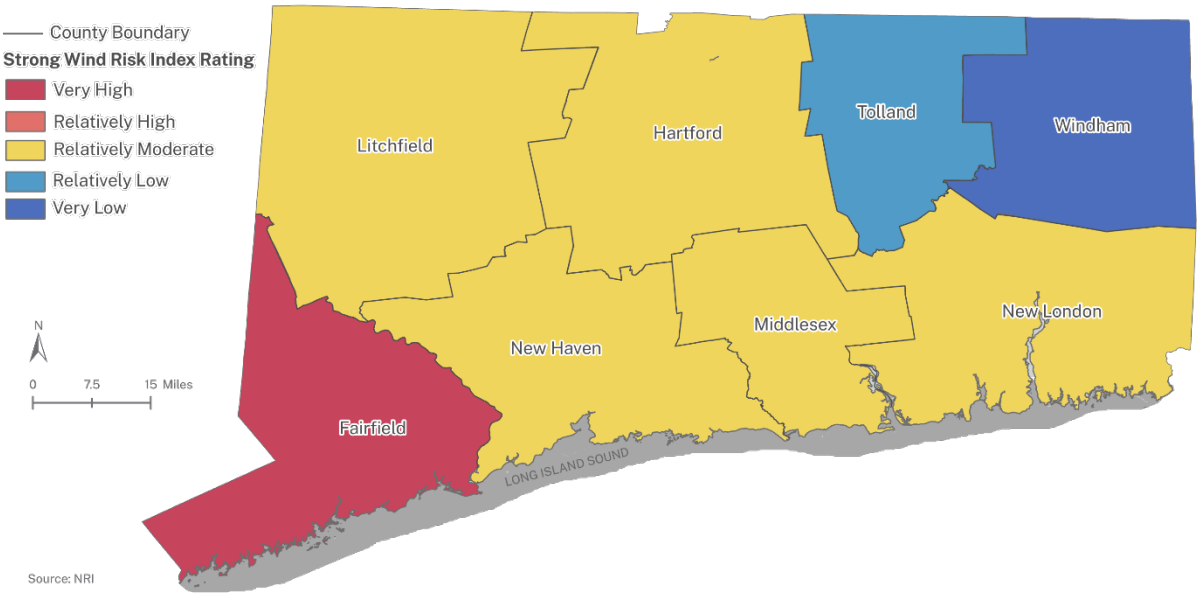


Figure 97. NRI Strong Wind Risk by County

Potential losses due to thunderstorm-related hazards for each county are shown in Table 111. Fairfield County has the highest expected annual loss due to thunderstorm-related

hazards, with over $7 million expected annual loss, followed by New Haven and Hartford counties, each with approximately $2 million expected annual loss.

Table 111. NRI expected annual loss by county

County	Expected Annual Loss Due to Hail	Expected Annual Loss Due to Lightning	Expected Annual Loss Due to Strong Winds	Expected Annual Loss due to Thunderstorm-Related Hazards
Fairfield	$18,379	$1,234,300	$6,570,260	$7,822,939
Hartford	$113,656	$827,939	$1,115,477	$2,057,072
Litchfield	$11,910	$272,872	$857,144	$1,141,926
Middlesex	$21,964	$510,223	$712,155	$1,244,342
New Haven	$40,082	$1,350,786	$1,261,957	$2,652,825
New London	$27,800	$793,452	$669,644	$1,490,896
Tolland	$24,611	$166,107	$380,901	$571,619
Windham	$17,589	$109,997	$92,083	$219,669
State Total	**$275,991**	**$5,265,676**	**$11,659,621**	**$17,201,288**

Agricultural losses due to lightning and hail during thunderstorm events can be devastating. Table 112 summarizes the potential monetary loss of crops in each county. The counties with the amount of high value crop types have the highest potential loss due to thunderstorms. Windham and New London Counties have the highest amount of potential monetary crop loss, and therefore are more vulnerable to agricultural loss due to thunderstorm events than other counties in the state.

Table 112. USDA Agricultural Statistics for Connecticut

County	Number of Farms	% of Farms	Land in Farms (acres)	Market Value of Products Sold	% of Total
Fairfield	402	7.28%	55,245	$42,069,000	7.25%
Hartford	786	14.24%	47,858	$93,912,000	16.19%
Litchfield	1,217	22.04%	90,322	$41,135,000	7.09%
Middlesex	441	7.99%	16,417	$57,077,000	9.84%
New Haven	686	12.43%	26,938	$111,626,000	19.24%
New London	823	14.91%	60,122	$135,786,000	23.41%
Tolland	520	9.42%	35,647	$53,417,000	9.21%
Windham	646	11.70%	51,990	$45,091,000	7.77%

Critical facilities can also be impacted by thunderstorms, affecting infrastructure and community lifelines within the state. A breakdown of critical facilities in each county that are in areas of high or moderate risk to thunderstorm according to the NRI can be found in Table 113. Fairfield and New Haven counties have the highest number of critical facilities exposed to high or moderate thunderstorm risk areas, followed by New London County. The critical facilities exposed to thunderstorm risk areas fall into the Safety and Security, Health and Medical, Energy, and Hazardous Materials community lifeline categories.

Table 113. Critical Facilities Impacted by Thunderstorm by County

County	Critical Facilities Impacted
Fairfield	270
Hartford	47
Litchfield	73
Middlesex	105
New Haven	219
New London	200
Tolland	36
Windham	27
Total	**977**

The population that is more vulnerable to thunderstorms include outdoor workers, outdoor recreationists, and unhoused individuals. Outdoor workers have increased exposure to hail, strong winds, and potential to be struck by lightning. Utility workers may need to climb utility poles for their job, putting themselves at higher risk for lightning strike. Any person participating in outdoor activities recreationally, particularly in or near water bodies is more susceptible to lightning strikes. Unhoused individuals may not have access to shelters during thunderstorm events, and may be injured by hail or lightning strike.

To determine vulnerability at a local level, the Climate Change Vulnerability Index (CCVI) Social Sensitivity score was overlaid with areas of high or moderate thunderstorm risk. As seen in Figure 99, the most vulnerable populations reside in pockets within Hartford County, New Haven County, and Fairfield County. New Haven County and Fairfield County are both counties with high or moderate thunderstorm risk, and although Hartford County is less at risk to thunderstorm, the census tracts that are at risk of thunderstorms tend to have higher social sensitivity.

A geospatial analysis was also performed to determine the state transportation assets within the spatial thunderstorm hazard area in Figure 83. Please see Appendix 3 for further information.

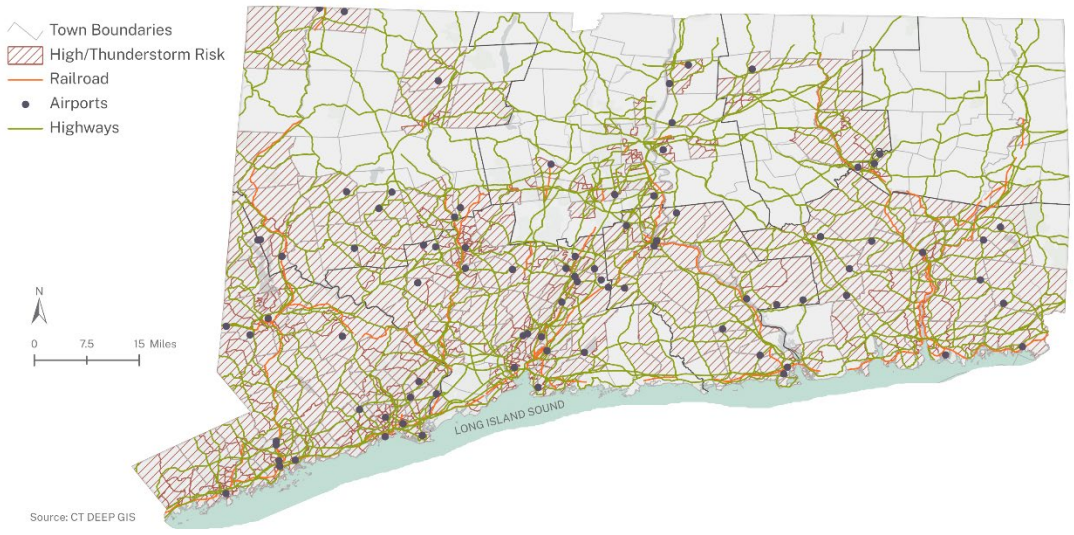


Figure 98. Transportation infrastructure within thunderstorm hazard areas.

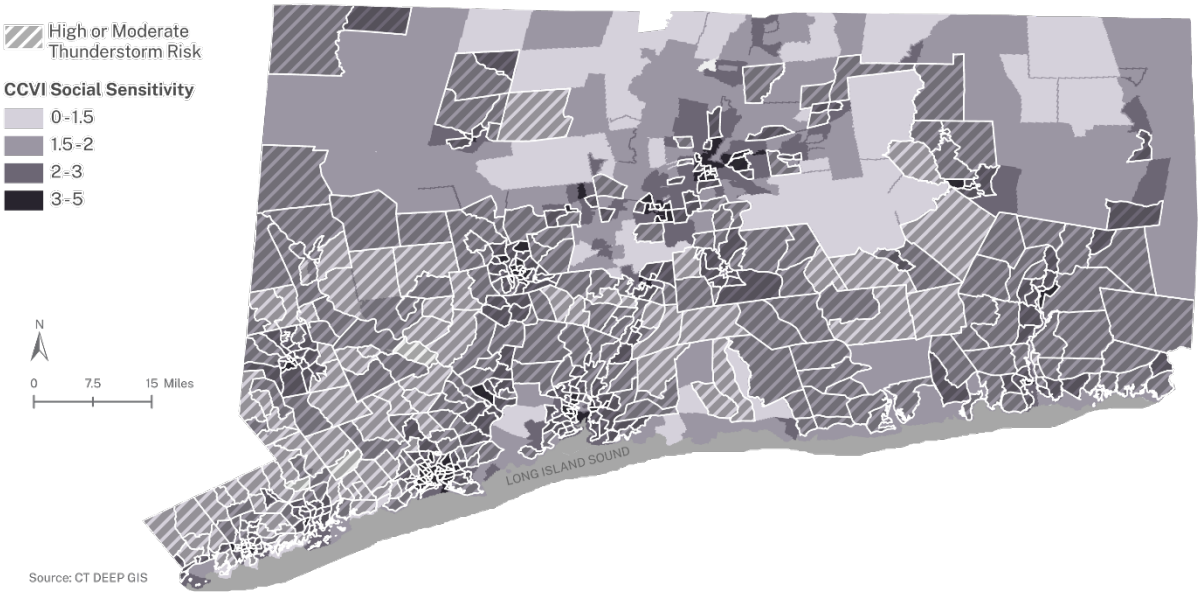


Figure 99. Social sensitivity score with areas of high or moderate thunderstorm risk

4.6.7.4 Changes in Development

Any new development and increases in population will be vulnerable to thunderstorm events. Every county has portions with high or moderate risk to thunderstorms, but the

southern counties of Fairfield, New Haven, Middlesex, and New London have the most areas of high or moderate thunderstorm risk. Fairfield County also has the highest projected increase in development, with the highest number of building permits issued (Figure 100). As of 2022, approximately 66.8% of the building permits statewide were in Fairfield, New Haven, and Hartford Counties, with these counties accounting for nearly half of all the housing units in the State. In addition to increased development, Fairfield and New Haven Counties have high risk for thunderstorm events, increasing the vulnerability of newly built structures.

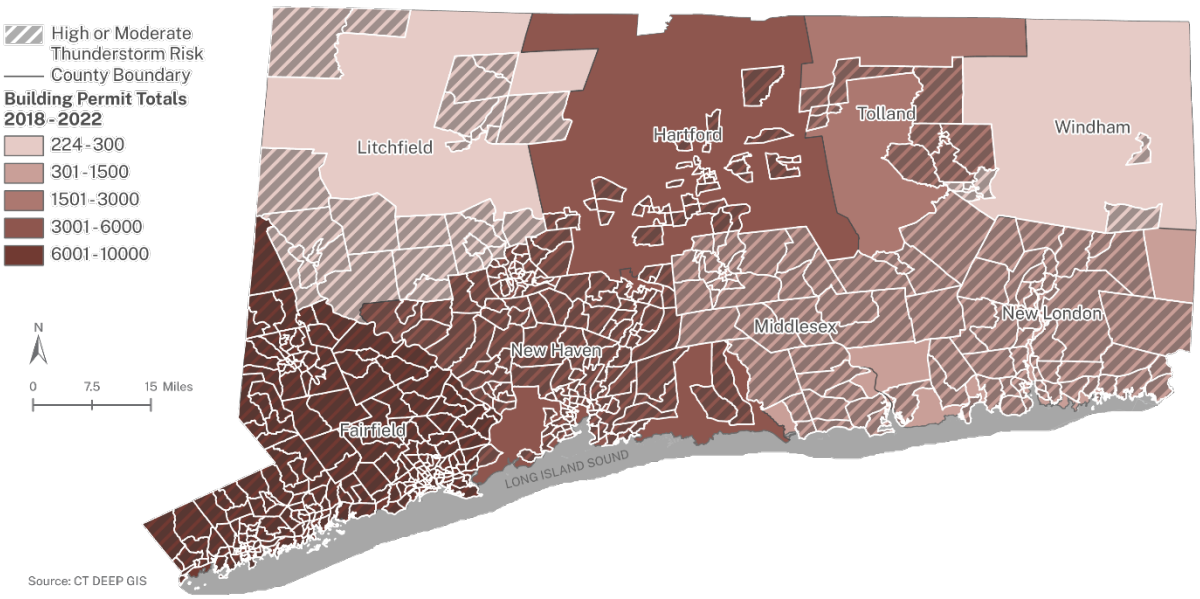


Figure 100. Building Permit Growth by County

Statewide, there is an estimated 1.7% change in population expected between 2015 and 2040; the increases in population will increase the State population's vulnerability to thunderstorm-related events. New Haven County is the only county in Connecticut with a significantly positive population growth that is also generally at high or moderate risk for thunderstorm, with a 4% projected population growth. Other counties with projected population growth do not have high risk to thunderstorm events. Windham County has an 11% projected change in population size from 2015-2040 and has the lowest proportion of area designated as high or moderate risk to thunderstorm. Hartford County has a 5% projected change in population size and also has low thunderstorm risk.

4.6.8 Conclusion

Thunderstorm was ranked on the risk parameters as detailed in Table 24. To summarize the overall risk of thunderstorm for each county, each risk parameter score was multiplied by its impact weight and combined into a county composite ranking.

Table 114 shows the thunderstorm hazard ranking for each county. The high to low comparison does not mean that a low or medium-low hazard will not occur or will not have some impact on the community. However, it does provide an overview of what hazards may pose the greatest risk to each county given available data. This document should serve as a guide to help planners and officials in managing risk and prioritize mitigation actions.

Table 114. Thunderstorm hazard ranking by county.

	Fairfield	Hartford	Litchfield	Middlesex	New Haven	New London	Tolland	Windham
Hazard Concern	M	M	M	M	M	M	M	M
Local Plan Rating	M-H	M-H	M-H	M-H	M-H	M-H	M-H	M-H
Geographic Extent	H	M-L	M	M-H	M	M-H	M-L	L
Population Density	H	M-H	M	M-L	M-H	M	M-L	L
Future Development	H	M-H	M-L	M-L	M-H	M	M	L
Facility Intersect	M-H	L	M	M-H	M	H	M-L	M-L
Future Events	M-H	M-H	H	L	M	M-L	M	M-L
Future Losses	H	M-H	M	L	M-H	M	M-L	M-L
Injury & Death	H	M-H	M	M-L	M	M-H	M-L	L
Social Sensitivity	H	M-H	M-L	M-L	M-H	M	L	M
Composite*	**H**	**M-H**	**M**	**M-L**	**M-H**	**M-H**	**L**	**L**

* Each parameter's weighted score was added together to create a composite rank for each county. A risk determination of high, medium-high, medium, medium-low, and low was then assigned based on percentiles. A summation of all the composite scores for all assessed hazards in each jurisdiction provides an overall risk rank per county. For more information, refer to Section 4.1.1.4.

4.7 Extreme Cold

Extreme cold is characterized by prolonged periods of unusually low temperatures, generally accompanied by high winds. The average high and low temperatures in Connecticut are shown in Figure 101. Extreme cold is characterized by the ambient air temperature dropping to approximately 0°F or below. Extreme cold typically accompanies a winter storm, however, there can be periods of extreme cold without the presence of a winter storm.

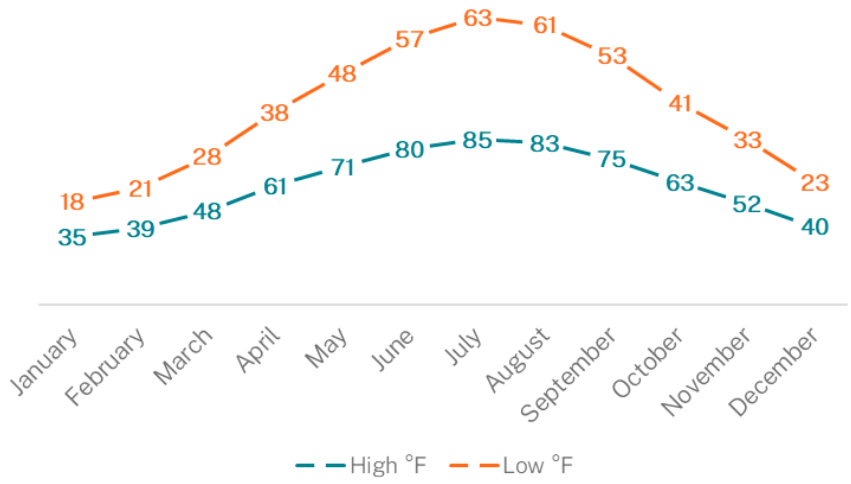


Figure 101. Average temperature in Hartford, CT (1990 - 2020)[158]

4.7.1 Location

The entire state is exposed to the impacts of extreme cold. Although the entire state can experience periods of extreme cold, recorded extreme temperature events vary across the state. As shown in Figure 102, Litchfield County has the most reported "extreme cold" and "cold" events according to the NCEI Storm Events Database, with 55 reported events. Litchfield is located in an inland, northern portion of the state which typically tends to have more extreme temperatures than coastal areas. The coastal counties in Connecticut all had much lower numbers of extreme cold and cold events, with only 7 in Middlesex, New London, and New Haven, and 6 reported events in Fairfield County.

[158] Current Results. Hartford Temperatures: Averages by Month.

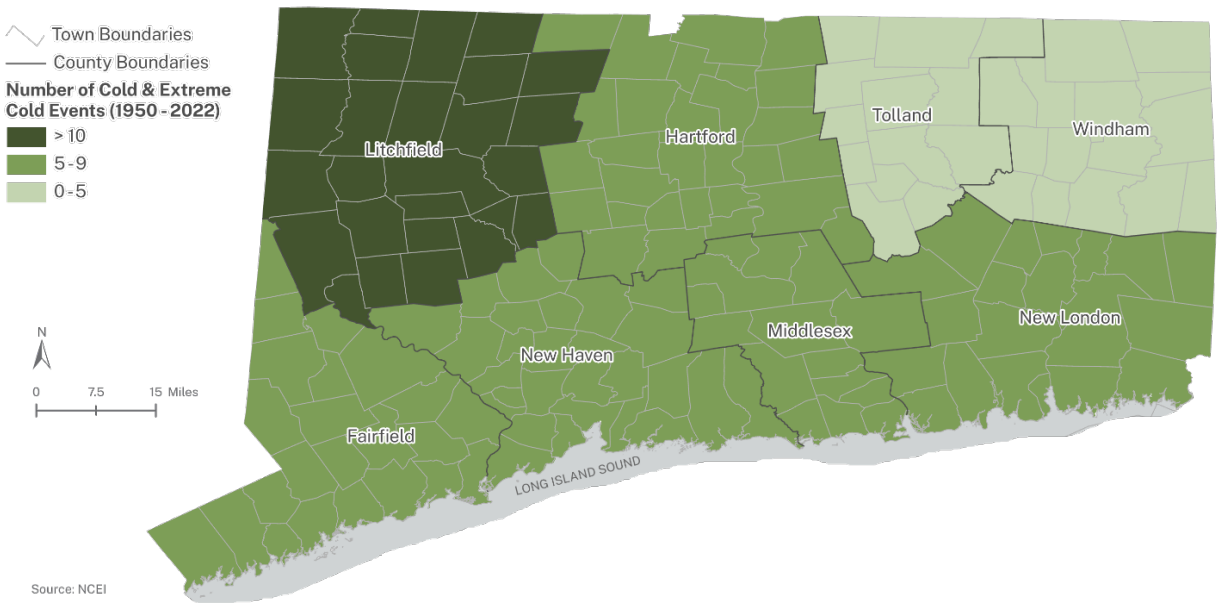


Figure 102. Number of extreme cold events by county (1950 – 2022)

4.7.2 Intensity

The intensity of extreme cold is generally described through wind chill. The "wind chill" is a measure of the combined effects of air temperature and wind speed to produce the perceived temperature. For example, a temperature of 20°F "feels like" 4°F when the wind speed is 20 mph.

Wind chill is defined by the National Weather Service as the rate of heat loss on the human body resulting from the combined effect of low temperature and wind.[159] As winds increase, heat is carried away from the body at a faster rate, driving down both the skin temperature and eventually the internal body temperature. Animals are also affected by wind chill; however, cars, plants, and other objects are not.

Prolonged periods of unusually low temperatures generally accompanied by high winds can and do occur in the Northeast region. The National Weather Service's "Wind Chill Temperature Index" provides a method for measuring wind chill. The National Weather Service Wind Chill chart is shown in Figure 103 and indicates the length of time for frostbite to develop on exposed skin.

[159] NWS. Wind Chill.

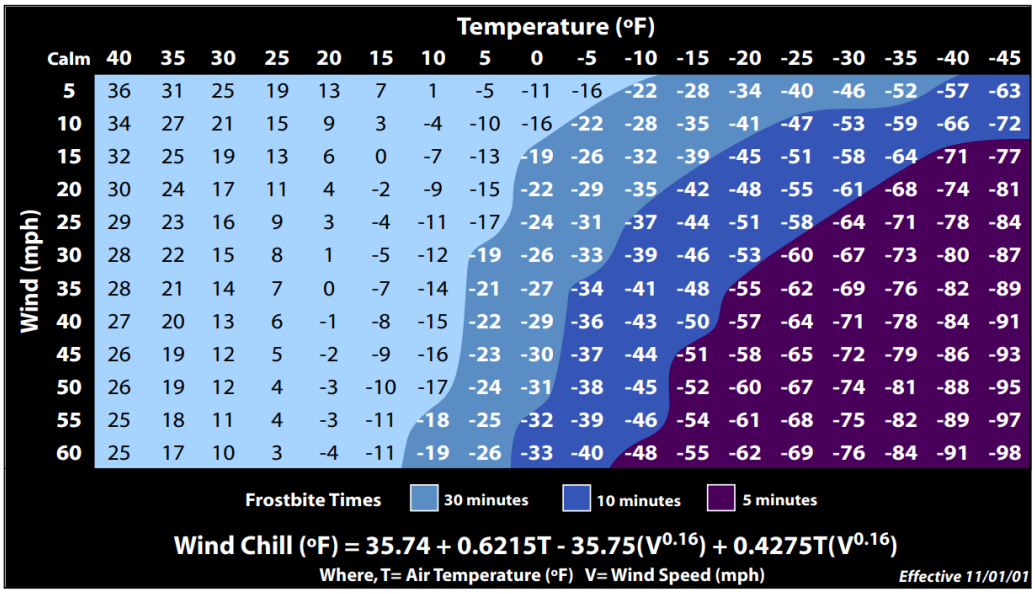


Figure 103. Wind Chill Chart

Periods of extreme cold cannot always be predicted far in advance, but weather forecasts can occasionally provide several days' notice. The National Weather Service issues wind chill warnings, watches, and advisories, as well as freeze watches, warnings, and frost advisories prior to extreme cold weather events.[160]

- **Wind Chill Warning**: NWS issues a wind chill warning when dangerously cold wind chill values are expected or occurring. There is a risk of hypothermia or frostbite if exposed to cold temperatures. Limit time outside and cover up exposed skin.
- **Wind Chill Watch**: NWS issues a wind chill watch when dangerously cold wind chill values are possible. There is a chance of very cold air and strong winds. Check the forecast and be prepared if cold weather does occur.
- **Wind Chill Advisory**: NWS issues a wind chill advisory when seasonably cold wind chill values but not extremely cold values are expected or occurring. Cold and breezy conditions could cause frostbite or hypothermia if precautions are not taken. Dress in layers and cover up exposed skin.
- **Hard Freeze Warning**: NWS issues a hard freeze warning when temperatures are expected to drop below 28°F for an extended period of time, killing most types of commercial crops and residential plants.
- **Freeze Warning**: When temperatures are forecasted to go below 32°F for a long period of time, NWS issues a freeze warning. This temperature threshold kills some types of commercial crops and residential plants.

[160] NWS. Wind Chill Warning vs Watch.

- **Freeze Watch**: Be Prepared: NWS issues a freeze watch when there is a potential for significant, widespread freezing temperatures within the next 24-36 hours. A freeze watch is issued in the autumn until the end of the growing season and in the spring at the start of the growing season.
- **Frost Advisory**: Be Aware: A frost advisory means areas of frost are expected or occurring, posing a threat to sensitive vegetation.

The State of Connecticut has "Severe Cold Weather Protocols" that can be enacted during extreme cold events. The purpose of the severe cold weather protocol is to ensure that the most vulnerable populations receive protection from the severe cold conditions, which could be life-threatening if exposure to the elements occurs for an extended period of time. While enacted, a system is set up for state agencies and municipalities to coordinate with United Way 2-1-1 and Connecticut's network of shelters to make sure that anyone in need can receive shelter from the outdoors, including transportation to shelters.[161]

4.7.3 Impacts

Extreme cold events are common in Connecticut and can have significant impacts on the state's population and infrastructure. Cold weather events are primarily associated with severe winter storms.

The combination of cold weather with severe winter storm events is particularly dangerous because winter weather can knock out heat and power, increasing the vulnerability of populations sheltering from the cold. Loss of heat and power may also lead to carbon monoxide poisoning from inappropriate use of combustion-powered generators, heaters, and cooking appliances, and heavy snowfall may block vents for gas dryers and heaters. Power failure leads to increased use of diesel generators for power and more wood stoves are used in extreme cold; in both situations, air pollution and health impacts increase. Further descriptions of the impacts of extreme cold are detailed below.



- Freezing temperatures in extreme cold events may cause pipes to burst and freeze in critical facilities and state-owned buildings.
- Cold weather can also weaken concrete and create cracks in drywall joint compound and paint. Poorly insulated buildings or buildings without heat may be more vulnerable to freezing.



- Extreme cold events can cause roads and bridges to freeze. Ice, freezing rain, and snowstorms on roadways and bridges can cause traffic accidents and may lead to injury or loss of life.

[161] CT DEMHS. Cold Weather Protocol.

- Cold temperatures can cause trees and winter crops to die. Prolonged cold snaps can impact livestock not protected from the frigid temperatures.
- Cold weather can cause wastewater systems to fail, potentially leading to pollution in waterways.

- People, especially the elderly, outdoor laborers, children, and individuals that are homeless or in poor physical health, are vulnerable to cold-related illnesses (e.g., frostbite) and death (extreme hypothermia).
- Prolonged extreme cold can also lead to a drastic increase in cost to heat a home, which can impact people who are financially unstable and unable to afford to pay utility bills.

- Extreme cold events may impact agricultural productivity. Indirect impacts due to loss of agricultural productivity may include higher food prices across the state.

4.7.4 Previous Occurrences and Losses

According to NCEI data, the state experienced 89 cold and extreme cold events between 1950 and 2022, as shown in Table 115. Cold events are reported by NCEI as a period of low temperatures or wind chill temperatures that reach or exceed locally or regionally defined advisory conditions (typically -18° F or colder). Extreme cold events are reported by NCEI when a period of extremely low temperatures or wind chill temperatures reaches or exceeds locally or regionally defined warning criteria (typical value around -35 °F or colder). There have been zero injuries or deaths reported in the NCEI Storm Events Database for these cold and extreme cold events.

Table 115. NCEI cold and extreme cold events

County	Number of Cold Events	Number of Extreme Cold Events	Total Cold Events
Fairfield	2	4	6
Hartford	5	2	7
Litchfield	41	14	55
Middlesex	2	5	7
New Haven	3	4	7
New London	2	5	7
Tolland	0	0	0

County	Number of Cold Events	Number of Extreme Cold Events	Total Cold Events
Windham	0	0	0
Total*	**55**	**34**	**89**

* Event totals may reflect a storm event that has affected multiple counties that have been counted as individual events in each affected county.

Although the NCEI database does not report any cold-related deaths or injuries, a Connecticut State Health Assessment report published in June 2020 states that there were 73 cold-related deaths between 2014 and 2018. Of these cold-related deaths, exposure to excessive natural cold or hypothermia was listed as the primary cause of death in 47% of deaths.[162]

The lowest recorded temperature in Connecticut is -32°F, which was recorded twice in the state's history. The record low was recorded on February 16, 1943, and then again on January 22, 1961.[163] The record low temperature in 1943 was reported from the Coventry sensor and in 1961 it was reported from the Falls Village sensor. These sensors are in Tolland County and Litchfield County, respectively.

FEMA disaster declarations related to extreme cold are shown in Table 116.

Table 116. FEMA Disaster Declarations related to extreme cold

Declaration	Event Date	Declaration Date	Event Description
EM-3060-CT	02/07/1978	02/07/1978	Blizzard & Snowstorms
EM-3098-CT	03/13/1993	03/16/1993	Severe Winds & Blizzard, Record Snowfall
DR-1092-CT	01/07/1996	01/24/1996	Blizzard of '96
EM-3176-CT	02/17/2003	03/11/2003	Snow
EM-3192-CT	12/05/2003	01/15/2004	Snow
EM-3200-CT	01/22/2005	02/17/2005	Record Snow
EM-3266-CT	02/11/2006	05/02/2006	Snow
DR-1958-CT	01/11/2011	03/03/2011	Snowstorm

[162] Connecticut Health Improvement Coalition. Healthy Connecticut 2025, June 2020.
[163] NCEI State Climate Extremes Committee Records.

4.7.5 Future Losses

Conditions that create extreme cold weather events occur annually in Connecticut. Based on historical data, there's a chance of a cold or extreme cold weather event occurring one to two times per year. There is also a high probability of cold-related deaths occurring each year in Connecticut based on recent data from the 2021 Connecticut State Health Assessment report. Expected annual loss due to cold wave events in Connecticut according to the National Risk Index (NRI) is $589,146. The NRI calculates total expected annual loss by combining loss to buildings, population, and agriculture. In Connecticut, the highest contributor to total expected annual loss is population equivalence, where each fatality or 10 injuries equals $11.6 million of economic loss.[164]

4.7.6 Climate Change Impacts

According to the Fourth National Climate Assessment, climate change has caused unusually cold winter temperatures to become less common across the contiguous 48 states in recent decades, particularly very cold nights.[165] Extreme cold waves are likely to continue to decrease in frequency and duration as winter temperatures increase in the future. **This winter warming is expected to reduce the number of direct cold-related deaths, but the decrease is projected to be smaller than increases in heat-related deaths in most regions.[166]**

In the Northeast region of the United States, seasonal differences in temperature have decreased, as **winters have warmed three times faster than summers in recent years**, according to the Fourth National Climate Assessment,. Winters are projected to become milder, with fewer cold extremes, particularly across inland and northern portions of the Northeast. The northern, inland areas in Connecticut, such as Litchfield, Hartford, Tolland, and Windham counties, may experience fewer extreme winters in the future.

However, as winter temperatures warm in Connecticut, the impact of the extreme cold events that do occur will become even more severe. Extreme drops in temperature may become less frequent in the future, lowering the perceived threat of extreme cold. In the event of an extreme cold event when the baseline temperature is several degrees higher, the state may not be prepared for cold temperatures and may not have the proper response steps in place to keep the population safe. Table 117 provides further details on the impacts of climate change on extreme cold events.

Table 117. Climate change impacts on extreme cold

Impact	Projected Change
Location	Inland and northern areas of the state may experience fewer cold extremes.

[164] FEMA. FEMA National Risk Index Technical Documentation.
[165] Fourth National Climate Assessment, Chapter 18: Northeast.
[166] EPA Climate Change Indicators: Cold-Related Deaths.

Impact	Projected Change
Intensity	Cold extremes will become less intense as climate change causes more mild winter temperatures.
Frequency	Extreme cold waves are expected to continue to decrease in frequency as winter temperatures increase in the future.
Duration	Extreme cold waves are projected to decrease in duration with warming winter temperatures.
Model Confidence	Medium to High Confidence

Source: Fourth National Climate Assessment

4.7.7 Vulnerability Assessment

The entire state is exposed to the impacts of extreme cold events. According to the NRI, all counties in Connecticut have either a Relatively Moderate or Relatively Low cold wave risk. In the NRI analysis, a cold wave is defined as a rapid fall in temperature within 24 hours and extreme low temperatures for an extended period. The temperatures classified as a cold wave are dependent on the location and defined by the local National Weather Service (NWS) weather forecast office. The Cold Wave Risk Index score and rating represent a community's relative risk for cold waves when compared to the rest of the United States, and incorporates expected annual loss, social vulnerability, and community resilience to the cold wave hazard. Cold Wave Risk Ratings for Connecticut's counties are shown in Figure 104.

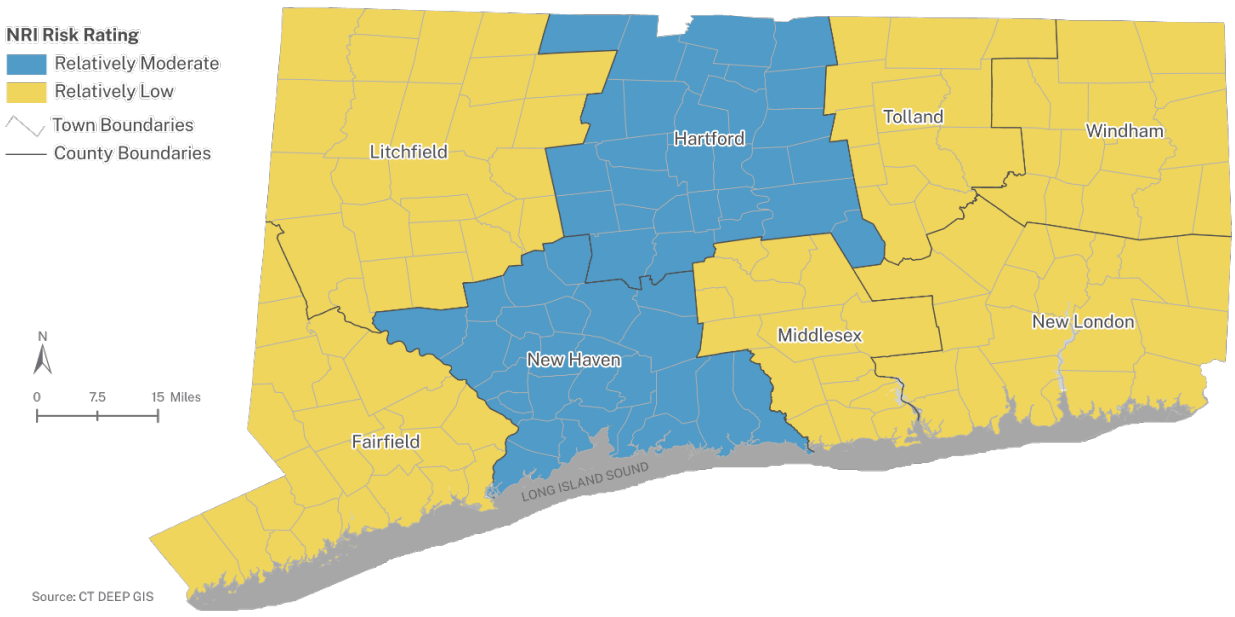


Figure 104. Cold wave NRI risk rating

4.7.7.1 State Vulnerability

All state-owned buildings are exposed to extreme cold. Extreme cold temperatures can damage buildings through freezing or bursting pipes and freeze and thaw cycles. Additionally, antiquated or poorly constructed facilities may not be able to withstand extreme temperatures. The heavy snowfall and ice storms associated with extreme cold temperature events can also cause power interruptions. Backup power is necessary to maintain power during extreme cold events that impact state-owned buildings.

Certain state departments may have increased vulnerability to extreme cold events because their work is directly impacted by the extreme cold, or they have a large number of employees who must work outside. Working outside in freezing weather creates a risk of hypothermia and frostbite for state workers, increasing their vulnerability to extreme cold.

The Connecticut Department of Transportation (DOT) handles bridge, road, and railway safety and repairs within the state. Extreme cold can cause unsafe conditions that must be repaired by CTDOT employees. For example, bridges can ice up before roads when cold air surrounds them and can become unstable if brittle parts contract too much or break, especially if winds are strong. Road surfaces also can crack as water seeps into small crevices, freezes and expands, causing cracks and potholes as vehicles roll over them. Railways can also be impacted when switches freeze or rail joints pull apart when rails contract in freezing weather. Whenever there is an impact to transportation in the state due to extreme cold, CTDOT employees must work to fix the issue and repair any unsafe roads, bridges, or railways. As of June 2023, there are currently 624 CTDOT projects scheduled to be completed or in construction. Project boundaries are shown in Figure 105. New Haven County has the highest number of CTDOT projects, followed by Hartford and Fairfield

counties. CTDOT assets and employees in these counties have higher vulnerability to extreme cold than counties with fewer CTDOT projects, such as Windham and Tolland counties.

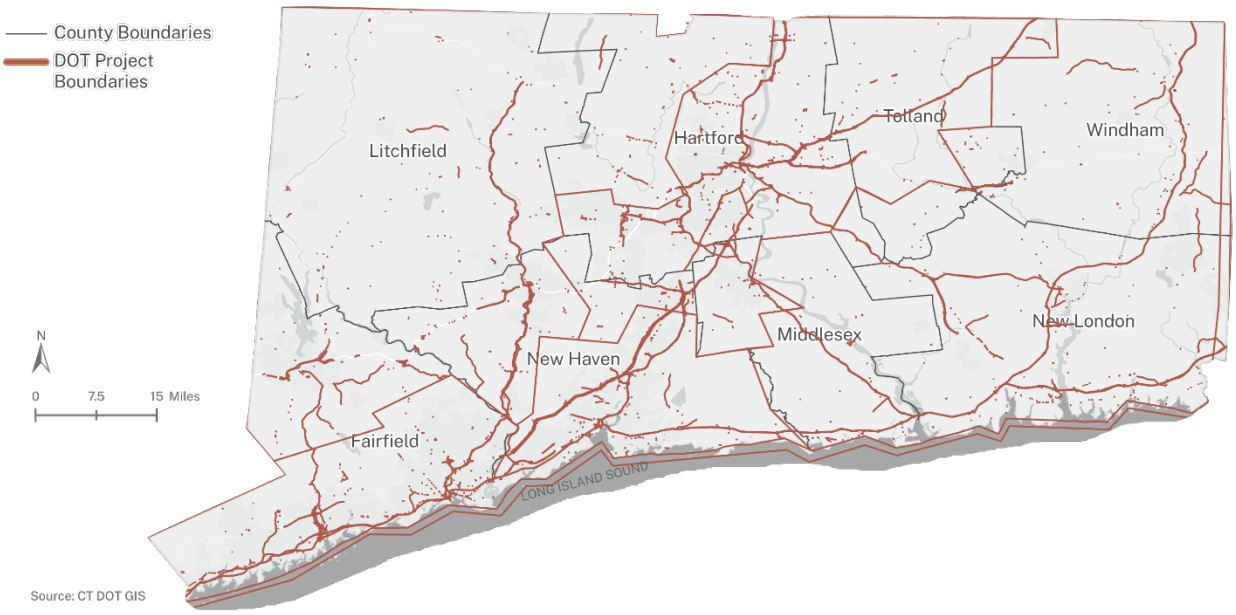


Figure 105. CTDOT Current Project Boundaries

In addition to CTDOT employees, any state department that requires employees to work outside in winter months, such as recreation-related work, has an increased vulnerability to extreme cold. If temperatures are too cold for employees to be outside consistently, there is a risk of loss of productivity and operational disruption.

All critical facilities in the state are exposed to extreme cold. Impacts of extreme cold on critical facilities are the same as the impacts on state-owned buildings, it is essential that critical facilities remain operational during extreme cold events. Critical facilities serve as community lifelines, which are important to human health and safety. Health and Medical lifelines such as hospitals are vital during extreme cold events, as there is an increased risk of hypothermia and frostbite, which require medical attention. In addition, the Food, Water, and Shelter community lifelines provide necessary functions to maintain a warm and safe place to live during extreme cold events. According to the 211 of Connecticut website, there are 80 homeless shelters, seasonal no freeze shelters, and extreme cold warming centers for people in need of shelter in Connecticut. These shelters are located in Hartford, Middlesex, and New Haven Counties. There are no reported shelters on the Connecticut 211 website in the other 5 counties in Connecticut, significantly increasing the risk of extreme cold for vulnerable populations in those counties.[167]

[167] 211 of Connecticut.

Restoring power to critical facilities in the event of a power outage during an extreme cold event may require backup power systems. There is an increased risk of carbon monoxide poisoning if generators are used improperly to restore power to critical facilities. Generators should be used in well-ventilated areas or outdoors to reduce the risk of carbon monoxide poisoning.

4.7.7.2 Councils of Government Vulnerability

Extreme cold can impact all the COGs in Connecticut. The COGs located in an inland, northern portion of the state, such as Northwest Hills, Capitol Region, and Naugatuck Valley COGs may have more days with extreme low temperatures than COGs located along the coastline. Coastal areas typically have more moderate temperatures than inland areas due to the heat capacity of the ocean. Although there may be fewer extreme cold events in coastal areas, COGs located along the Long Island Sound are vulnerable to coastal freezing during periods of extreme cold, which can interfere with the transportation of goods and people and can also inhibit fishing and other industries that rely on boats. The COGs with the most coastal areas are Western, Metropolitan, South Central, Lower Connecticut River Valley, and Southeastern Connecticut COGs.

4.7.7.3 Local Vulnerability

The impacts of extreme cold can be costly for jurisdictions, with major freeze events and winter storms causing 30 billion-dollar disasters over the past 40 years in the United States. The NRI calculates total expected annual loss due to cold wave events, which combines expected annual loss to building value, population, population equivalence, and agriculture value for counties in the United States. As shown in Table 118, the highest expected annual loss due to cold wave is in Hartford county, with nearly 40% of the total statewide expected annual loss.

Table 118. NRI expected annual loss due to cold wave

County	NRI Expected Annual Loss
Fairfield	$98,280.09
Hartford	$231,603.33
Litchfield	$75,196.24
Middlesex	$21,546.31
New Haven	$99,550.17
New London	$33,891.75
Tolland	$21,363.18
Windham	$16,715.90
State Total	**$598,146.98**

Nearly the entire population in each of the Connecticut counties is exposed to extreme cold temperatures during a cold wave. According to the NRI, all counties have above 99% of the population exposed to the cold wave hazard.

While extreme cold events can occur in any area in Connecticut, the impacts may be more severe in locations with a high number of socially vulnerable populations. According to the Centers for Disease Control, the populations most at risk of extreme cold include the following:

- People over the age of 65, who are less able to withstand temperatures extremes due to their age, health conditions, and limited mobility to access shelters;
- Infants and children under 5 years of age;
- Low-income individuals who cannot afford proper heating;
- Unhoused individuals, who may have a limited capacity to shelter from dangerously low temperatures;
- Outdoor occupational groups that work during winter months (such as agricultural workers or utility workers); and
- Populations with pre-existing health conditions that may be worsened by extreme cold temperatures.

Locations within the state that have high concentrations of vulnerable populations are more likely to report fatalities or injuries due to extreme cold. People over the age of 65 years old are more at risk for hypothermia because their body's response to cold can be diminished by certain illnesses, such as diabetes and some medicines, including over-the-counter cold remedies. In addition, older adults may be less active and generate less body heat.[168] Populations of people over the age of 65 in Connecticut, according to the American Community Survey (ACS), are shown for each census tract in Figure 106. There are higher concentrations of older people living in Litchfield, Hartford, Fairfield, New Haven, and Middlesex Counties.

[168] NIH. Hypothermia: A Cold Weather Risk for Older People. 2009.

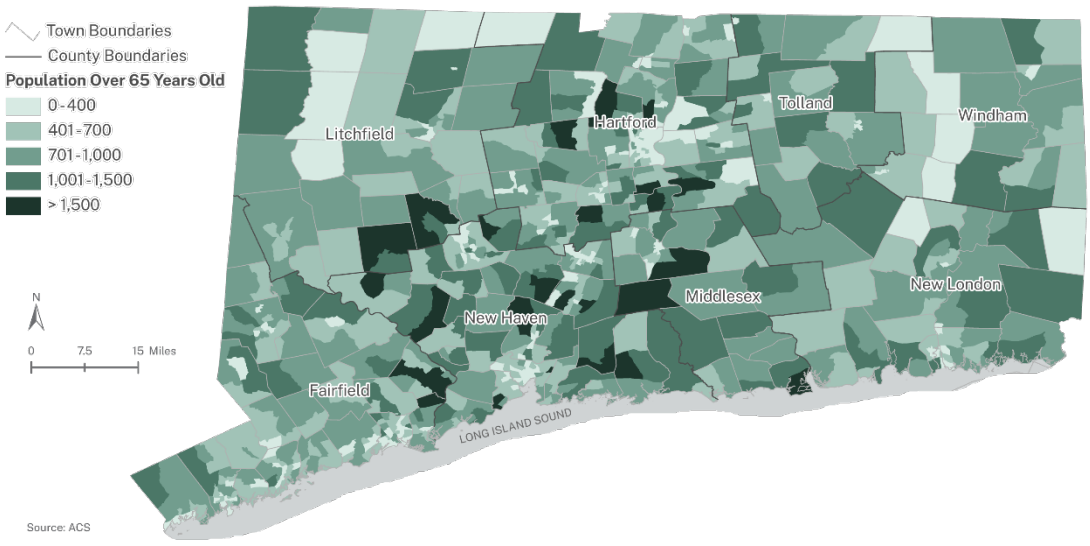


Figure 106. Population over 65 years old by census tract

In addition to age, an additional risk factor for extreme cold is being unhoused or having the inability to heat a home during an extreme cold event. Figure 107 shows the population living below the 150% poverty estimate in Connecticut, by census tract. People living in poverty are often unable to afford to heat their homes or may experience housing loss. Living in cold or inadequate housing can increase the risk of hypothermia or frostbite, as well as minor illnesses, such as cold and flu, and exacerbate existing conditions, such as arthritis and rheumatism. In addition, children living in cold homes are more than twice as likely to suffer from a variety of respiratory problems than children living in warm homes.

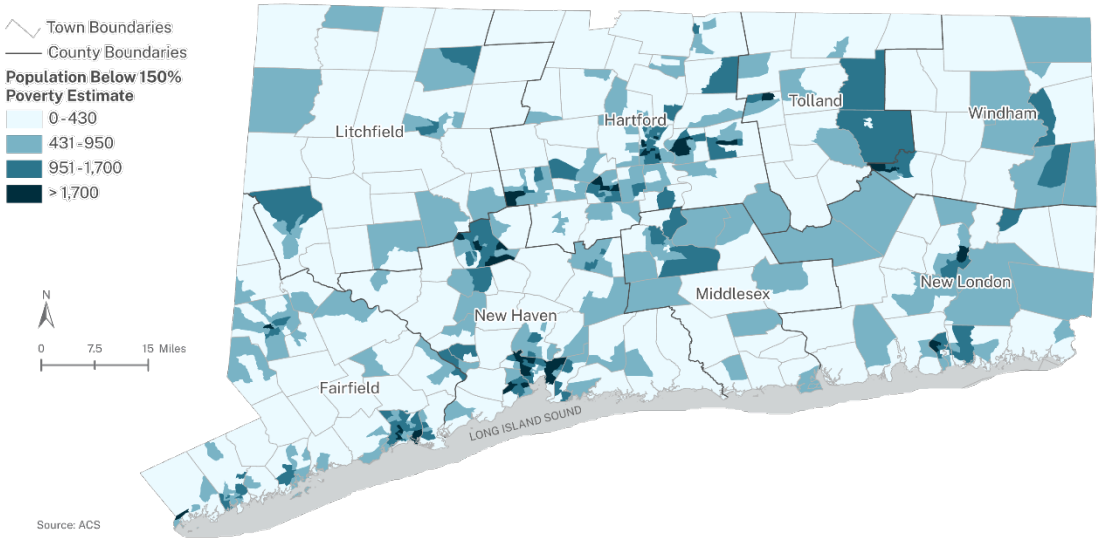


Figure 107. Population below 150% poverty estimate by census tract

Vulnerable populations may rely on shelters for a warm place to live during extreme cold events. The state can reduce its vulnerability to extreme cold events by providing shelters

with the necessary resources to accommodate the population that is at risk during extreme cold events. Table 119 shows the percentage of the population in each county that is over the age of 65 and below the 150% poverty line. Litchfield and Middlesex counties have the highest percentage of the population over 65 years old and New Haven and Windham counties have the highest percentage of the population below the 150% poverty line. These counties are more vulnerable to extreme cold events, and therefore may benefit from an increased number of shelters during the winter months.

Table 119. Vulnerable population exposed to extreme cold

County	Population Over 65	Percent of Total Population (Over 65)	Population below 150% Poverty Estimate	Percent of Total Population (Below Poverty Estimate)
Fairfield	150,147	15.9%	133,306	14.1%
Hartford	152,812	17.1%	151,282	17.0%
Litchfield	38,580	21.3%	21,334	11.8%
Middlesex	33,127	20.4%	18,247	11.2%
New Haven	148,857	17.4%	150,188	17.6%
New London	48,749	18.3%	38,674	14.5%
Tolland	23,874	15.8%	17,536	11.6%
Windham	19,320	16.6%	20,089	17.2%

4.7.7.4 Changes in Development

Population growth and development can lead to increased vulnerability to extreme cold events in the state. Windham County is projected to have the largest population increase of all counties in Connecticut by 2040, with an 11% increase in population. Fairfield County is projected to have the largest increase in development, with the highest number of building permits for construction between 2018 and 2022. As these counties, and other parts of the state experience growth, construction workers and builders who work outside during the winter months may be exposed to extreme cold. They may be more vulnerable to the health impacts of extreme cold when spending extended periods of time working outside in dangerously low temperatures. Additionally, it will be important to maintain affordable housing as the population grows to allow households to afford to heat their homes and an adequate number of shelters for those who cannot.

4.7.8 Conclusion

Extreme cold was ranked on the risk parameters as detailed in Table 24. To summarize the overall risk of extreme cold for each county, each risk parameter score was multiplied by its impact weight and combined into a county composite ranking.

Table 120 shows the extreme cold hazard ranking for each county. The high to low comparison does not mean that a low or medium-low hazard will not occur or will not have some impact on the community. However, it does provide an overview of what hazards may pose the greatest risk to each county given available data. This document should serve as a guide to help planners and officials in managing risk and prioritize mitigation actions.

Table 120. Extreme cold hazard ranking by county.

	Fairfield	Hartford	Litchfield	Middlesex	New Haven	New London	Tolland	Windham
Hazard Concern	M	M	M	M	M	M	M	M
Local Plan Rating	M	M	M	M	M	M	M	M
Geographic Extent	H	H	H	H	H	H	H	H
Population Density	H	M-H	M	M-L	M-H	M	M-L	L
Future Development	H	M-H	M-L	M-L	M-H	M	M	L
Facility Intersect	H	H	H	H	H	H	H	H
Future Events	M-L	M	H	M-H	M-H	M-H	L	L
Future Losses	M-H	H	M	M-L	M-H	M	M-L	L
Injury & Death	L	L	L	L	L	L	L	L
Social Sensitivity	M-H	H	M-L	M-L	M-H	M	L	M
Composite*	**M-H**	**M-H**	**M**	**M-L**	**M-H**	**M**	**L**	**L**

* Each parameter's weighted score was added together to create a composite rank for each county. A risk determination of high, medium-high, medium, medium-low, and low was then assigned based on percentiles. A summation of all the composite scores for all assessed hazards in each jurisdiction provides an overall risk rank per county. For more information, refer to Section 4.1.1.4.

4.8 Tornado

A tornado is a narrow, violently rotating column of air that extends from the base of a thunderstorm to the ground.[169] It is visible only if it forms a condensation funnel made of water droplets, dust, and debris. Tornadoes typically move between 30 and 125 miles per hour (mph) and can generate internal winds exceeding 300 mph. A tornado path averages about four miles but may reach up to 300 miles in length. Typical widths range from 300 to 400 yards, but severe tornadoes have cut swaths a mile or more in width or have formed groups of two or three funnels traveling together. The damage caused by a tornado results from the high wind velocity and wind-blown debris, which can be accompanied by lightning or hail. A tornado is a relatively short-lived storm, but a severe tornado can cause significant damage.

Tornadoes often develop suddenly, with little to no advance warning time. Tornado season typically occurs from March through August; however, tornadoes can happen in any month. They can also occur at any time during the day but are more likely to form in the late afternoon and early evening.

4.8.1 Location

All of Connecticut is susceptible to tornadoes, and historically, tornado events have occurred in each county. The majority of past tornado occurrences have occurred in the western counties in the state, as shown in Figure 108.

[169] National Weather Service. Tornado Definition. https://www.weather.gov/phi/TornadoDefinition

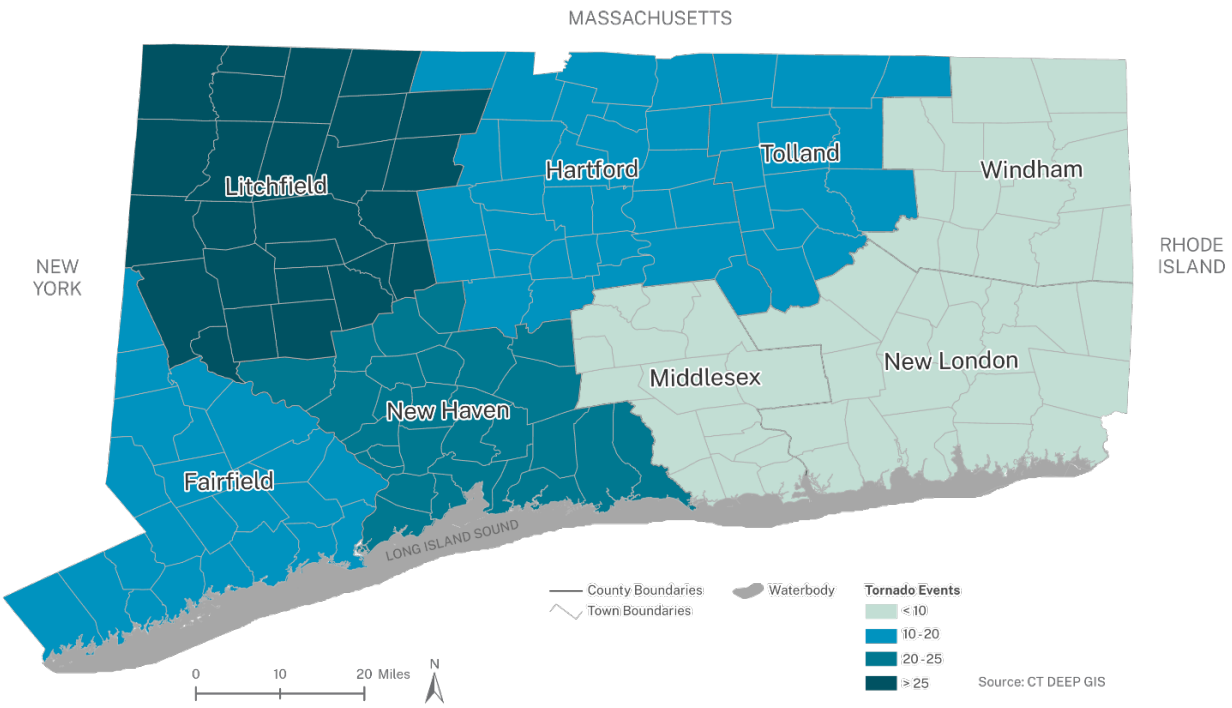


Figure 108. Tornado events by county

Connecticut is located in an area of the country with lower tornado risk, as defined by the FEMA National Risk Index (NRI).[170] FEMA NRI calculates risk based on expected annual loss, social vulnerability, and community resilience. Figure 109 shows tornado risk rating by county in the United States and Connecticut.

[170] FEMA National Risk Index. Determining Risk. https://hazards.fema.gov/nri/determining-risk

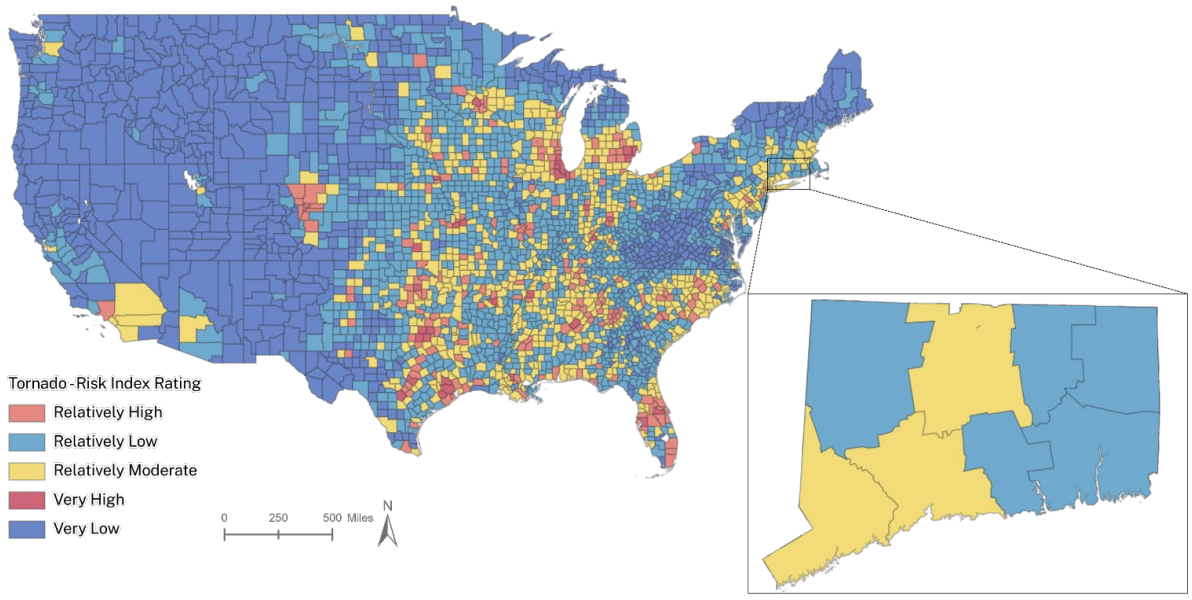


Figure 109. Tornado risk rating (FEMA NRI)

4.8.2 Intensity

Tornado intensity is measured on the Fujita and Enhanced Fujita Damage Scales. The Fujita-Pearson Scale (F Scale) was developed in 1971 to estimate tornado intensity based on associated damages. The F Scale assigns numerical values for wind speeds inside a tornado according to the type of damage caused by the tornado and the degree of the tornado. In 2007, the F Scale was replaced by the Enhanced Fujita Scale (EF Scale) as the standard for tornado assessment. The EF Scale rates the intensity of a tornado based on damage caused, not by size. Due to the difficulty in determining the intensity and power of a tornado while it is occurring, the EF Scale is typically used to assess the intensity of a tornado after it has passed. Table 121 shows a comparison of the F Scale with the EF Scale with corresponding wind speeds and typical damages.

Table 121. Fujita Scale and Enhanced Fujita Scale comparison

Fujita Scale			Enhanced Fujita Scale	
F Number	Fastest ¼ Mile (mph)	3-Second Gust (mph)	EF Number	3-Second Gust
0	40-72	45-78	0	65-85
1	73-112	79-117	1	86-110
2	113-157	118-161	2	111-135
3	158-207	162-209	3	136-165
4	208-260	210-261	4	166-200
5	261-318	262-317	5	Over 200

The EF Scale was implemented with slightly lower wind speeds at higher F-numbers, and more thoroughly refined structural damage indicators. Table 122 shows the EF Scale with corresponding wind speeds and typical damage.

Table 122. Enhanced Fujita Tornado damage scale

EF-Scale Number	Intensity Phrase	Wind Speed* (mph)	Typical Damage
EF0	Light	65–85	**Light** damage: Peels surface off some roofs; some damage to gutters or siding; branches broken off trees; shallow-rooted trees pushed over.
EF1	Moderate	86-110	**Moderate** damage: Roofs severely stripped; mobile homes overturned or badly damaged; loss of exterior doors; windows and other glass broken.
EF2	Significant	111-135	**Considerable** damage: Roofs torn off well-constructed houses; foundations of frame homes shifted; mobile homes completely destroyed; large trees snapped or uprooted; light-object missiles generated; cars lifted off ground.
EF3	Severe	136-165	**Severe** damage: Entire stories of well-constructed houses destroyed; severe damage to large buildings such as shopping malls; trains overturned; trees debarked; heavy cars lifted off the ground and thrown; structures with weak foundations blown away some distance.
EF4	Devastating	166-200	**Devastating** damage: Well-constructed houses and whole frame houses completely leveled; cars thrown and small missiles generated.
EF5	Incredible	>200	**Incredible** damage: Strong frame houses leveled off foundations and swept away; automobile-sized missiles fly through the air in excess of 100 meters (109 yards); high-rise buildings have significant structural deformation; incredible phenomena occur.

*Wind Speed consists of wind estimates (not measurements) based on damage
Source: NOAA National Weather Service. The Enhanced Fujita Scale. https://www.weather.gov/oun/efscale

As tornadoes can occur with little to no warning, warning time may be short or non-existent prior to a tornado event. The National Weather Service (NWS) issues Tornado Watch and Tornado Warning messages to warn residents of potential tornadoes. A Tornado Watch is issued when severe thunderstorms and tornadoes are possible in and near the watch area. It does not mean that they will occur, but that they are possible. A Tornado Warning is issues when a tornado is imminent. The NWS recommends that residents seek safe shelter

immediately following a Tornado Warning announcement.[171] Tornado Warning times vary in the range of 10 to 15 minutes prior to the tornado strike.

Tornadoes emerge from thunderstorms, which gain most of their energy from solar heating and latent heat released by the condensation of water vapor. Therefore, it is common for most tornadoes occur in the afternoon and evening hours, with a minimum frequency around dawn (when temperatures are lowest and radiation deficits are highest). However, tornadoes have occurred at all hours of the day, and nighttime occurrences may give sleeping residents of a community little or no warning.[172] Figure 110 indicates the historical time of tornado occurrence in the northeast climate region, of which Connecticut belongs.

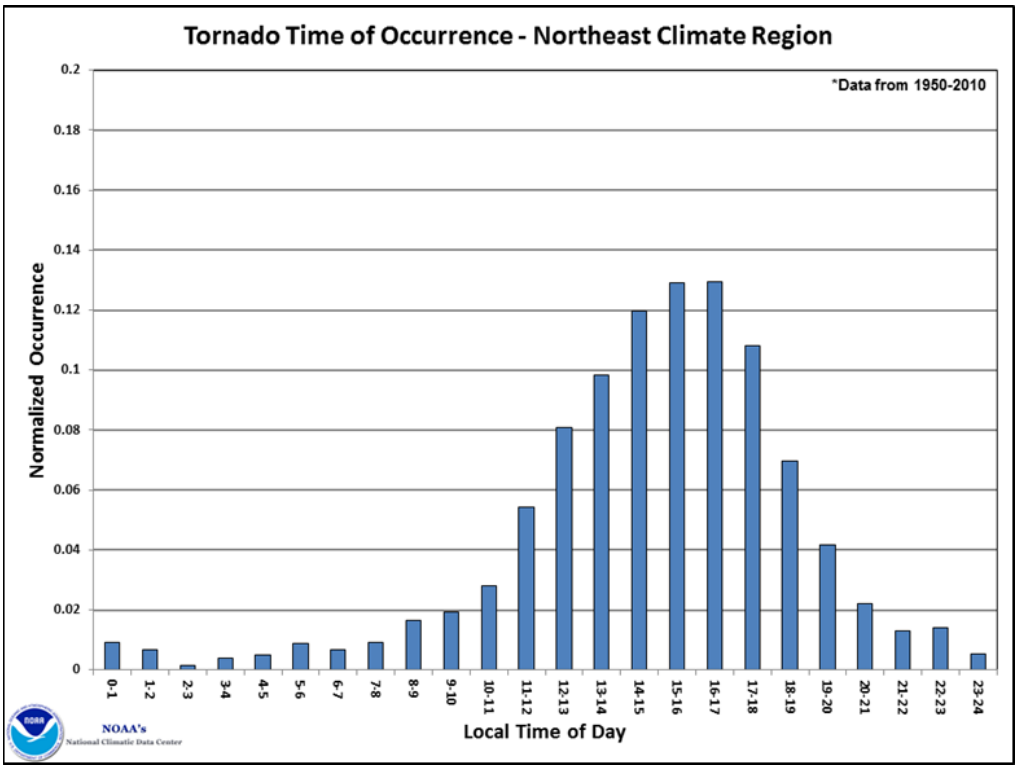


Figure 110. Tornado Time of Occurrence

4.8.3 Impacts

The impact of tornadoes primarily depends on their location. Tornadoes that occur in undeveloped areas often go unreported, as they cause no damage to structures or population. In developed areas, tornadoes have the potential to cause widespread utility outages, downed trees, closed roadways, and damages to critical and essential infrastructure. Homes, businesses, and infrastructure can suffer extensive damage if located in the direct path or along the outer edges of a tornado.

[171] NOAA NWS. Watch/Warning/Advisory Definitions.
[172] https://www.ncdc.noaa.gov/climate-information/extreme-events/us-tornado-climatology/trends



- The majority of deaths due to tornadoes occur in residential structures as they are generally more susceptible to tornado damage than commercial or industrial structures due to differences in building construction. Wood and masonry buildings, in general and regardless of their occupancy class, tend to experience more damage than concrete or steel buildings.
- High-rise buildings are also very vulnerable structures. Mobile homes are the most vulnerable to tornado damage and offer little protection to people inside.
- People who are in vehicles, wildlife, and livestock are also at a greater risk to suffer fatal injuries due to a tornado than those inside structures. Flying debris carried by a tornado is the main cause serious injury and death.



- Roads and bridges can be damaged due to strong wind or debris carried by tornado wind, resulting in road closures. Road closures may impact the movement of essential goods, and impact public transportation routes.
- Power outages may also occur, which can cause food spoilage at grocery stores and shelters or loss of function for essential equipment at hospitals and other critical facilities.



- The environmental impact of tornadoes can vary based on the strength of the tornado. Strong winds may uproot trees and other large plants, causing significant damage to the surrounding environment. Additionally, the loss of root systems can increase the potential for soil erosion in damaged areas.



- There may be public health impacts from tornadoes. Building materials or hazardous waste may be carried by strong winds of the tornado into water bodies, which could then become contaminated. This may impact drinking water quality or lead to the spread of water-borne diseases.
- Populations living in mobile homes, in vehicles, or outside at the time of a tornado event may also be at a higher risk and should seek shelter in a building. Following a tornado event, residents may be displaced or require temporary to long-term shelter.



- In areas impacted by tornado events, economic impacts can also be significant. Types of impacts may include loss of business functions, water supply system damage, damage to inventories, relocation costs, wage losses, and rental losses due to the repair or replacement of buildings. Recovery and clean-up costs can also be expensive.

4.8.4 Previous Occurrences and Losses

The entire State of Connecticut is vulnerable to tornadoes and their impacts. Between 1950 and 2022, the State has experienced 126 tornado events that have injured over 700 people, resulted in four deaths, and caused over $1.8 billion in damages. The most tornado activity has occurred during the summer months (June through August). Figure 111 shows historic tornado tracks and magnitude from 1950 to 2022.[173] Table 123 has a summary of tornado events, by county.

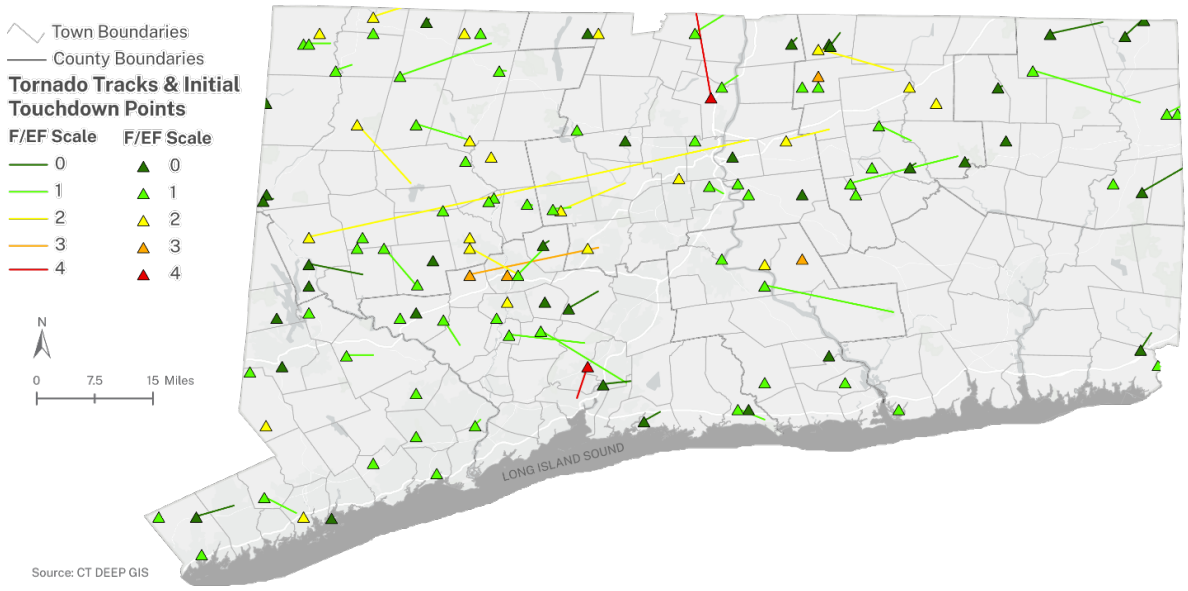


Figure 111. Historic tornado events (1950 – 2022)

Table 123. NCEI total tornado events (1950-2022)

County	Number of Events	Number of Injuries	Number of Deaths	Property Damages (2022 USD)
Fairfield	17	13	0	$ 10,534,876
Hartford	18	507	3	$ 1,059,650,192
Litchfield	36	84	0	$ 124,334,757
Middlesex	8	8	0	$ 2,887,334
New Haven	21	137	1	$ 680,078,372
New London	4	0	0	$ 72,853
Tolland	15	4	0	$ 3,749,894
Windham	7	0	0	$ 6,878,449

[173] NOAA Storm Prediction Center. SVRGIS. https://www.spc.noaa.gov/gis/svrgis/

County	Number of Events	Number of Injuries	Number of Deaths	Property Damages (2022 USD)
Total*	**126**	**703**	**4**	**$1,888,186,729**

*Note: event totals may reflect a storm event that has affected multiple counties that have been counted as individual events in each affected county.

Most of Connecticut's tornadoes are generally weak and do not cause much damage, as shown in Table 124. Tornadoes that occurred prior to 2007 are shown in the Fujita Scale, while tornadoes that occurred after 2007 are shown in the Enhanced Fujita Scale. Of the 126 tornadoes that occurred between 1950 and 2022, only 7 were reported in the higher classifications of F3 and F4. No F5 or EF 5 tornadoes have occurred in the State since 1950. A list of historical tornado events can be found in Appendix 3.

Table 124. Connecticut tornado numbers and strength (1950 – 2022)

1950-2006			2007-2022		
Fujita Scale	Count	Percent	Enhanced Fujita Scale	Count	Percent
F0	12	9.7%	EF0	22	17.9%
F1	39	31.7%	EF1	21	17%
F2	22	17.9%	EF2	0	0%
F3	5	4%	EF3	0	0%
F4	2	1.6%	EF4	0	0%
F5	0	0%	EF5	0	0%

Source: NCEI Storm Events Database

Although the majority of tornado events in Connecticut have zero reported deaths or injuries, three major tornado events have caused over twenty injuries, and at least one death. These events are described below:

- **New Haven County – May 24, 1962:** An F3 tornado tracked through Northern New Haven and Southern Hartford Counties. The tornado produced "near-F4 damage" in parts of Waterbury and Southington with more than 200 buildings destroyed and another 600 damaged. One person was killed, with another fifty injured, and the tornado caused $4,000,000 in damage along its 11.6-mile path.[174]
- **Hartford County – October 3, 1979:** The Windsor Locks, Connecticut tornado struck the towns of Windsor, Windsor Locks, and Suffield, Connecticut, and Feeding Hills, Massachusetts, on Wednesday, October 3, 1979. The short-lived but intense tornado

[174] NCEI Storm Data Archives. https://www.ncdc.noaa.gov/IPS/sd/sd.html

struck without warning and caused three deaths and 500 injuries along its 11.3-mile track. It received a rating of F4 on the Fujita scale.[175]

- **Litchfield County & New Haven County – July 10, 1989:** The tornadoes on July 10, 1989 in Connecticut were the epicenter of a northeastern U.S. tornado outbreak. An F4 tornado was reported in New Haven County, injuring 40 people and causing $250 million in damages. Thirty minutes prior to the F4 tornado, an F2 tornado was reported in Litchfield and New Haven Counties, causing a combined 70 injuries and $50 million in damages. The damage in Connecticut was substantial with hundreds and hundreds of homes and businesses destroyed. Many people in the New Haven suburbs – including North Haven and North Branford were caught in the hail core of the storm with golf ball size hail or larger.

Between 1954 and 2023, Connecticut was included in three FEMA declared tornado-related disasters (DR) or emergencies (EM). Table 125 shows details on each tornado-related FEMA disaster declarations. Generally, these disasters cover a wide region of the State; therefore, they may have impacted many counties. Since the 2018 State HMP, Connecticut has not had any tornado related declarations.

Table 125. FEMA Tornado Disaster Declarations

Disaster Number	Program Type	Declaration Date	Incident Type	Title	Declared County Area
608	IA	10/4/1979	Tornado	Tornado & Severe Storms	Hartford
837	IA/PA	7/17/1989	Tornado	Tornado & Severe Storms	Litchfield & New Haven
4385	PA	8/20/2018	Tornado	Severe Storms, Tornadoes, and Straight-Line Winds	Fairfield & New Haven

4.8.5 Future Losses

Based on past NCEI historic records of tornado activity in Connecticut, it is estimated that the state will experience one to two tornado events per year. Table 126 summarizes the NCEI storm events data by county, which was used to analyze future probability and losses.

[175] NBC Connecticut. The 1979 Windsor Locks Tornado. https://www.nbcconnecticut.com/news/local/the-1979-windsor-locks-tornado/165100/

Table 126. NCEI annualized tornado events and losses (1950-2022)

County	Annualized Events	Annualized Deaths	Annualized Injuries	Annualized Damages (2022 Dollars)
Fairfield	0.24	0.18	0.00	$146,317.72
Hartford	0.25	7.04	0.04	$14,717,363.78
Litchfield	0.50	1.17	0.00	$1,726,871.63
Middlesex	0.11	0.11	0.00	$40,101.86
New Haven	0.29	1.90	0.01	$9,445,532.94
New London	0.06	0.00	0.00	$1,011.85
Tolland	0.21	0.06	0.00	$52,081.86
Windham	0.10	0.00	0.00	$95,534.01
Total	***1.75**	**9.76**	**0.06**	**$26,224,815.68**

*Note: event totals may reflect a storm event that has affected multiple counties that have been counted as individual events in each affected county.

In general, the pattern of occurrence and potential locations for tornadoes in Connecticut is expected to remain relatively unchanged in the upcoming years. Based on NOAA and NCEI historical data, Litchfield county has the highest count of past tornado events, indicating a higher risk for the occurrence of future tornadoes. The western portion of the state, including Fairfield, Hartford, and New Haven counties each have moderately high risk for future tornadoes, followed by Tolland county with a moderate risk based on previous occurrences. Middlesex, Windham and New London counties may be considered to have a low risk since tornadoes have historically occurred less frequently than in other counties in the state.

4.8.6 Climate Change Impacts

Climate change may affect the frequency and intensity of future tornado events, but a lack of reliable historical data makes it difficult to determine whether there are any long-term trends in their frequency or intensity. Tornadoes often occur over much shorter time periods and smaller geographic areas, which further reduces the ability to detect trends and develop future projections.[176] Table 127 shows an overview of the impacts of climate change on future tornado events.

[176] Fourth National Climate Assessment, Chapter 2: Our Changing Climate. https://nca2018.globalchange.gov/chapter/2/

Table 127. Climate Change Impacts on Future Tornado Events

Impact	Projected Change
Location	Climate science currently does not report a conclusive change in location of tornado activity.
Intensity	There is not enough scientific data to project a change in tornado intensity due to climate change.
Frequency	Over the past century, there has not been a significant trend in tornado frequency in the Northeast region.
Duration	Climate science currently does not report a conclusive change in tornado duration.
Model Confidence	Low confidence.

Source: Fourth National Climate Assessment

4.8.7 Vulnerability Assessment

The locations with highest vulnerability to tornadoes can be determined by analyzing the location of historic tornado occurrences. To determine density of tornado touchdowns, the ArcGIS kernel density tool was used to calculate an average score per square mile. Tornado touchdown points between 1950 and 2022 were utilized for the density analysis. As shown in Figure 112, the highest tornado density area touches parts Litchfield, New Haven, Hartford, and Tolland counties. New London County has the lowest tornado density.

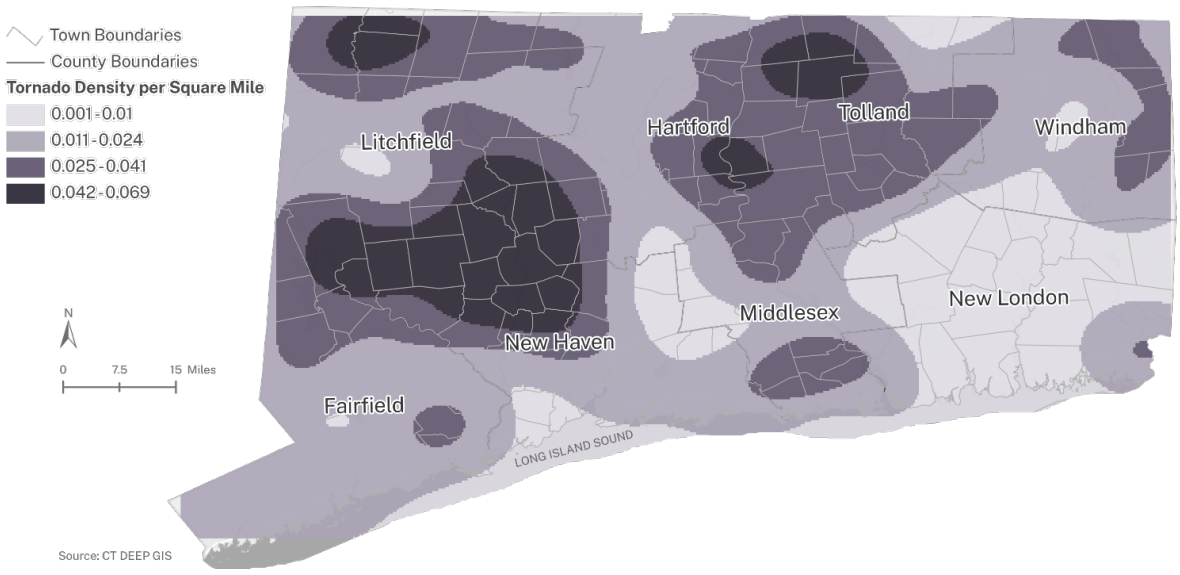


Figure 112. Connecticut tornado density

4.8.7.1 State Vulnerability

All state-owned facilities and critical facilities are exposed to tornado events. However, facilities located within the high tornado density area are historically more likely to be damaged due to a tornado event than facilities located elsewhere in the State. To assess the vulnerability of state-owned facilities, facilities points were overlaid with the tornado density layer.

Table 128 and Table 129 show state-owned building count and value of the buildings located in the high tornado density areas within the state. A total of 286 state-owned buildings (8% of the total number of state-owned buildings in the state) are located within the high-density zone. Hartford, Litchfield, and New Haven Counties are the only counties with state-owned buildings located in the high-density tornado area. New Haven County has the highest number of state-owned buildings exposed to tornado hazard, with 152. Hartford has the second highest number with 83.

Table 128. Number of state-owned buildings in the high tornado density area, by county

County	Number of State-Owned Buildings in High Tornado Density Area	Percent of Total State-Owned Buildings in High Tornado Density Area
Fairfield	0	0%
Hartford	83	12%
Litchfield	49	19%
Middlesex	0	0%
New Haven	152	25%

County	Number of State-Owned Buildings in High Tornado Density Area	Percent of Total State-Owned Buildings in High Tornado Density Area
New London	0	0%
Tolland	2	0%
Windham	0	0%
Total	**286**	**8%**

As shown in Table 129, the value of buildings located in high tornado density areas in Hartford and New Haven Counties make up approximately 31% of the total value of state-owned buildings in their respective counties. The value of state-owned buildings in Litchfield is lower, at 7% of the total value.

Table 129. Value of state-owned buildings in the high tornado density area

County	Value of State-Owned Buildings in High Tornado Density Area	Percent of Total Value High Tornado Density Area
Fairfield	$0	0%
Hartford	$820,000,000	31%
Litchfield	$4,200,000	6%
Middlesex	$0	0 %
New Haven	$390,800,000	34%
New London	$0	0%
Tolland	$0	0%
Windham	$0	0%
Total	**$1,215,000,000**	**20%**

4.8.7.2 Councils of Government Vulnerability

In Connecticut, vulnerability can vary by COG region in addition to County region. Table 130 shows a summary of the critical facilities located in the high tornado density area, by COG region. The COG region with the most critical facilities vulnerable to tornado hazard is the Naugatuck Valley Council of Governments region, with 56% of the critical facilities located in the high tornado density area. Capitol Region has the second highest percentage of critical facilities located in the high tornado density area, followed by Northwest Hills, Western Connecticut, and South Central Regional areas. The Metropolitan, Northeastern Connecticut, Lower Connecticut River Valley, and Southeastern Connecticut Council of Governments Regions do not have any critical facilities located in the high tornado density areas. A more detailed table of critical facilities by COG can be found in Appendix 3.

Critical facilities also serve as community lifelines that provide fundamental services to each community. When critical facilities are damaged by tornadoes, a community has reduced capacity to support continuous operation of critical government and business functions, and human health and safety may be at risk. When analyzing vulnerable critical facilities, it was determined that the most vulnerable community lifelines are Safety and Security and Health and Medical.

Table 130. Number of critical facilities in the high tornado density area

COG Region	Number within High Tornado Density Area	Percent within High Tornado Density Area
Capitol Region	86	20%
Metropolitan	0	0%
Naugatuck Valley	117	56%
Northeastern Connecticut	0	0%
Northwest Hills	12	9%
Lower Connecticut River Valley	0	0%
South Central Regional	4	2%
Southeastern Connecticut	0	0%
Western Connecticut	20	7%
State Total	**239**	**12%**

To estimate the population vulnerable to tornado events in each county, population of each COG intersecting the high tornado density areas were determined. A GIS analysis was conducted by analyzing the population count of census tracts intersecting the high tornado density area. This analysis used 2020 Census data for population. The results show the population of the entire census tract that intersects a high tornado density area, even if only a portion of the tract is located within the high-density area and therefore may be an over estimation of the population exposed to a tornado. As shown in Table 131, Naugatuck Valley Region has the highest percent of the total population located within the high tornado density area. This region is the most vulnerable in terms of population exposed to tornado events. The Capitol Region, and the Northwest Hills Region have the second highest vulnerable populations, with 29% exposed in each Region.

Table 131. Population intersecting the high tornado density area

COG Region	Population of COG Intersecting the High Tornado Density Area	Percent of the Population Intersecting High Tornado Density Area
Capitol Region	283,375	29%
Metropolitan	0	0%

COG Region	Population of COG Intersecting the High Tornado Density Area	Percent of the Population Intersecting High Tornado Density Area
Naugatuck Valley	310,718	69%
Northeastern Connecticut	0	0%
Northwest Hills	32,416	29%
Lower Connecticut River Valley	0	0%
South Central Regional	13,467	2%
Southeastern Connecticut	0	0%
Western Connecticut	44,073	7%
State Total	**684,049**	**19%**

4.8.7.3 Local Vulnerability

The impact of tornado events on life, health and safety is dependent upon several factors including the severity of the event and if adequate warning time was provided to residents. All Connecticut residents and structures are exposed to the tornado hazard.

Tornadoes can be costly disasters, causing over $1 billion in damages to Connecticut since 1950. To assess potential future losses due to tornadoes, NRI expected annual loss values were determined for each county in the state, as shown in Table 132. The NRI calculates an expected annual loss value for tornado events, which considers loss to building value, population, and agriculture. Hartford county has the highest total expected annual loss, with over $7 million in losses.

Table 132. NRI expected annual loss due to tornado

County	NRI Expected Annual Loss
Fairfield	$3,113,742.08
Hartford	$7,049,267.38
Litchfield	$1,687,724.19
Middlesex	$989,618.71
New Haven	$4,723,996.56
New London	$1,276,096.27
Tolland	$995,300.49
Windham	$723,256.24
State Total	**$20,559,001.93**

Figure 113 shows the location of tornado high density areas in Connecticut and CCVI Social Sensitivity scores by census tract. All of the high tornado density areas overlap with at least one census tract with a Social Sensitivity score above 1.5. In Hartford and New Haven Counties, the high tornado density area overlaps with areas with a social sensitivity score above 3. This indicates that there are socially vulnerable populations located in areas of high tornado density, and therefore at higher risk of future tornado events. Socially vulnerable populations may be more vulnerable to the effects of tornado events. Populations located in communities without early warning systems or access to warning systems in their spoken language may be at a higher risk of tornadoes due to lack of warning time. Additionally, populations with functional needs or over the age of 65 may be at higher risk due to inability to evacuate without assistance.

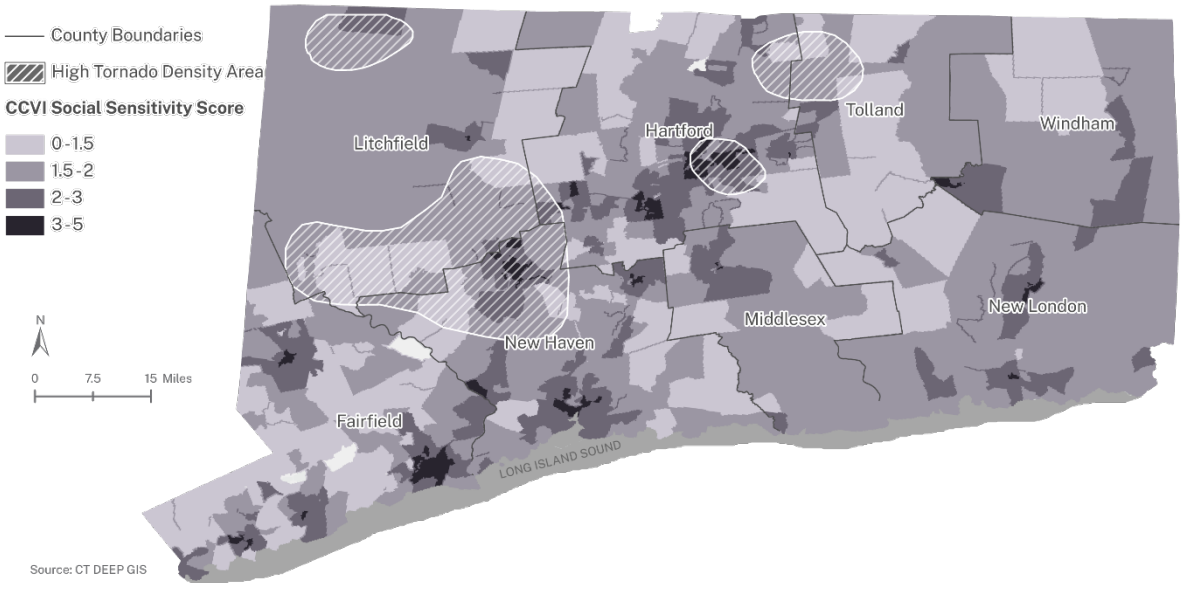


Figure 113. Social Sensitivity scores by census tract and high tornado density areas

Table 133 shows a summary of the critical facilities located within the high tornado density area by county. A total of 239 critical facilities (12% of the total number of critical facilities in the state) are located within the high tornado density area. New Haven County has the highest number of critical facilities located in the high-density area with 83 facilities, followed by Hartford and Litchfield Counties, with 73 and 67 facilities, respectively. A more detailed table of critical facilities by county can be found in Appendix 3.

Table 133. Number of critical facilities in the high tornado density area

County	Number within High Tornado Density Area	Percent within High Tornado Density Area
Fairfield	0	0%
Hartford	73	20%
Litchfield	67	37%

County	Number within High Tornado Density Area	Percent within High Tornado Density Area
Middlesex	0	0%
New Haven	83	21%
New London	0	0%
Tolland	16	14%
Windham	0	0%
State Totals	**239**	**12%**

To estimate the population vulnerable to tornado events in each county, population of the county intersecting the high tornado density areas were determined. The same GIS analysis was conducted for county population data as the COG population analysis in **section 4.8.7.2** above. Table 134 shows the population and percent of population of census tracts within each county intersecting the high tornado density area. Overall, Litchfield county has 60% of its population located within the high tornado density area. This indicates high vulnerability to tornado events in over half of the County's population. Hartford, New Haven, and Tolland Counties also have significant amount of total population in high tornado density areas, with 30% vulnerable in Hartford, and 28% vulnerable in both New Haven and Tolland Counties.

Table 134. Population intersecting the high tornado density area

County	Population Intersecting the High Tornado Density Area	Percent of the Population Intersecting the High Tornado Density Area
Fairfield	14,336	1%
Hartford	273,204	30%
Litchfield	111,180	60%
Middlesex	0	0%
New Haven	243,726	28%
New London	0	0%
Tolland	41,603	28%
Windham	0	0%
Total	**684,049**	**19%**

Tornadoes pose a threat to public safety, but their occurrence is not considered frequent enough in Connecticut to justify construction of tornado shelters at this time.

In lieu of a tornado shelter program, the State of Connecticut, through CT DEMHS, has chosen to provide NOAA weather radios to all public schools and many municipalities for use in local government buildings. These radios are tuned into the NWS radio frequencies.

When weather warnings are given by the NWS, the schools and local communities receive immediate notification of a storm event. Based on the type of warning provided, residents are advised to seek shelter or take appropriate precautions as directed by the NWS. NOAA radios have proven to be very useful in communities in Connecticut, as they serve to warn local populations of many types of weather events, not just tornado activity.

Additionally, the state provides guidance on how to respond to a tornado warning on their Emergency Management News and Resource Center website.

Geospatial analyses were performed to show transportation infrastructure within the tornado hazard area (figure 99). Further information about state transportation infrastructure within certain spatial hazards can be referenced in Appendix 3.

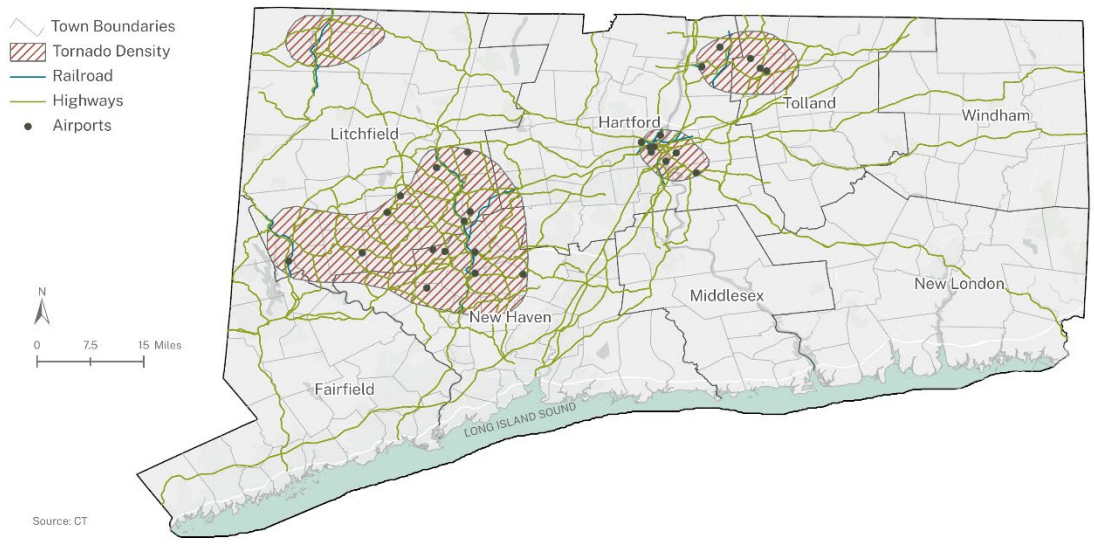


Figure 114. Transportation Infrastructure within the tornado hazard area.

4.8.7.4 Changes in Development

Tornados can occur anywhere in the State. Therefore, any new development and increases in population will be vulnerable to the impacts from tornado events. An understanding of population and development trends can assist in planning for future development and ensuring that appropriate mitigation, planning, and preparedness measures are in place.

Total building permits issued in each county in Connecticut between 2018 and 2022 shows areas of the State that have experienced growth in development. As shown in Figure 115, New Haven and Hartford Counties both have had between 3,000 and 6,000 total building

permits issued and both overlap with the high tornado density area. These counties are at a higher risk of tornado effects than counties with lower development due to the increased number of structures that are exposed to tornado events. Fairfield County has had the highest number of building permits issued between 2018 and 2022. Although Fairfield County does not have significant overlap with the high tornado density area, there have been 17 reported tornado events in the County since 1950, so there is still a risk of a tornado occurrence in the County, which could cause a significant amount of damage to the structures in the County. If recent trends in development continue, these Counties will continually increase their vulnerability to tornadoes through increasing development and population.

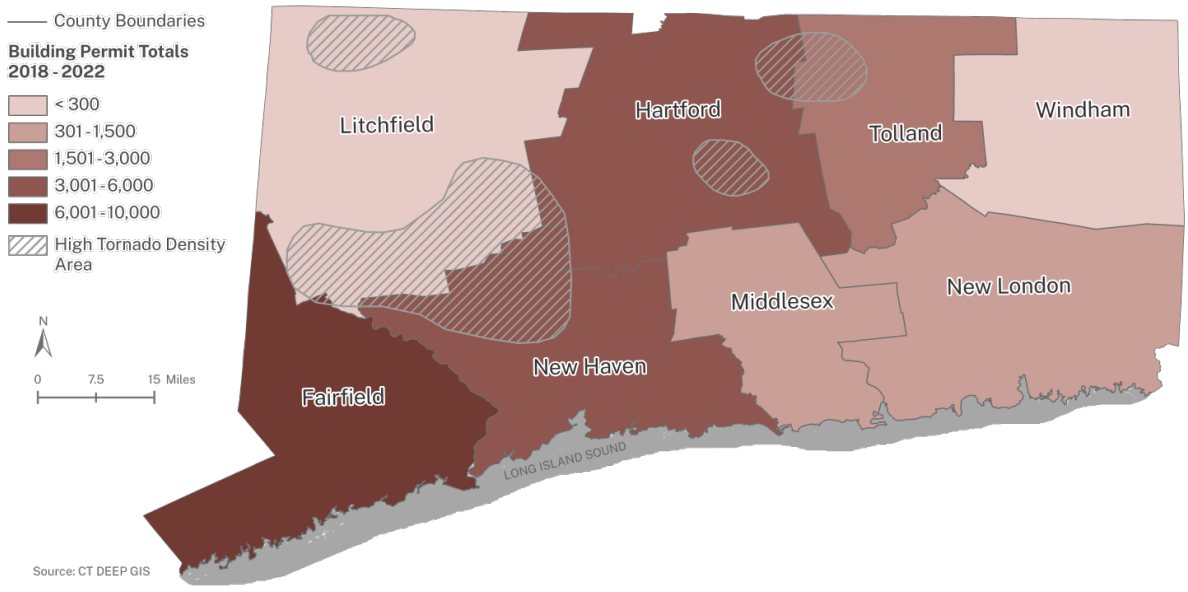


Figure 115. Total building permits issued 2018-2022 and high tornado density areas

Locations where future development is most likely to occur can also be determined by Opportunity Zones. In the United States, federally designated Opportunity Zones encourage investment in development in low-income communities to spur economic growth and job creation.[177] There are tax incentives to develop in these areas, and therefore these areas are target areas for development. Connecticut has 27 Opportunity Zones located across the state. As shown in Figure 116, there are 20 Opportunity Zones that intersect high tornado density areas. Fourteen of the 20 Opportunity Zones that intersect high tornado density areas are located in the City of Hartford and the remaining 6 are located between Naugatuck and Waterbury. The increase in development in these hazard-prone areas puts the structures and population at risk of damage from a tornado. Tornado risk is also compounded in Opportunity Zone areas because they are located in low-income areas that may have reduced capacity to rebuild and recover following a tornado event.

[177] US IRS. Opportunity Zones.

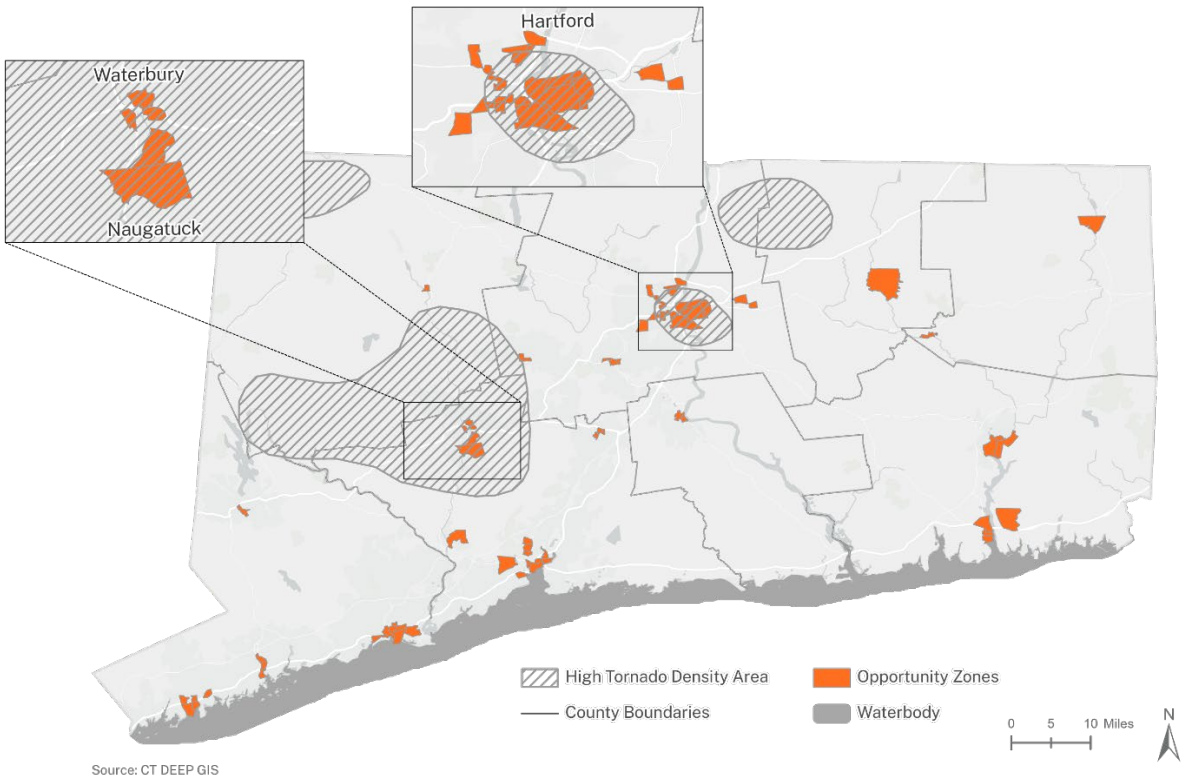


Figure 116. Opportunity Zones and high tornado density areas

Population growth also contributes to increased exposure of people to tornadoes and their related impacts. Future population projections can identify counties and COGs in Connecticut that may be more vulnerable to tornadoes due to an increase in population. As shown in Figure 117, the high tornado density areas intersect two counties with a projected population change over 1%. Hartford and New Haven Counties are projected to experience 5% and 4% population growth by 2040. The high tornado density areas also intersect with Litchfield and Tolland Counties, which are expected to decrease in population by 2040, lowering the population vulnerability of those counties.

As population and development increases in Connecticut, infrastructure and businesses will follow these population centers. This increases the potential future vulnerability that counties face from tornadoes. The State's population and related infrastructure is concentrated in, and will continue to grow, in areas of high tornado activity.

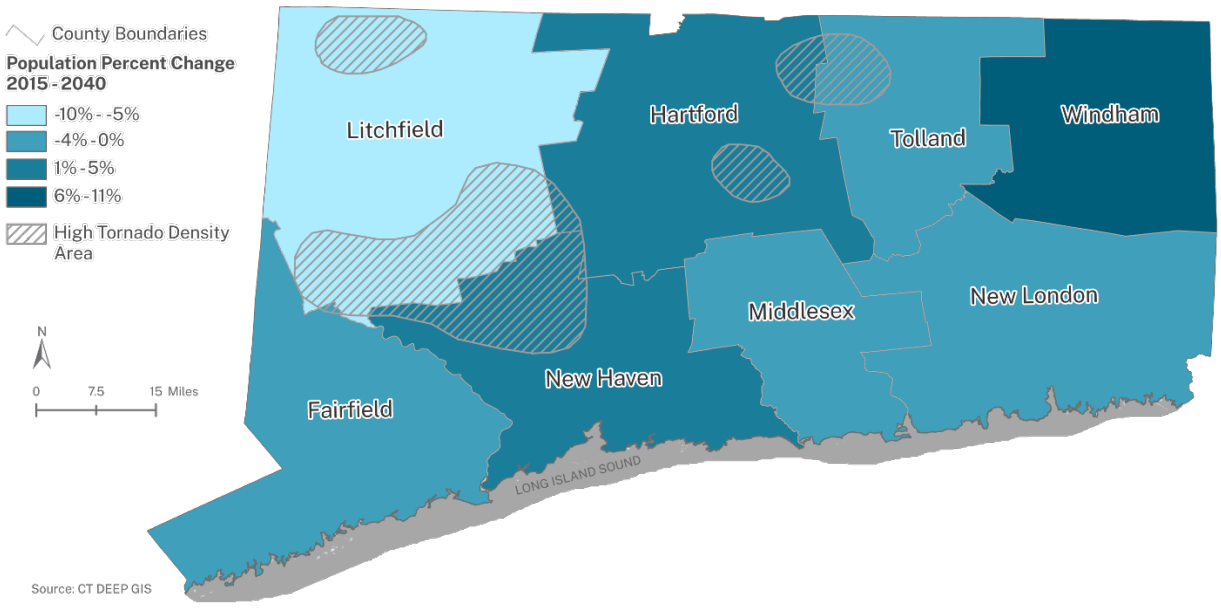


Figure 117. Future population percent change and high tornado density areas

4.8.8 Conclusion

Tornado was ranked on the risk parameters as detailed in Table 24. To summarize the overall risk of tornado for each county, each risk parameter score was multiplied by its impact weight and combined into a county composite ranking.

Table 135 shows the tornado hazard ranking for each county. The high to low comparison does not mean that a low or medium-low hazard will not occur or will not have some impact on the community. However, it does provide an overview of what hazards may pose the greatest risk to each county given available data. This document should serve as a guide to help planners and officials in managing risk and prioritize mitigation actions.

Table 135. Tornado hazard ranking by county.

	Fairfield	Hartford	Litchfield	Middlesex	New Haven	New London	Tolland	Windham
Hazard Concern	M	M	M	M	M	M	M	M
Local Plan Rating	M-H	M-H	M-H	M-H	M-H	M-H	M-H	M-H
Geographic Extent	M	M-H	H	M-L	M-H	L	M	M-L
Population Density	H	M-H	M	M-L	M-H	M	M-L	L
Future Development	H	M-H	M-L	M-L	M-H	M	M	L

	Fairfield	Hartford	Litchfield	Middlesex	New Haven	New London	Tolland	Windham
Facility Intersect	L	M-H	H	L	M-H	L	M	L
Future Events	M	M-H	H	M-L	M-H	L	M	M-L
Future Losses	M	H	M-H	M-L	M-H	L	M-L	M
Injury & Death	M	H	M-H	M	M-H	L	M-L	L
Social Sensitivity	L	H	L	L	M-H	L	L	L
Composite*	**M**	**H**	**M-H**	**M-L**	**M-H**	**L**	**M-L**	**L**

* Each parameter's weighted score was added together to create a composite rank for each county. A risk determination of high, medium-high, medium, medium-low, and low was then assigned based on percentiles. A summation of all the composite scores for all assessed hazards in each jurisdiction provides an overall risk rank per county. For more information, refer to Section 4.1.1.4.

4.9 Wildland Fire

A wildland fire is a non-structure fire that occurs in vegetation or natural fuels. The three types of wildland fire include naturally occurring wildland fire, interface or intermix fire, and prescribed fire. A brief description of each is provided below:

- **Wildland Fire:** Fuel consists mainly of natural vegetation.
- **Interface or Intermix Fire:** Urban/wildland fires that consist of vegetation and human-made fuels.
- **Prescribed Fire:** Any fire ignited by management actions to meet specific objectives.

Wildland fires pose a great threat to life and property, particularly when they move from forest or brushy areas into more developed or inhabited areas. Since 1983, more than five million acres are burned annually in the U.S. as a result of wildland fires, causing millions of dollars in damage. Each year, more than 70,000 wildland fires occur in the U.S., almost 86% of which are started by humans; the remaining 14% are caused by lightning.[178] Weather is one of the most significant factors in determining the severity of wildland fires.

Wildland fires result in the uncontrolled destruction of forests, brush, field crops, grasslands, real estate, and personal property, and have secondary impacts on other hazards such as flooding, by removing vegetation and destroying watersheds.

Connecticut's high population density has created land use pressures in which more people are moving from urban areas to build homes in rural wildland areas. The Wildland Urban Interface, also known as WUI, is the transition zone between rural and developed lands where human development meets vegetated and/or undeveloped wildland. With more people living in the State's forested areas, the number of fires started could increase. A potentially explosive combination is created when hazardous wildland fuels interface home development, and an increased risk of human-caused ignition come together under extreme fire weather conditions.

Residents in the WUI commonly experience negative effects of wildland fire with varying impact severities. Some residents may experience smoke or evacuation, while others may lose their homes to a wildland fire. Across the United States, 9.3-percent of all land is classified as WUI. All states have some land classified as WUI. WUI areas are divided into two categories: intermix and interface. Intermix areas have more than one house per 40 acres and more than 50-percent vegetation. Interface areas have more than one house per 40 acres, have less than 50-percent vegetation, and are within 1.5 miles of an area over 1,235 acres that is more than 75-percent vegetated.[179] Concentrations of WUI can be seen

[178] National Interagency Fire Center. Statistics. https://www.nifc.gov/fire-information/statistics
[179] Stewart et al. 2006. "The wildand-urban interface in the United States." U.S. Department of Agriculture. Newtown Square, PA.

along the east coast of the United States, where housing density rarely falls below the threshold of one housing unit per 40 acres and forest cover is abundant.

The cause of a wildland fire can be natural (e.g., lightning strike) or human induced (e.g., intentional acts of arson, negligently discarded cigarettes, unattended open burning of debris, unattended campfires, etc.). When not quickly detected and contained, wildland fires can cause extensive damage to property and threaten human life. Firefighters are trained to fight either structural (building) fires or wildland fires, and they typically maintain a primary focus on one and a secondary focus on the other. Structural firefighting focuses on reducing heat or oxygen in a fire. With wildland fires, firefighters focus their main efforts on reducing fuel. There are four types of fuels for wildland fires:

- **Ground Fuels** – organic soils, forest floor duff, stumps, dead roots, and buried fuels
- **Surface Fuels** – litter layer, downed woody materials, dead and live plants to two meters in height
- **Ladder Fuels** – vine and draped foliage fuels
- **Canopy Fuels** – tree crowns

The abundance of a specific fuel type will help to determine which wildland areas may be at higher risk for a specific class of wildland fire: surface fire (surface and ladder fuels); ground fire (ground fuels); or crown fire (ladder and canopy fuels).

The forest fire season in Connecticut can be broken down into spring, summer, and fall. Each portion of the forest fire season is attributed to different conditions which can result in different fire behavior.

Fire Suppression

Fire suppression is the primary activity utilized at all levels of fire management (Federal, state, and local) to manage wildland fires. Although fire suppression activities can reduce or eliminate the threat of small wildland fires, they result in continued growth of vegetation that would have otherwise been naturally reduced by fire. This continued vegetation growth provides a larger fuel load, increasing fire susceptibility.

In addition to fire suppression activities, state and local fire departments engage in many prevention activities, including public awareness activities and limitations on open burning, especially during increased fire danger levels. Some communities also proactively engage in local wildland fire mitigation programs, such as the National Fire Protection Association's Firewise Program, that encourages fire safety and prevention activities at a neighborhood or property-owner level. Fire safety activities for communities include fuel reduction, defensible space creation, fire resistant construction, and emergency planning.

In Connecticut, the Department of Energy and Environmental Protection (DEEP) is tasked with conserving, improving, and protecting the natural resources and environment of the state of Connecticut. Within DEEP, the Division of Forestry maintains an active forest fire prevention program and a specially trained force of firefighting personnel to combat fires that burn an average of 500 acres of woodland per year. The Division also has crews that are able to assist the US Forest Service in controlling large fires that take place outside of Connecticut.[180]

4.9.1 Location

According to the U.S. Department of Agriculture, about 60% of Connecticut is forested, which accounts for nearly 1.8 million acres (Figure 118). Private homeowners own 42% of the forested areas of the state.[181] Litchfield County, in the northwest corner of Connecticut, is the most heavily forested County with roughly 70% of its land area covered by forests. The majority of the state's other counties are also dominated by forests. Only in the more heavily urbanized counties of Fairfield (44%), New Haven (44%), and Hartford (39%) does forest area dip below 50%.

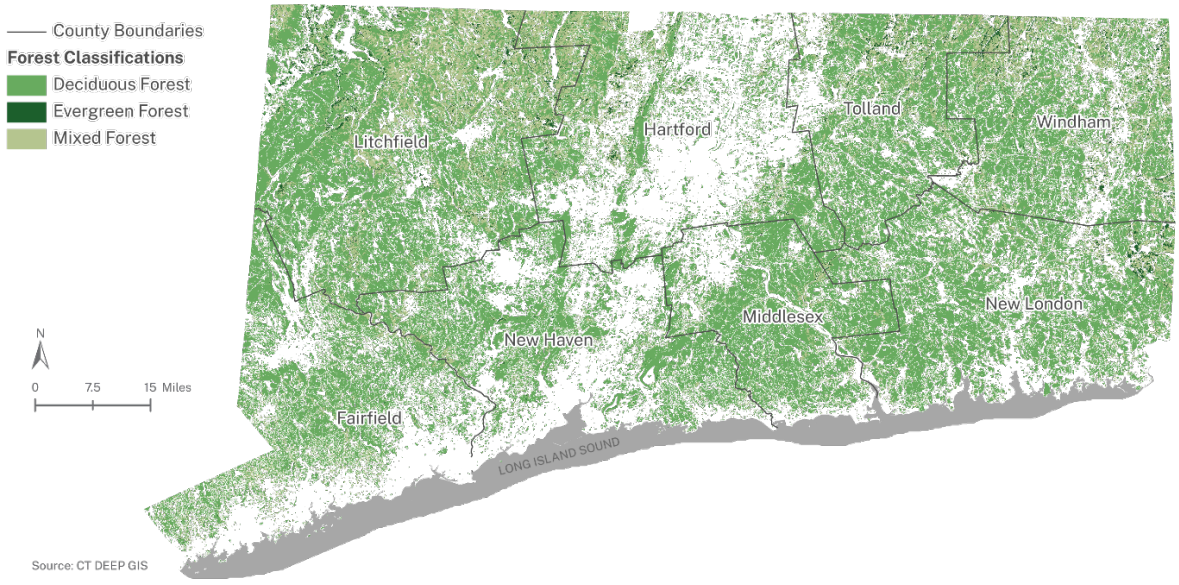


Figure 118. Forested land in Connecticut

In addition to being one of the most heavily forested states in the nation, Connecticut also ranks among the most densely populated, and in turn, among the highest in terms of-percentage of land considered in WUI areas.[182] According to 2020 U.S. Census data,

[180] CT DEEP. CT Forestry Division. https://portal.ct.gov/DEEP/Forestry/CT-Forestry-Division
[181] CT DEEP. The Classification of Land as Forest Land. http://www.ct.gov/deep/cwp/view.asp?a=2697&q=322788&depNav_GID=1631
[182] CT DEEP Forestry Division. Connecticut's 2020 Forest Action Plan. 2020. https://portal.ct.gov/-/media/DEEP/forestry/2020-Approved-CT-Forest-Action-Plan.pdf

Connecticut ranks as the fourth most densely populated state in the United States with more than 740 persons per square mile. In a 2018 study analyzing change in WUI areas from 1990 to 2010, Connecticut ranked number one in the country with 59.3% of its land mass considered in WUI areas. It also ranked number one for percentage of land cover located in intermix areas at 49.6% and number 2 with 9.8% of its land mass considered interface. The high-percentage of WUI areas are a result of a growing trend to move from highly urbanized geographic areas of the state to more suburban and rural wildland areas of the state. Figure 119 illustrates wildland fire hazard areas based on 2010 WUI map products developed by the SILVIS Lab at the University of Wisconsin-Madison. Fuels are primarily hardwood leaf litter, as over 80% of the woodlands are hardwood species. Volatile fuels of concern include mountain laurel, huckleberry, greenbrier, and phragmites which are found along coastal and wetland areas. The northwestern corner has the steepest terrain.

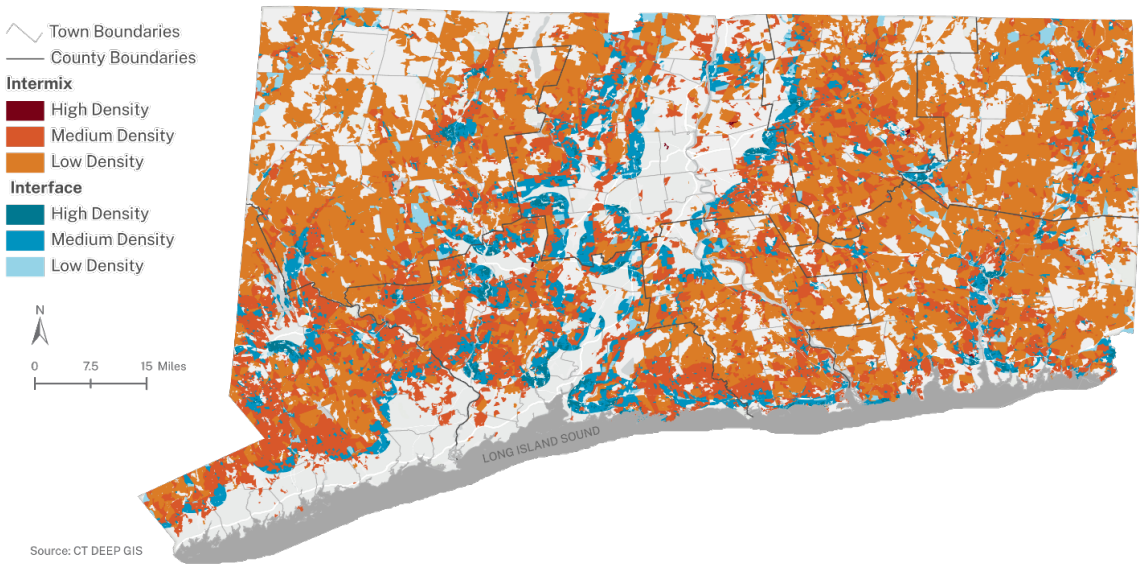


Figure 119. Wildland fire hazard areas

The areas considered most vulnerable to wildland fire risks and losses are those classified as WUI areas. The environment, people, and structures located within these areas will continue to be vulnerable to the risk of fires. However, the risk of wildland fires in Connecticut is currently managed through a variety of State and local activities, such as declining requests for open burning, and less uncontrolled or unsupervised interaction with forests and the natural environment overall. Wildland fire risk is also routinely addressed by the State through fire danger monitoring and fire suppression activities.

4.9.2 Intensity

The intensity of wildland fires depends on weather and human activity. The magnitude of wildland fire events is often characterized by speed of propagation, total number of acres burned, and potential destructive impacts to people and property. The severity and impact

of a wildland fire is greatly dependent on how the fire behaves in combination with fire detection, control, and suppression capabilities.

The CT DEEP Division of Forestry issues Forest Fire Danger Ratings for Connecticut starting in the spring of each year. A National Fire Danger Rating system that utilizes two indexes is used in Connecticut: spread index and build up index, as shown in the Table 136 below.[183]

The "spread" of a fire is predicted with the Spread Index, which is a numeric rating that corresponds with how fast a fire travels in 'Chains per Hour' (a chain is 66'). For example, if a prediction is made that the Spread Index will be 19, the fire is predicted to spread 1,254 feet (19 x 66') in an hour.

Connecticut also uses a build-up index (BUI) that measures drought (shown in Table 136). The BUI is a relative scale based upon past precipitation.[184] It reflects the combined cumulative effects of daily drying and precipitation in fuels with a 10-day time lag constant. The BUI can represent three to four inches of compacted litter or it can represent up to six inches or more of loose litter.[185]

Table 136. Build-Up Index

Rating or Class Days	Spread Index	Build Up Index
Low	0-10	0-22
Moderate	11-15	23-44
High	16-29	45-59
Very High	30-39	60-74
Extreme	> 40	> 75

Additionally, the State of Connecticut receives Red Flag Warnings that are issued by the National Weather Service (NWS). Connecticut is divided between three different National Weather Service stations. Predictions for Hartford, Tolland and Windham counties are made in Taunton, MA; predictions for Litchfield County are made in Albany, NY; and predictions for Fairfield, New Haven, Middlesex and New London counties are made in Brookhaven, NY.

A Red Flag warning is a warning to the firefighting community that extreme burning conditions are expected. Red Flag warnings are not a fire danger rating and they are not synonymous with High, Very High or Extreme fire danger. Red Flag warnings are issued

[183] CT DEEP. Fire Danger, Weather, and Reporting. https://portal.ct.gov/DEEP/Forestry/Forest-Fire/Fire-Danger-Weather-and-Reporting
[184] CT DEEP. Forest Fire Weather Information and Danger Explanations. https://portal.ct.gov/DEEP/Forestry/Forest-Fire/Forest-Fire-Weather-Information-and-Danger-Explanations
[185] NCFC. NC Fire Danger Technote 03 – May 15th, 2009: What is the Buildup Index? http://www.ncforestservice.gov/fire_control/pdf/technotes/FDTN03.pdf

when winds will be sustained or there will be frequent gusts above a certain threshold, normally 25 mph. In addition, relative humidity needs to be below 30-percent and precipitation for the previous 5 days must have been less than 1/4-inch.[186]

Wildland fires are often caused by humans, intentionally or accidentally. There is no way to predict when one might break out. However, there are tools used to identify the possibility of fire weather in an area. Fire weather watches and red flag warnings are used to convey the possibility of severe fire weather to wildland fire agencies. Fire weather conditions include dry conditions or periods of drought and dry lightning. Severe weather can be predicted; therefore, wildland fire risk can be monitored during weather events that might include lightning. Reliable NWS lightning warnings are available on average 24 to 48 hours prior to a significant electrical storm.

If a fire does break out and spread rapidly, residents may need to evacuate within days or hours. Once a fire has started, alerting the public is reasonably rapid in most cases. The use of cellular and two-way radio communications in recent years has further contributed to a significant improvement in warning time.

The Wildland Fire Assessment System (WFAS) provides a national view of weather and fire potential, including national fire danger, weather maps and satellite-derived "greenness" maps. Each day during the fire season, national maps of selected fire weather and fire danger components of the National Fire Danger Rating System (NFDRS) are produced by the WFAS. The US Fire Service indicates that the Fire Danger Rating level takes into account current and antecedent weather, fuel types, and both live and dead fuel moisture. This information is provided by local station managers. Table 137 describes the fire danger ratings and color codes.

Table 137. Fire danger rating and color code

Fire Danger Rating and Color Code	Description
Low (L) (Dark Green)	Fuels do not ignite readily from small firebrands although a more intense heat source, such as lightning, may start fires in duff or punky wood. Fires in open cured grasslands may burn freely a few hours after rain, but woods fires spread slowly by creeping or smoldering, and burn in irregular fingers. There is little danger of spotting.

[186] CT DEEP. Forest Fire Weather Information and Danger Explanations. https://portal.ct.gov/DEEP/Forestry/Forest-Fire/Forest-Fire-Weather-Information-and-Danger-Explanations

Fire Danger Rating and Color Code	Description
Moderate (M) (Light Green or Blue)	Fires can start from most accidental causes, but with the exception of lightning fires in some areas, the number of starts is generally low. Fires in open cured grasslands will burn briskly and spread rapidly on windy days. Timber fires spread slowly to moderately fast. The average fire is of moderate intensity, although heavy concentrations of fuel, especially draped fuel, may burn hot. Short-distance spotting may occur but is not persistent. Fires are not likely to become serious and control is relatively easy.
High (H) (Yellow)	All fine dead fuels ignite readily, and fires start easily from most causes. Unattended brushes and campfires are likely to escape. Fires spread rapidly and short-distance spotting is common. High intensity burning may develop on slopes or in concentrations of fine fuels. Fires may become serious and their control difficult unless they are attacked successfully while small.
Very High (VH) (Orange)	Fires start easily from all causes and, immediately after ignition, spread rapidly and increase quickly in intensity. Spot fires are a constant danger. Fires burning in light fuels may quickly develop high-intensity characteristics such as long-distance spotting and fire whirlwinds when they burn into heavier fuels.
Extreme (E) (Red)	Fires start quickly, spread furiously, and burn intensely. All fires are potentially serious. Development into high-intensity burning will usually be faster and occur from smaller fires than in the very high fire danger class. Direct attack is rarely possible and may be dangerous except immediately after ignition. Fires that develop headway in heavy slash (trunks, branches, and tree tops) or in conifer stands may be unmanageable while the extreme burning condition lasts. Under these conditions the only effective and safe control action is on the flanks until the weather changes or the fuel supply lessens.

The Fire Potential Index (FPI) is a tool that combines daily weather and vegetation conditions to identify areas with a high risk of fire ignition. By assessing the moisture levels of live and dead vegetation, and considering factors of low humidity, high temperature, and low precipitation, the FPI can determine fire susceptible areas. Provided by the United States Forest Service, daily FPI maps help local and regional fire planners identify fire

ignition risk. The FPI scale ranges from 0 (low) to 100 (high). While the FPI doesn't include most NFDRS calculations, it does take 10-hour moisture content into account.[187]

Fuel Moisture (FM) content is the quantity of water in a fuel particle expressed as a percent of the oven-dry weight of the fuel particle. FM is influenced by past and present weather events and is crucial for assessing fire potential. There are two types of FM: live and dead. Live FM changes slower and is affected by events such as drought, disease, early curing of annuals, timber harvesting, and changes in fuel models caused by wind and ice storms. Dead fuels undergo drying and wetting processes through evaporation, and their moisture content is influenced by factors such as fuel size, weather, topography, decay classes, fuel composition, surface coatings, fuel compactness, and arrangement.

Fuels are classified into four categories based on their moisture responses, measured by a time lag. The time lag represents the time it takes for fuels particles to reach two-thirds of the way to equilibrium with its local environment. The four categories include:

1. 1-hour fuels: up to 0.25-inch diameter – fine, flashy fuels that respond quickly to weather changes. Computed from observation time, temperature, humidity, and cloudiness.
2. 10-hour fuels: 0.25-inch to 1-inch diameter - computed from observation time, temperature, humidity, and cloudiness can be an observed value.
3. 100-hour fuels: 1-inch to 3-inch diameter - computed from 24-hour average boundary condition composed of day length (daylight hours), hours of rain, and daily temperature/humidity
4. 1,000-hour fuels: 3-inch to 8-inch diameter - computed from a seven-day average boundary condition composed of day length, hours of rain, and daily temperature/humidity ranges.

The Haines Index (refer to Figure 120), also known as the Lower Atmosphere Stability Index, is a fire-weather index that assesses the potential for existing fires to become large fires. It considers the stability and moisture content of the lower atmosphere. Developed by Donald Haines, a research meteorologist, the index ranges from two to size, with higher values indicating direr and more unstable conditions. It combines stability and moisture measurements to estimate the likelihood of significant fire growth, especially when surface winds have less influence. The index is applicable across the United States and can be adapted for three elevation regimes, low, middle, and high elevation regimes, depending on the fire's location relative to sea level.

[187] USGS. Wildland Fire Potential Index (WFPI). https://www.usgs.gov/fire-danger-forecast/wildland-fire-potential-index-wfpi

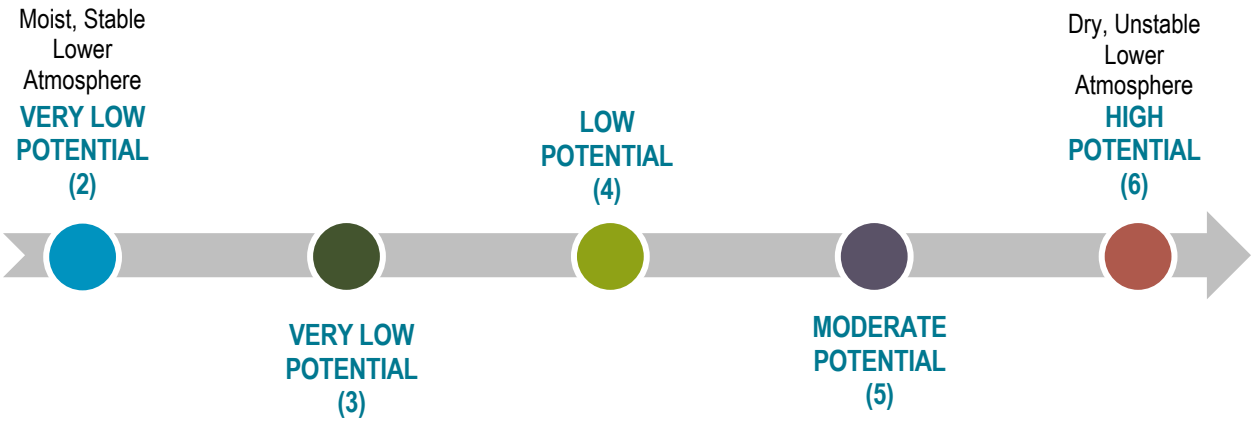


Figure 120. Haines Index levels

4.9.3 Impacts

Wildland fires, particularly large-scale fires, can dramatically alter the terrain and ground conditions, making land already devastated by fire susceptible to flooding, degradation, and exposure. Potential losses from wildland fire include human life, structures, and natural resources. Given the immediate response times to reported wildland fires, the likelihood of injuries and casualties is minimal. However, environmental and structural impacts are unavoidable and range in severity based on the duration, intensity, and frequency of wildland fire.

- Wildland fires can cause direct damage to buildings and infrastructure through exposure to heat and flames. Fire can ignite and consume structures as most buildings are made from flammable materials.

- Most roads and railroads would not be damaged except in the worst-case wildland fire scenarios.
- Power lines are the most at risk to wildland fire because most poles are made of wood and susceptible to burning. In a wildland fire, pipelines that provide fuel could be ignited, leading to a catastrophic explosion. Wildland fire hazard typically does not have a major direct impact on bridges, but it can create conditions in which bridges are obstructed or weakened.

- Wildland fires can increase the probability of other natural disasters, specifically floods and mudflows. Flooding after a wildland fire is often more severe, as debris and ash left from the fire can form mudflows.
- Wildland fires destroy and contaminate large areas of vegetation, wildlife habitats, and watersheds that can take years to begin recovering recovery.

- Smoke and air pollution from wildland fires can be a health hazard, especially for sensitive populations including children, the elderly, and those with respiratory and cardiovascular diseases.
- Wildland fire may also threaten the health and safety of those fighting the fires. First responders are exposed to the dangers from the initial incident and after-effects from smoke inhalation and heat stroke.

- Wildland fire management can cost thousands of taxpayer dollars and involve thousands of man hours from volunteer firefighters. There are also many direct and indirect costs to local businesses that excuse volunteers from working to fight these fires
- Negative effects on communities result from the initial loss of structures, subsequent loss of revenue from destroyed businesses, and decrease in tourism.

Wildland fires can have widespread impacts within a region, even outside of the immediate area that is burned. Smoke from wildland fires can create dangerous air quality across multiple states. In June 2023, wildland fires in Canada produced smoke that impacted states on the east coast from Maine to Georgia for multiple days. In Connecticut, the air quality was rated “Unhealthy” on the U.S. Air Quality Index for the majority of the State for three days, with one area near Bridgeport experiencing “Very Unhealthy Air” on June 9th. “Unhealthy” air indicates that the general public may experience health impacts due to poor air quality, and sensitive groups will have more serious impacts if exposed to the air. “Very Unhealthy” air quality indicates that the risk of health effects is increased for everyone.[188] Figure 121 shows the poor air quality across Connecticut caused by Canadian wildland fires.[189]

[188] AirNow. Air Quality Index (AQI) Basics. https://www.airnow.gov/aqi/aqi-basics/
[189] AirNow. Interactive Map of Air Quality. 2023. https://gispub.epa.gov/airnow/

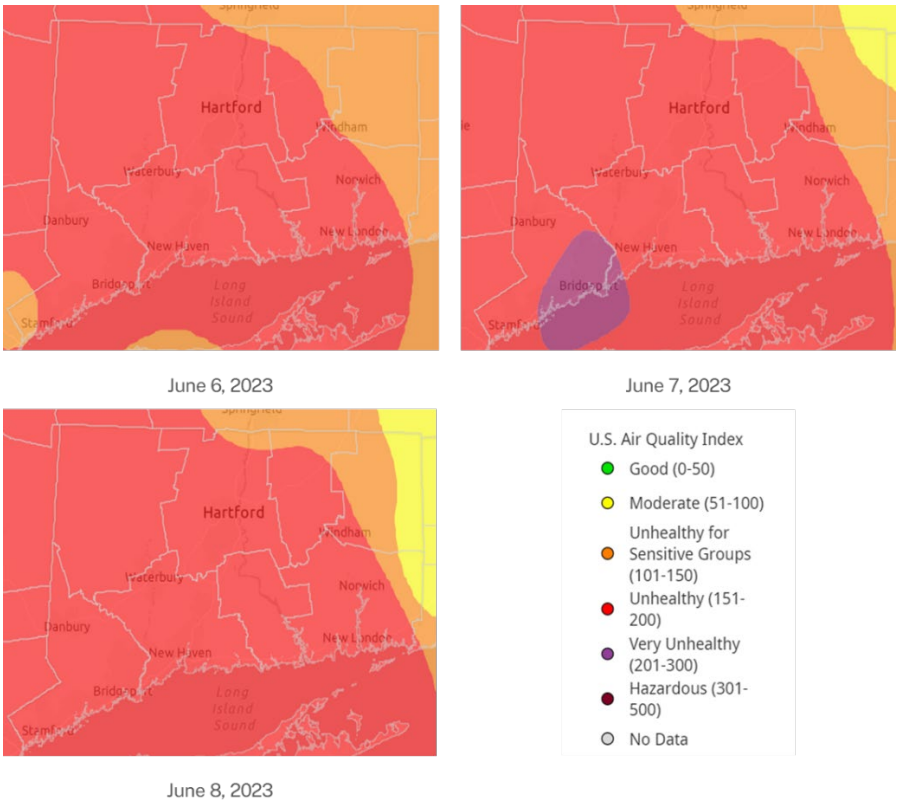


Figure 121. Connecticut air quality due to June 2023 wildland fires

4.9.4 Previous Occurrences and Losses

The State of Connecticut is one of the most heavily forested states in the United States. It is estimated that 1.8 million acres of forest and wildland cover the State.[190] While wildland fires have historically, and continue to be, a very frequent occurrence, the Connecticut Division of Forestry estimates that these incidents burn less than a fraction of one-percent of the total forested acreage in the state. This is due to the fact that most wildland fires are quickly detected, contained, and suppressed before they can spread. Figure 122 shows a detailed map of the land cover of the State of Connecticut.

[190] https://www.fs.fed.us/nrs/pubs/ru/ru_fs19.pdf

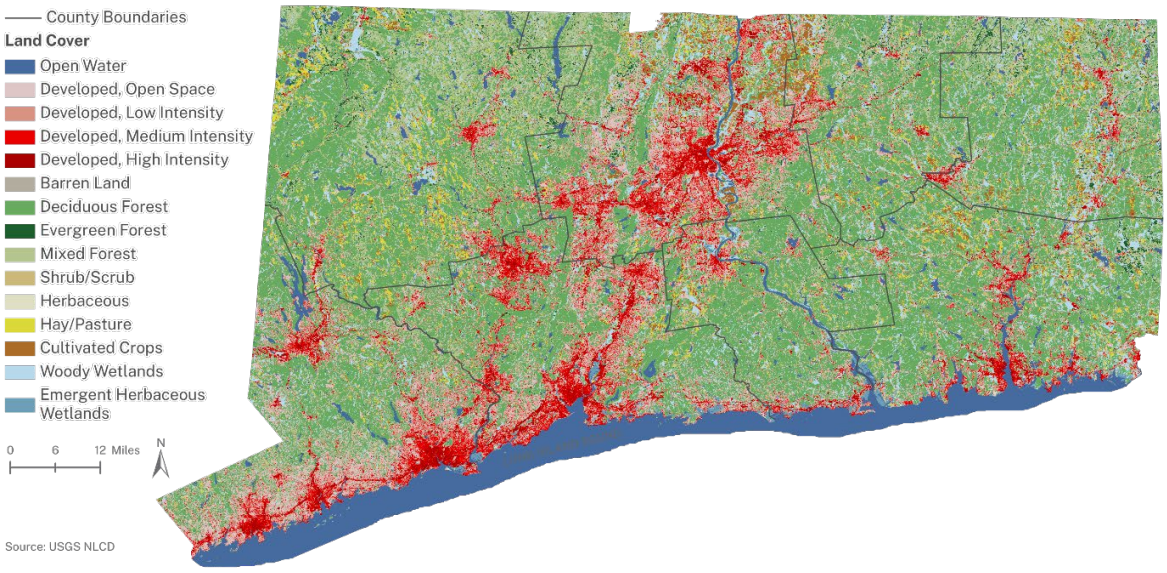


Figure 122. Forest and other land cover in Connecticut

Reporting of wildland fires is based on the National Fire Incident Reporting System (NFIRS). This system has greatly improved the accuracy of reported data concerning wildland fires, including characteristics such as cause, size, and intensity. However, some small wildland fires that occur in uninhabited areas may go unreported. In addition to the NFIRS system, the US Forest Service Fire Program Analysis (FPA) Fire-Occurrence Database (FOD) was used in this Plan as supplemental wildland fire data for the years 2015-2020. The FPA FOD includes wildland fire data reports from federal and non-federal sources, including the Connecticut Division of Forestry.

Table 138 summarizes the State of Connecticut data on reported wildland fire events from 2013-2022. In 2022, 150 wildland fires were reported to the National Interagency Fire Center (NIFC), or collected by the FPA FOD, and 347 acres burned due to wildland fire in the State of Connecticut.[191] According to these records, there have been 2,430 events reported between 2013 and 2022. The average fire size (total acres burned) per incident is 1.2 acres. In the past 5 years, from 2017-2022, no single fire incident occurred that burned more than 300 acres. The last large wildland fire in Connecticut was in September 2016 and burned 384 acres.[192] During the past 5 years, the year with the highest number of fires was 2020 with 603 separate wildland fire events. However, 2017 had the highest number of total acres burned over the past 5 years at 389 acres.

Many sources provided information regarding previous occurrences and losses associated with wildland fire events throughout the State of Connecticut. The 2019 Plan discussed specific wildland fire events that occurred in the State through 2017. For this 2023 Plan

[191] NIFC. National Report of Wildland Fires and Acres Burned by State. https://www.predictiveservices.nifc.gov/intelligence/2017_statssumm/fires_acres17.pdf
[192] USGS. GeoMAC Map Viewer. https://www.sciencebase.gov/catalog/item/5d8103f0e4b0c4f70d0537ff

update, wildland fire events were summarized between January 1, 2013 and December 31, 2022.

Table 138. NFIC and FPA FOD Wildland Fire Events in Connecticut

Year	Number of Events	Number of Acres Burned
2013	76	238
2014	28	69
2015	372	418
2016	636	945
2017	332	389
2018	67	45
2019	106	68
2020	603	366
2021	60	127
2022	150	347
Total	**2,430**	**3,012**

*Note: NFIC and FPA FOD data may not include all events that have occurred in the State.

Between 1954 and 2023, the State of Connecticut has not been included in any wildland fire-related major disaster (DR) or fire management assistance (FM) declarations.[193]

4.9.5 Future Losses

Based on available data, wildland fires will continue to be a highly probable occurrence (>5 events per year) in Connecticut, though the size and severity of these events are deemed minimal due to the rapid detection, containment, and suppression of fire incidents. Estimating the approximate number of catastrophic wildland fires to occur in Connecticut every year is very difficult. This is because several variable factors impact the potential for a fire and because some conditions, such as ongoing land use development patterns, location, and fuel sources, can exert increasing pressure on the WUI zone.

Given the many factors that can impact urban fire and wildland fire potential, the likelihood of a fire event starting and sustaining itself should be gauged by professional fire managers daily.

Although the total land mass of Connecticut is much smaller in comparison to larger mid-western and western states, and recent history suggests that wildland fires are not currently a major hazard threat for the state overall, wildland fires may pose a greater threat in the future. This is due to a combination of factors, including but not limited to

[193] FEMA. Disaster Information. https://www.fema.gov/disasters

increasing population densities in WUI areas, increasing fuel loads due to disease, pests, and storm events that result in dieback of mature trees, and potentially drier, longer, and more severe fire seasons as a result of climate change. Each of these factors is described in more detail below.

Extreme weather events, including Tropical Storm Irene, Superstorm Sandy, Winter Storm Alfred, Winter Storm Nemo, and other snow, ice, or wind events caused heavy damage and dieback to forested areas throughout the state. These impacts have resulted in a significantly increased amount of woody debris and fuel loads, increasing the probability of future wildland fire occurrences.

Due to the composition of the flora species that exist today in Connecticut's wildland areas and the unknown transference rate of species from the current forest and wildland species to more southern and invasive species, it is difficult to project the exact risk or potential increased number of fire outbreaks which may occur in the future. However, what is known from past WUI research is that education of private property owners and mitigation efforts implemented by homeowners will be significantly important as the risk of wildland fires increases in the future. These educational and mitigation efforts will require a collaboration between government agencies at all levels and private property owners.[194]

Risk-reduction factors for WUI areas in Connecticut include fuel-loading levels that are significantly less than other parts of the country, weather patterns producing median annual precipitation of greater than 42 inches throughout the year, and a landscaping preference which emphasizes large lawn expanses around buildings. However, a change in these factors may increase the risk and potential number of wildland fire outbreaks experienced within WUI areas.

4.9.6 Climate Change Impacts

Fire is impacted by climate variability, local topography, and human intervention. Hot, dry spells create the highest fire risk. Increased temperatures may intensify wildland fire danger by warming and drying out vegetation. A warmer climate would result in a longer wildland fire season. When climate alters fuel loads and fuel moisture, this changes the forest susceptibility to wildland fires. Climate changes also may increase winds that spread fires. Faster fires are harder to contain, and thus are more likely to expand into residential neighborhoods.

The USDA Forest Service states that wildland and forest ecosystems are very complex, and it is difficult to project the exact impacts of climate change. Climate change studies for the Northeast indicate that over the next century, the existing forest habitat range may move 300 to 500 miles northward. Thus, trees and vegetation currently found in the forests and wildland areas of Connecticut today would be replaced over the next century with tree species and vegetation adapted to a warmer climate. The change in flora composition will

[194] Cohen, Jack, The Wildland-Urban Interface Fire Problem, Forest History Today, Fall 2008.

influence the existing risk of wildland fires by altering the fuel load of wildland areas. In addition, it has been projected that climate change will create a warmer climate in Connecticut that is more conducive to invasive plant species and destructive vectors that will change the fire regime.

Climate change may also cause an increase in invasive insect species in Connecticut forests. These species can kill mature tree species, creating an increase in vegetative fuel loads in wildland areas, and increasing the chance of wildland fire. The introduction of disease, pests, and invasive plants promotes the dieback of mature tree species thus increasing available vegetative fuel loads in wildland areas. As the existing forests continue to change in age, structure, and species composition, wildland fire danger will continue to be an issue. Impacts of climate change on wildland fire is described in Table 139.

Table 139. Wildland fire climate change impacts

Impact	Projected Change
Location	No conclusive changes in the location of wildland fire as climate effects will vary and pose challenges in identifying potential fire regime. Burned areas in general will increase due to fires spreading over larger territories fueled by climate factors (NCA 2018)
Intensity	Climate model simulations indicate an increase in wildland fire intensity with warmer and longer dry seasons, as well as an increase in the number of very intense wildland fires. With the changing conditions, the severity of wildland fires is projected to increase (CMRA)
Frequency	Wildland fire frequency is projected to significantly increase due to rising temperature, prolonged droughts, and altered precipitation patterns supporting fire ignition and fuel (NCA 2018)
Duration	The increase in higher temperatures, longer dry seasons, and drier vegetation will lengthen the fire season in many areas (CMRA)
Model Confidence	High confidence (NCA 2018)

4.9.7 Vulnerability Assessment

Areas with the highest exposure to wildland fires are displayed in Figure 123. To identify areas vulnerable to wildland fires throughout Connecticut, the density of wildland fire events was calculated per square mile. Wildland fire events between 2013 and 2022 were included in the kernel density analysis. The highest wildland fire density is at least 6.7 fires per square mile and located across Litchfield, New Haven, Fairfield counties. Hartford has the lowest wildland fire density per square mile.

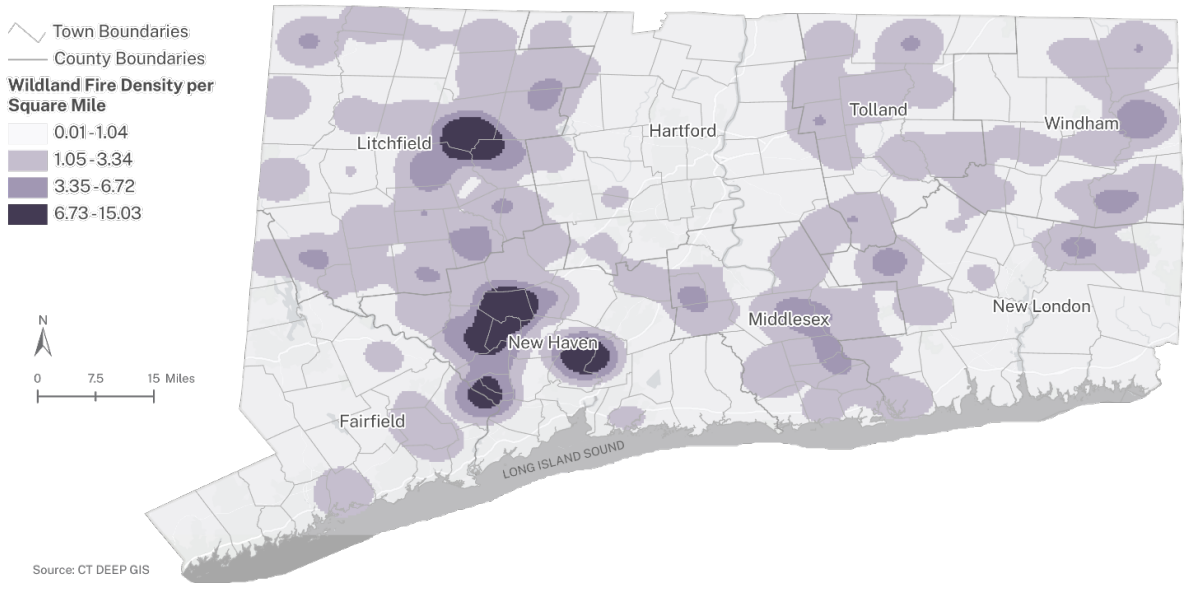


Figure 123. Wildland fire density in Connecticut

4.9.7.1 State Vulnerability

To assess the vulnerability of state-owned facilities, an analysis was conducted with the wildland fire hazard areas (WUI). Using ArcGIS, WUI hazard areas were overlaid with state-owned facilities to determine state-owned facilities that are exposed to wildland fire hazard. For the purposes of this 2023 Plan update, all state buildings and local assets located in the wildland-urban interface hazard areas are exposed to wildland fires. As the State of Connecticut continues to become more urbanized, the state facilities will need to be developed in locations that will serve the growing population.

Table 140 and Table 141 provide a breakdown of the numbers and values of state-owned buildings intersecting wildland intermix and wildland interface areas by county. A total of 1,529 state-owned buildings (48.3% of the total number of state-owned buildings in the state) are located within a wildland fire hazard area. This amounts to $1.9 billion in building values exposed to the wildland fire hazard (23.0% of the total value of all state-owned buildings in the state). Middlesex County had the highest percentage of total buildings at risk with 81% of buildings being in the Intermix or Interface WUI class. Windham County measured at the second highest exposed county in Connecticut with 73% of total buildings at risk. New London had the highest number of total buildings at risk, accounting for 53% of its total state-owned buildings.

Table 140. Number of state-owned buildings in WUI

County	Total State-Owned Buildings	Buildings Intersecting Intermix	Buildings Intersecting Interface	Buildings At Risk (Intersecting Intermix or Interface)
Fairfield	267	40	42	82
Hartford	688	118	61	179
Litchfield	261	79	66	145
Middlesex	312	181	71	252
New Haven	605	144	72	216
New London	493	160	101	261
Tolland	885	79	181	260
Windham	186	66	63	129
Total	**3,697**	**864**	**665**	**1,529**

Displayed in Table 141, Litchfield County has the highest percentage of its buildings' value within a WUI area at 43.5%. New London has the second highest percentage of building value located in a WUI area at 40.2%. All counties had at least 11.4% of their building value in a WUI area, with Fairfield County having the lowest percentage at 11.4%.

Table 141. Value of state-owned facilities in WUI

County	Total State-Owned Building Values	Value of Buildings Intersecting Intermix	Value of Buildings Intersecting Interface	Value of Building Value at Risk
Fairfield	$931,475,770	$570,180	$105,812,280	$106,382,460
Hartford	$2,851,852,743	$272,772,160	$615,709,520	$888,481,680
Litchfield	$146,057,470	$3,233,150	$60,292,140	$63,525,290
Middlesex	$389,946,220	$9,788,580	$115,202,400	$124,990,980
New Haven	$1,519,655,950	$25,678,460	$249,630,670	$275,309,130
New London	$461,430,830	$95,018,320	$90,700,430	$185,718,750
Tolland	$1,607,428,350	$13,424,830	$182,006,850	$195,431,680
Windham	$445,226,203	$30,221,250	$54,832,050	$85,053,300
Total	**$8,353,073,536**	**$450,706,930**	**$1,474,186,340**	**$1,924,893,270**

4.9.7.2 Councils of Government Vulnerability

Vulnerability of wildland fires can vary by COG region, in addition to varying by County. Table 142 summarizes the critical facilities located within the intermix and interface WUI

areas. Critical facilities are essential lifelines to the continuation of a community and provide fundamental services. The COG region with the most critical facilities vulnerable to wildland fires is the Northeastern Council of Government, with 91.4% of the critical facilities located within a WUI area. Northwest Hills has the second highest percentage of critical facilities located within the WUI, followed by Lower Connecticut River Valley, Southeastern, Naugatuck Valley, and Western COGs. Capitol Region, Metropolitan, and South Central are the only 3 COGs with their risk percentage below 50% for critical facilities within the WUI. A detailed table of critical facilities by COG can be found in Appendix 3.

Table 142. Number of critical facilities in WUI, by Council of Governments (COGs)

Council of Governments (COG)	All Critical Facilities	# within Intermix	Percent within Intermix	# within Interface	Percent within Interface	Total Facilities At Risk	Total Percent At Risk
Capitol Region	321	81	25.2%	76	23.7%	157	48.9%
Lower CT River Valley	134	63	47.0%	36	26.9%	99	73.9%
Metropolitan	92	17	18.5%	6	6.5%	23	25.0%
Naugatuck Valley	160	39	24.4%	66	41.3%	105	65.6%
Northeastern	93	60	64.5%	25	26.9%	85	91.4%
Northwest Hills	98	52	53.1%	34	34.7%	86	87.8%
South Central	201	27	13.4%	50	24.9%	77	38.3%
Southeastern	186	66	35.5%	59	31.7%	125	67.2%
Western	230	50	21.7%	67	29.1%	117	50.9%

The number of critical facilities in high density areas of wildland fire events was additionally measured for each Council of Governments in Connecticut to assess extremely vulnerable community lifelines. Table 143 shows that Naugatuck Valley had the highest percentage of critical facilities in the high wildland fire density area, followed by South Central and Northwest Hill Council of Governments. Analyzing critical facilities in areas with high density of wildland fires identified that the most vulnerable community lifelines are Safety and Security, and Health and Medical.

Table 143. Number of critical facilities in the high wildland fire density area, by COGs

Council of Government	All Critical Facilities	# within High Wildland Fire Density Area	Percent within High Wildland Fire Density Area
Capitol Region	321	0	0.0%
Lower CT River Valley	134	0	0.0%
Metropolitan	92	0	0.0%
Naugatuck Valley	160	36	22.5%
Northeastern	93	0	0.0%
Northwest Hills	98	11	11.2%
South Central	201	15	7.5%
Southeastern	186	0	0.0%
Western	230	0	0.0%
Total for State	**1,515**	**62**	**4.1%**

The population vulnerability of wildland fire events in each Council of Governments was estimated by intersecting the high wildland fire density areas with census tracts. 2020 Census data provided the population totals at the tract level to count the population within the high-density areas. As shown in Table 144, Northwest Hills has the highest percent of total population located within the high wildland fire density area, meaning that this region has the most vulnerable population for exposure to wildland fires. The Naugatuck Valley and South Central Region also have population exposed to high fire density at 17.1% and 6.3%. No other COG regions have populations exposed to high wildland fire density.

Table 144. Population in high wildland fire density area, by COG

Council of Government	Total Population	# within High Wildland Fire Density Area	Percent within High Wildland Fire Density Area
Capitol Region	975,792	0.0%	0.0%
Lower CT River Valley	174,559	0.0%	0.0%
Metropolitan	326,061	0.0%	0.0%
Naugatuck Valley	449,926	17.1%	17.1%
Northeastern	95,582	0.0%	0.0%
Northwest Hills	112,367	26.5%	26.5%
South Central	570,761	6.3%	6.3%
Southeastern	280,908	0.0%	0.0%
Western	619,372	0.0%	0.0%

Council of Government	Total Population	# within High Wildland Fire Density Area	Percent within High Wildland Fire Density Area
Total for State	**3,605,330**	**4.0%**	**4.0%**

4.9.7.3 Local Vulnerability

Figure 124 displays the location of high wildland fire density areas in Connecticut overlaid CCVI Social Sensitivity scores at the census tract level. All of the high-density areas overlap census tracts that all have a Social Sensitivity score above 1.35, signifying that there are socially vulnerable populations in these areas. Socially sensitive communities and population may have a higher exposure and vulnerability to effects of wildland fire. Communities with high Social Sensitivity scores in wildland fire-prone areas are less likely to have adaptive capacity for collaborative investment in fuels management and preventative activities. Lower income residents are less likely to be able to afford the expense of clearing vegetative fuels, fire-proofing their homes, or rebuilding after a fire.[195] As shown in Table 144 in the previous section, the Northwest COG Region and Litchfield County have the highest percentage of population exposed high wildland fire density.

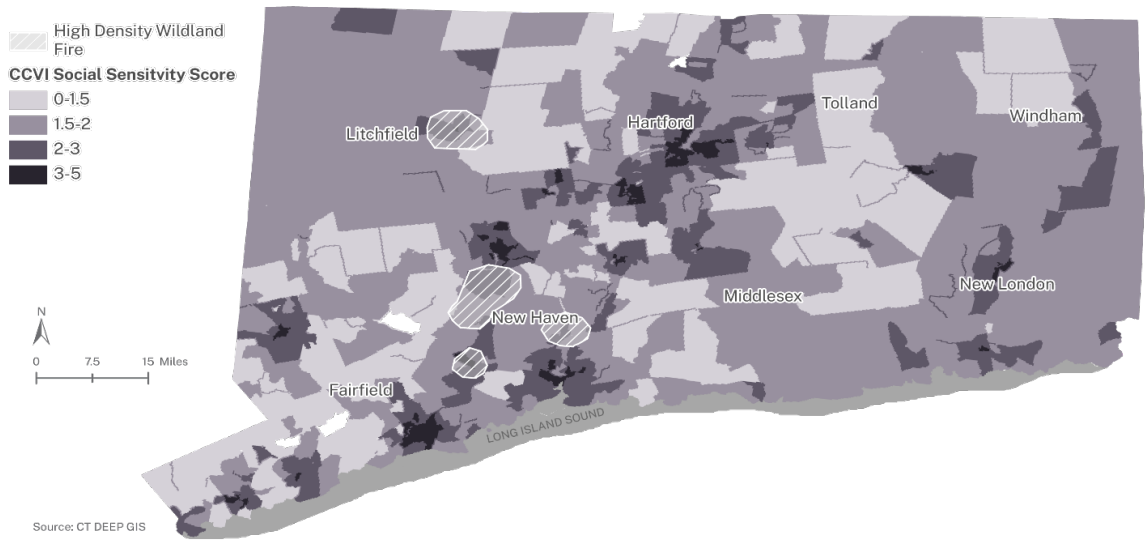


Figure 124. High wildland fire density area and Social Sensitivity Scores, by census tract

Table 145 shows the number of critical facilities intersecting wildland intermix and wildland interface areas by county. A total of 870 critical facilities (57.4% of the total number of critical facilities in the state) are located within a wildland fire hazard area. Litchfield and

[195] Coughlan, M., Ellison, A., Cavanaugh, A. Social Vulnerability and Wildland fire in the Wildland-Urban Interface. https://ewp.uoregon.edu/sites/ewp.uoregon.edu/files/WP_96.pdf

Windham counties have the highest percentage of critical facilities at risk, followed by Tolland and Middlesex counties.

Table 145. Number of critical facilities in WUI, by county

County	All Critical Facilities	# within Intermix	Percent within Intermix	# within Interface	Percent within Interface	Facilities At Risk	Percent At Risk
Fairfield	323	64	19.8%	66	20.4%	130	40.2%
Hartford	256	37	14.5%	66	25.8%	103	40.2%
Litchfield	128	59	46.1%	53	41.4%	112	87.5%
Middlesex	115	51	44.3%	32	27.8%	83	72.2%
New Haven	304	53	17.4%	96	31.6%	149	49.0%
New London	199	75	37.7%	57	28.6%	132	66.3%
Tolland	94	56	59.6%	21	22.3%	77	81.9%
Windham	96	59	61.5%	25	26.0%	84	87.5%

Of the 1,515 critical facilities located in the State of Connecticut, 4.1% are located within a high density WUI area as shown in Table 146. New Haven County has the highest percentage of critical facilities located in a high-density area, with 14.5% of all critical facilities exposed to high density wildland fire areas.

Table 146. Number of critical facilities in high wildland fire density areas, by county

County	All Critical Facilities	# within High Density	Percent of Critical Facilities in High Density Areas
Fairfield	323	4	1.2%
Hartford	256	0	0.0%
Litchfield	128	11	8.6%
Middlesex	115	0	0.0%
New Haven	304	44	14.5%
New London	199	0	0.0%
Tolland	94	0	0.0%
Windham	96	3	3.1%
Total for State	**1,515**	**62**	**4.1%**

An overview of the potential losses due to wildland fire is shown in Table 147. The National Risk Index (NRI) calculates total annual loss by combining building value loss, population

loss, and agricultural loss due to a hazard.[196] Hartford County has the highest expected annual loss value, followed by Fairfield county.

Table 147. NRI total expected annual loss due to wildland fire

County	NRI Total Expected Annual Loss ($)
Fairfield	37,059.24
Hartford	59,139.10
Litchfield	29,587.66
Middlesex	14,044.30
New Haven	25,275.68
New London	26,063.42
Tolland	21,776.11
Windham	14,286.20
State Total	**227,231.71**

To estimate potential population exposure by jurisdiction, the exposure analysis methodology was used. Table 148 provides a breakdown by county of the numbers of people intersecting wildland fire hazard areas. This analysis was conducted by intersecting the 2020 U.S. census blocks with wildland fire hazard data using GIS. In instances where only a portion of the census block intersected the hazard area, only that same portion of the population is counted. For example, if 20% of the census block intersects with an intermix area, only 20% of the population number for that census block group is counted). This results in estimated values and there is potential for error with this methodology, but this is considered a more refined approach than assuming 100% of the population is contained within the 20% of the census block that intersects the hazard area. The total population at risk is estimated at 1,680,543, which is 46.6% of the total population of the state. New Haven County has the highest total population at risk of wildland fire hazard areas, followed by Hartford County.

Table 148. Population intersecting wildland fire hazard areas, by county.

County	Total Population	Population Intersecting Intermix	Population Intersecting Interface	Total at Risk
Fairfield	956,446	143,526	133,634	277,160
Hartford	898,636	89,961	211,004	300,965
Litchfield	185,175	81,420	76,473	157,893
Middlesex	164,568	53,426	48,874	102,300

[196] FEMA. FEMA National Risk Index Technical Documentation. https://www.fema.gov/sites/default/files/documents/fema_national-risk-index_technical-documentation.pdf

County	Total Population	Population Intersecting Intermix	Population Intersecting Interface	Total at Risk
New Haven	864,751	123,404	311,698	435,102
New London	269,131	96,756	97,309	194,065
Tolland	150,120	59,761	49,530	109,291
Windham	116,503	54,849	48,918	103,767
Total	**3,605,330**	**703,103**	**977,440**	**1,680,543**

New Haven and Hartford counties are also two of the three counties that have population exposed to high wildland fire density areas. However, as Table 149 shows, Litchfield County has the highest percentage of the population intersecting the high-density area with 16.1% exposed.

Table 149. Population in high density areas, by county

County	Total Population	Population Intersecting High Density Areas	Percent Intersecting High Density Areas
Fairfield	956,446	12,532	1.3%
Hartford	898,636	0	0.0%
Litchfield	185,175	29,820	16.1%
Middlesex	164,568	0	0.0%
New Haven	864,751	100,377	11.6%
New London	269,131	0	0.0%
Tolland	150,120	0	0.0%
Windham	116,503	0	0.0%
Total	3,605,330	142,729	4.0%

Geospatial analyses were performed to show transportation infrastructure within the wildland fire spatial hazard area (figure 110). Please reference Appendix 3 for further information on spatial hazard areas and transportation infrastructure.

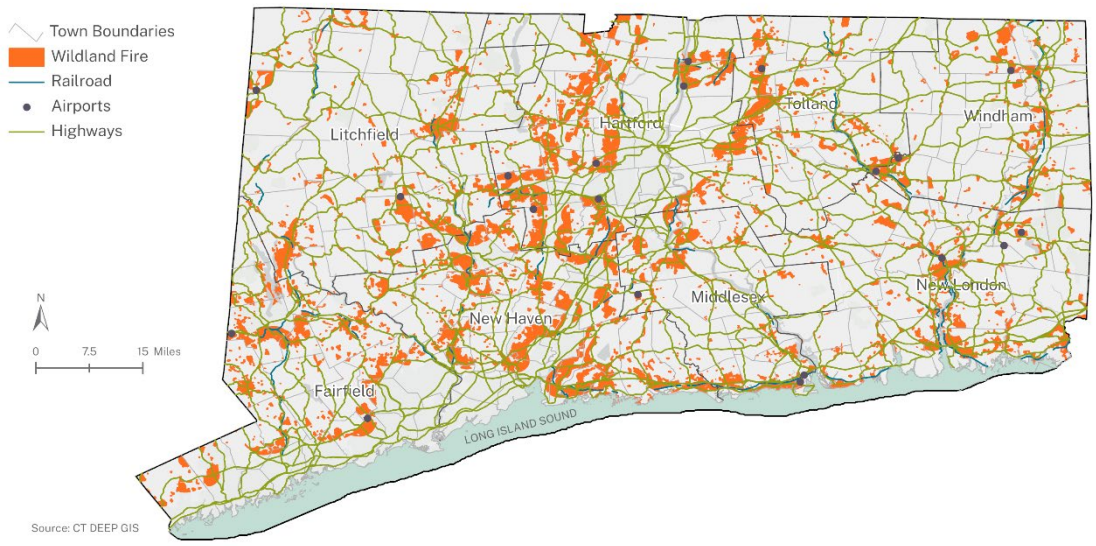


Figure 125. State transportation infrastructure within the wildland fire hazard area.

The local governments' vulnerability to fire hazard was assessed with the *Northeast Midwest State Foresters Alliance* dataset. The analysis is based on exposure and risk to housing units. Exposure is the spatial coincidence of wildfire likelihood and intensity. Risk to housing units is calculated through integrating wildfire likelihood and intensity with generalized consequences to housing infrastructure. The following are the top five communities at risk in the State of Connecticut based on these evaluations.

1. Colchester (New London County, Southeastern Connecticut COG)
2. Danbury (Fairfield County, WestCOG)
3. Norwich (New London County, Southeastern Connecticut COG)
4. Naugatuck (New Haven County, Naugatuck Valley COG)
5. Waterbury (New Haven County, Naugatuck Valley COG)

Table 150 includes wildfire risk to local governments as analyzed in LHMP, and community annexes in multi-jurisdictional HMP.

Table 150. Wildfire risk, by local jurisdiction

COG	County	Local Jurisdiction	Wildfire Hazard Rank
WestCOG	Fairfield	Bethel	L
WestCOG	Litchfield	Bridgewater	M
WestCOG	Fairfield	Brookfield	M
WestCOG	Fairfield	Danbury	L

COG	County	Local Jurisdiction	Wildfire Hazard Rank
WestCOG	Fairfield	Darien	L
WestCOG	Fairfield	Greenwich	L
WestCOG	Fairfield	New Canaan	L
WestCOG	Fairfield	New Fairfield	M
WestCOG	Litchfield	New Milford	M
WestCOG	Fairfield	Newtown	M
WestCOG	Fairfield	Norwalk	L
WestCOG	Fairfield	Redding	M
WestCOG	Fairfield	Ridgefield	M
WestCOG	Fairfield	Sherman	M
WestCOG	Fairfield	Stamford	L
WestCOG	Fairfield	Weston	L
WestCOG	Fairfield	Westport	L
WestCOG	Fairfield	Wilton	L
NVCOG	New Haven	Ansonia	L
NVCOG	New Haven	Beacon Falls	M
NVCOG	Litchfield	Bethlehem	M
NVCOG	Hartford	Bristol	L
NVCOG	New Haven	Cheshire	M
NVCOG	New Haven	Derby	L
NVCOG	New Haven	Middlebury	M
NVCOG	New Haven	Naugatuck	L
NVCOG	New Haven	Oxford	M
NVCOG	Litchfield	Plymouth	L
NVCOG	New Haven	Prospect	M
NVCOG	New Haven	Seymour	L
NVCOG	Fairfield	Shelton	L
NVCOG	New Haven	Southbury	M
NVCOG	Litchfield	Thomaston	L
NVCOG	New Haven	Waterbury	L
NVCOG	Litchfield	Watertown	L
NVCOG	New Haven	Wolcott	M
NVCOG	Litchfield	Woodbury	M

COG	County	Local Jurisdiction	Wildfire Hazard Rank
RiverCOG	Middlesex	Chester	L
RiverCOG	Middlesex	Clinton	L
RiverCOG	Middlesex	Cromwell	L
RiverCOG	Middlesex	Deep River	L
RiverCOG	Middlesex	Durham	L
RiverCOG	Middlesex	East Haddam	L
RiverCOG	Middlesex	East Hampton	L
RiverCOG	Middlesex	Essex	L
RiverCOG	Middlesex	Haddam	L
RiverCOG	Middlesex	Killingworth	L
RiverCOG	New London	Lyme	L
RiverCOG	Middlesex	Middlefield	L
RiverCOG	Middlesex	Middletown	L
RiverCOG	New London	Old Lyme	L
RiverCOG	Middlesex	Portland	L
RiverCOG	Middlesex	Old Saybrook	L
RiverCOG	Middlesex	Westbrook	L
NHCOG	Litchfield	Barkhamsted	L
NHCOG	Hartford	Burlington	L
NHCOG	Litchfield	Canaan	M
NHCOG	Litchfield	Colebrook	M
NHCOG	Litchfield	Cornwall	M
NHCOG	Litchfield	Goshen	M
NHCOG	Hartford	Hartland	M
NHCOG	Litchfield	Harwinton	L
NHCOG	Litchfield	Kent	M
NHCOG	Litchfield	Litchfield	L
NHCOG	Litchfield	Morris	L
NHCOG	Litchfield	New Hartford	L
NHCOG	Litchfield	Norfolk	M
NHCOG	Litchfield	North Canaan	L
NHCOG	Litchfield	Roxbury	L
NHCOG	Litchfield	Salisbury	M

COG	County	Local Jurisdiction	Wildfire Hazard Rank
NHCOG	Litchfield	Sharon	M
NHCOG	Litchfield	Torrington	L
NHCOG	Litchfield	Warren	M
NHCOG	Litchfield	Washington	L
NHCOG	Litchfield	Winchester	L
SCCOG	New London	Bozrah	5 out of 10
SCCOG	New London	Colchester	5 out of 10
SCCOG	New London	East Lyme	5 out of 10
SCCOG	New London	Franklin	5 out of 10
SCCOG	New London	Griswold	5 out of 10
SCCOG	New London	Groton (City)	5 out of 10
SCCOG	New London	Groton (Town)	5 out of 10
SCCOG	New London	Lebanon	5 out of 10
SCCOG	New London	Ledyard	5 out of 10
SCCOG	New London	Lisbon	5 out of 10
SCCOG		Mashantucket Pequot Tribal Nation	5 out of 10
SCCOG		Mohegan Tribe	5 out of 10
SCCOG	New London	Montville	5 out of 10
SCCOG	New London	New London	5 out of 10
SCCOG	New London	North Stonington	5 out of 10
SCCOG	New London	Norwich	5 out of 10
SCCOG	New London	Preston	5 out of 10
SCCOG	New London	Salem	5 out of 10
SCCOG	New London	Sprague	5 out of 10
SCCOG	New London	Stonington (Borough)	5 out of 10
SCCOG	New London	Stonington (Town)	5 out of 10
SCCOG	New London	Waterford	5 out of 10
SCCOG	Windham	Windham	5 out of 10
SCRCOG	New Haven	Bethany	L
SCRCOG	New Haven	Branford	L
SCRCOG	New Haven	East Haven	L
SCRCOG	New Haven	Guilford	L

COG	County	Local Jurisdiction	Wildfire Hazard Rank
SCRCOG	New Haven	Hamden	L
SCRCOG	New Haven	Madison	L
SCRCOG	New Haven	Meriden	L
SCRCOG	New Haven	Milford	L
SCRCOG	New Haven	New Haven	L
SCRCOG	New Haven	North Branford	L
SCRCOG	New Haven	North Haven	L
SCRCOG	New Haven	Orange	L
SCRCOG	New Haven	Wallingford	L
SCRCOG	New Haven	West Haven	L
SCRCOG	New Haven	Woodbridge	L
MetroCOG	Fairfield	Bridgeport	-
MetroCOG	Fairfield	Easton	-
MetroCOG	Fairfield	Fairfield	-
MetroCOG	Fairfield	Monroe	-
MetroCOG	Fairfield	Stratford	-
MetroCOG	Fairfield	Trumbull	-
NECOG	Windham	Ashford	-
NECOG	Windham	Brooklyn	-
NECOG	Windham	Canterbury	-
NECOG	Windham	Chaplin	-
NECOG	Windham	Eastford	-
NECOG	Windham	Hampton	-
NECOG	Windham	Killingly	-
NECOG	Windham	Plainfield	-
NECOG	Windham	Pomfret	-
NECOG	Windham	Putnam	-
NECOG	Windham	Scotland	-
NECOG	Windham	Sterling	-
NECOG	Windham	Thompson	-
NECOG	Tolland	Union	-
NECOG	New London	Voluntown	-
NECOG	Windham	Woodstock	-

COG	County	Local Jurisdiction	Wildfire Hazard Rank
CRCOG	Tolland	Andover	ML
CRCOG	Hartford	Avon	ML
CRCOG	Hartford	Berlin	ML
CRCOG	Hartford	Bloomfield	ML
CRCOG	Tolland	Bolton	ML
CRCOG	Hartford	Canton	ML
CRCOG	Tolland	Columbia	ML
CRCOG	Tolland	Coventry	ML
CRCOG	Hartford	East Granby	ML
CRCOG	Hartford	East Hartford	L
CRCOG	Hartford	East Windsor	L
CRCOG	Tolland	Ellington	ML
CRCOG	Hartford	Enfield	L
CRCOG	Hartford	Farmington	L
CRCOG	Hartford	Glastonbury	L
CRCOG	Hartford	Granby	ML
CRCOG	Hartford	Hartford	ML
CRCOG	Tolland	Hebron	ML
CRCOG	Hartford	Manchester	ML
CRCOG	Tolland	Mansfield	ML
CRCOG	Hartford	Marlborough	ML
CRCOG	Hartford	New Britain	ML
CRCOG	Hartford	Newington	ML
CRCOG	Hartford	Plainville	ML
CRCOG	Hartford	Rocky Hill	L
CRCOG	Hartford	Simsbury	ML
CRCOG	Tolland	Somers	L
CRCOG	Hartford	Southington	L
CRCOG	Hartford	South Windsor	ML
CRCOG	Tolland	Stafford	ML
CRCOG	Hartford	Suffield	ML
CRCOG	Tolland	Tolland	ML
CRCOG	Tolland	Vernon	ML

COG	County	Local Jurisdiction	Wildfire Hazard Rank
CRCOG	Hartford	West Hartford	L
CRCOG	Hartford	Wethersfield	ML
CRCOG	Tolland	Willington	ML
CRCOG	Hartford	Windsor	ML
CRCOG	Hartford	Windsor Locks	ML

4.9.7.4 Changes in Development

An understanding of population and development trends can assist in planning for future development and ensuring that appropriate mitigation, planning, and preparedness measures are in place. Shown in Figure 126, Fairfield has had the highest number of building permits issued between 2018 and 2022. While Fairfield has the highest number of building permits issued, New Haven County has the most total building permits issued that overlap the high wildland fire density areas. Litchfield and Fairfield counties have some total building permits overlapping high density wildland fire areas, signifying that these counties have an increased exposure the wildland fire. New Haven County has a higher risk of wildland fire effects than other counties with lower development due to the increased number of structures exposed to wildland fire events. If recent building and population development trends continue, New Haven County will increase its exposure and vulnerability to wildland fires.

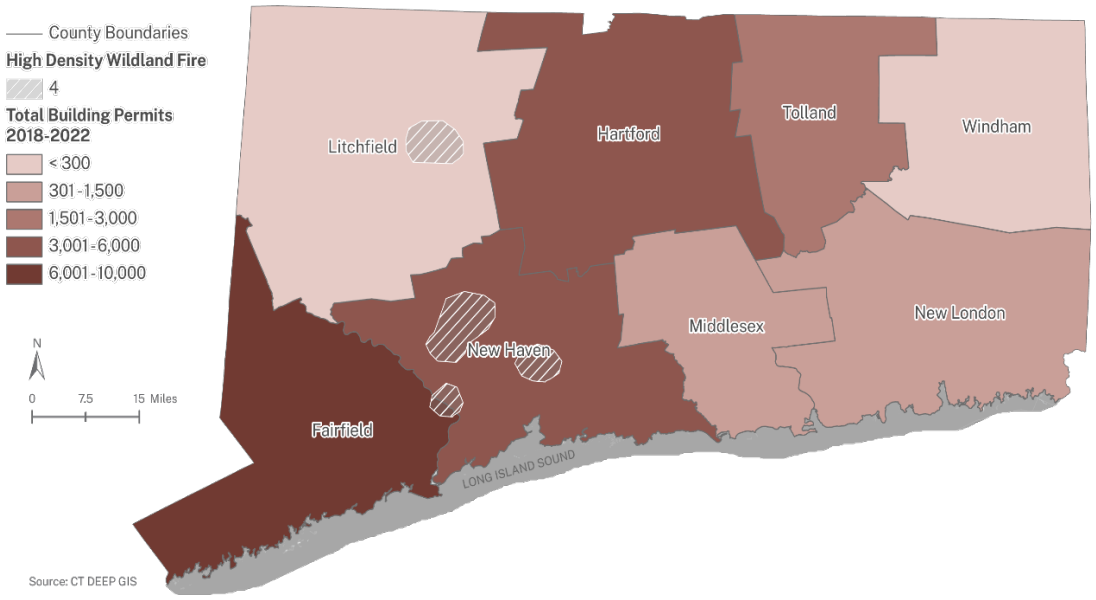


Figure 126. High wildland fire density areas and total building permits (2018-2022), by county

Population growth can also influence the increased exposure of communities to wildland fire events. Future population growth through 2040 for Connecticut can identify areas that may have an increased vulnerability or exposure to wildland fires as a result of increasing. Shown in Figure 127, the high-density wildland fire area overlaps 3 counties, with their population percent change over –10%, -4%, and 1%. The majority of high-density wildland areas are located within New Haven County, which is expected to experience at least a 1% growth by 2040. As population increases, vulnerability for communities and infrastructure will also increase as more development will occur with higher populations.

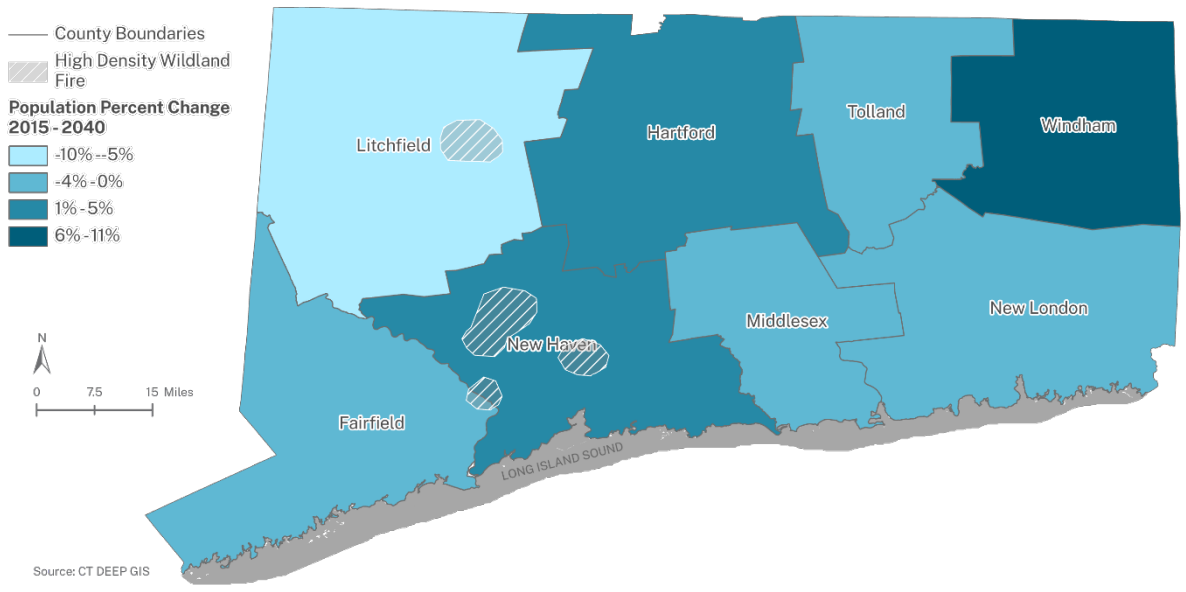


Figure 127. High wildland fire density areas and population percent change (2015-2040), by county

As discussed above, Connecticut is one of the most heavily forested states in the nation, ranks among the most densely populated, and in turn, and has the highest percentage of WUI areas. Most of the wildland-urban interface areas in the State are categorized as intermix areas 49.6-percent. If not adequately planned, any new development or increase in population may be vulnerable to these events. As discussed in **section 4.9.7.3**, Fairfield County and New Haven continue to experience the majority of development. As of 2022, approximately 59.1% of the building permits statewide were in Fairfield and New Haven Counties, with both counties accounting for nearly half of all the housing units in the State. If recent development trends continue, these two Counties will increase their vulnerability to wildland fire. While the data displayed in Figure 119 shows Litchfield County has the greatest intermix area in the State, Fairfield County has the greatest area of medium density, and Hartford County has the most area of high density intermix. It is possible that many new developments and population increase within Fairfield County and Hartford County will be in intermix areas. Statewide, there is an estimated 1.7% change in population expected between 2020 and 2040. The increases in population will expand the State population's vulnerability to wildland fire as populations move towards wildland-urban interface hazard areas.

4.9.8 Conclusion

Wildland fire was ranked on the risk parameters as detailed in Table 24. To summarize the overall risk of wildland fire for each county, each risk parameter score was multiplied by its impact weight and combined into a county composite ranking.

Table 151 shows the wildland fire hazard ranking for each county. The high to low comparison does not mean that a low or medium-low hazard will not occur or will not have some impact on the community. However, it does provide an overview of what hazards may pose the greatest risk to each county given available data. This document should serve as a guide to help planners and officials in managing risk and prioritize mitigation actions.

Table 151. Wildland Fire hazard ranking by county.

	Fairfield	Hartford	Litchfield	Middlesex	New Haven	New London	Tolland	Windham
Hazard Concern	M-L	M-L	M-L	M-L	M-L	M-L	M-L	M-L
Local Plan Rating	L	L	L	L	L	L	L	L
Geographic Extent	M-L	L	M	M	M-L	M-H	M-H	H
Population Density	H	M-H	M	M-L	M-H	M	M-L	L
Future Development	H	M-H	M-L	M-L	M-H	M	M	L
Facility Intersect	M-L	L	M-H	M	M-L	H	M-H	L
Future Events	M-L	L	H	M	M-H	M-L	M	M
Future Losses	M-H	H	M-H	L	M	M	M-L	M-L
Injury & Death	L	L	L	L	L	L	L	L
Social Sensitivity	M	M-H	M-L	M-L	H	M-H	L	M
Composite*	**M**	**L**	**M-H**	**M-L**	**M**	**M**	**M**	**M**

* Each parameter's weighted score was added together to create a composite rank for each county. A risk determination of high, medium-high, medium, medium-low, and low was then assigned based on percentiles. A summation of all the composite scores for all assessed hazards in each jurisdiction provides an overall risk rank per county. For more information, refer to Section 4.1.1.4.

4.10 Winter Weather

Winter weather includes events related to heavy snow, blowing snow, sleet, freezing rain, and extreme cold temperatures. Winter weather events can cause death, injury, or a significant impact to commerce or transportation. Three elements are required to create any type of winter weather event:

- **Cold Air** – below freezing temperatures in the clouds and near the ground,
- **Lift** – something to raise the moist air to form the clouds and cause precipitation, and
- **Moisture** – needed to form clouds and precipitation.

According to the Northeast States Emergency Consortium (NESEC), winter weather can occur from late September through late April in Connecticut. The most severe storms and weather conditions usually occur from December through March. Severe winter weather events may include ice storms, Nor'easters with coastal flooding, blizzards, and large accumulation snowstorms. Severe winter weather may include one or more of the following factors:

- **Blizzard** - Includes winter storm conditions of sustained winds or frequent gusts of 35 mph or more that cause major blowing and drifting of snow, reducing visibility to less than one-quarter mile for three or more hours. Extremely cold temperatures and low visibility, or white-out conditions are often associated with dangerous blizzard conditions.
- **Cold/Wind Chill** - Period of low temperatures or wind chill temperatures reaching or exceeding locally/regionally defined advisory (typical value is -18°F or colder) conditions.
- **Extreme Cold/Wind Chill** - A period of extremely low temperatures or wind chill temperatures meeting or exceeding locally/regionally defined warning criteria (typical value around -350F or colder).
- **Frost/Freeze** - A surface air temperature of 32 degrees Fahrenheit (F) or lower, or the formation of ice crystals on the ground or other surfaces, for a period of time long enough to cause human or economic impact, during the locally defined growing season.
- **Heavy Snow**- Snow accumulation meeting or exceeding locally/regionally defined 12- and/or 24-hour warning criteria. Heavy snow includes values such as 4, 6, or 8 inches or more in 12 hours or less; or 6, 8, or 10 inches in 24 hours or less.
- **Ice Storm** - Ice accretion meeting or exceeding locally/regionally defined warning criteria (typical value is 1/4 or 1/2 inch or more).

- **Winter Storm** - A winter weather event that has more than one significant hazard (i.e., heavy snow and blowing snow; snow and ice; snow and sleet; sleet and ice; or snow, sleet and ice) and meets or exceeds locally/regionally defined 12 and/or 24-hour warning criteria for at least one of the precipitation elements.

4.10.1 Location

Winter weather affects the entire state due to its northern climate. According to FEMA's National Risk Index (NRI), Connecticut counties have a Winter Weather Risk Rating ranging from Relatively Low to Relatively High.2 FEMA NRI determines risk based on expected annual loss, social vulnerability, and community resilience for a county in comparison to the rest of the United States. The NRI defines winter weather as winter storm events in which the main types of precipitation are snow, sleet, or freezing rain. Figure 128 shows winter weather risk rating by county in Connecticut by county. Fairfield County, in the southwest of Connecticut, is shown to have the highest risk of winter weather impacts, with a Relatively High Risk Rating.

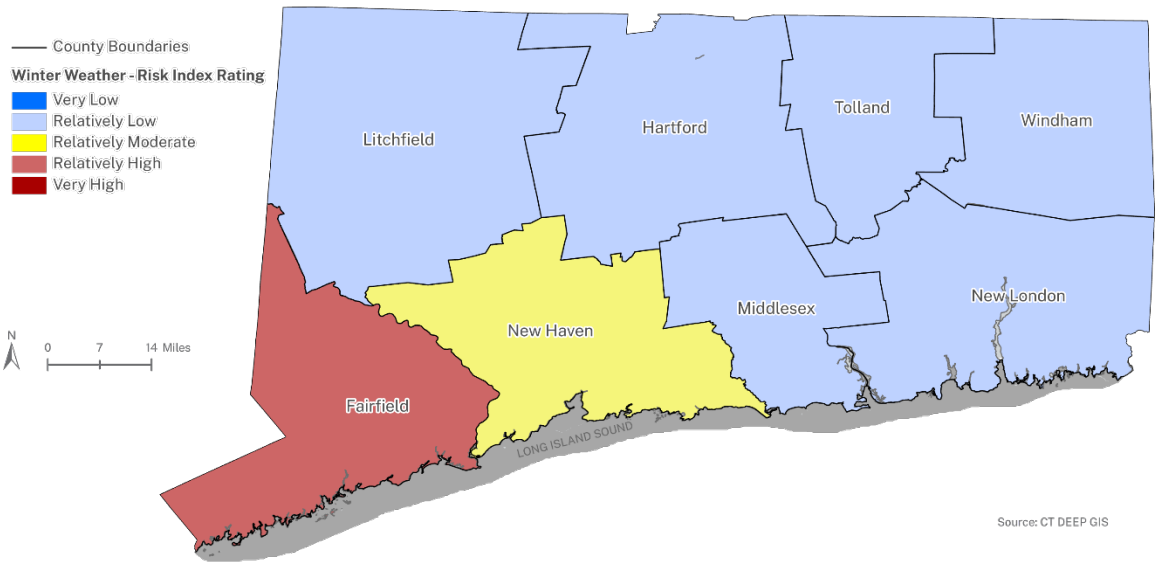


Figure 128. Winter weather risk rating (FEMA NRI)

4.10.2 Intensity

Winter storm intensity can be measured on the Northeast Snowfall Impact Scale (NESIS). This scale is similar to the Enhanced Fujita Scale, used for tornadoes and the Saffir-Simpson Scale, used for hurricanes. NESIS is used to measure a storm's societal impacts. It was developed due to the national impact of northeastern snowstorms on transportation and economic networks. NESIS scores are based on algorithms that evaluate the extent of the storm, snowfall total, and population in the impacted area. Figure 129 illustrates how NESIS values are calculated within GIS. The aerial distribution of snowfall and population

information are combined in an equation that calculates a NESIS score which varies from around one for smaller storms to greater than 10 for extreme storms.

Fifty-nine of the most notable winter storms that have impacted the Northeast United States have been analyzed and categorized using NESIS, and many of those storms have impacted Connecticut.

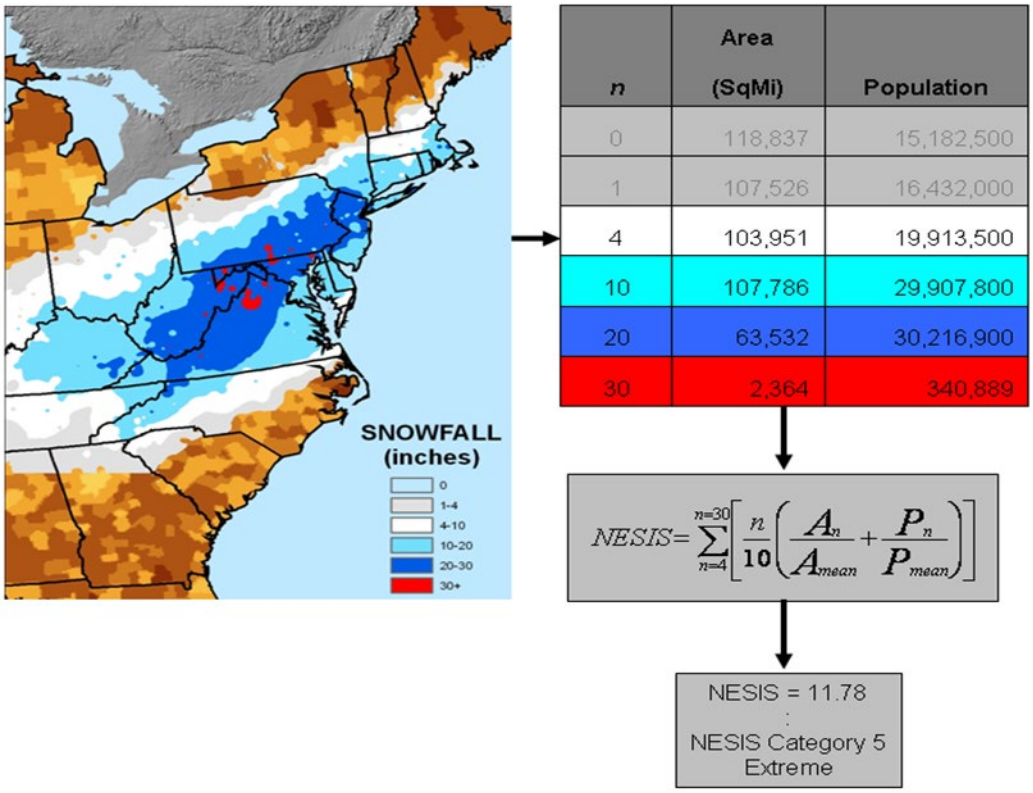


Figure 129. Algorithm to determine NESIS category of severity.

The Regional Snowfall Index (RSI) is an evolution of NESIS, operated through NOAA's National Center for Environmental Information and tracks. This index ranks significant snowstorms that impact the eastern two-thirds of the United States. The RSI ranks snowstorm impacts on a scale from 1-5, as does NESIS, but while NESIS is thought to be a quasi-national index, the RSI is a regional index.

Table 152 shows the RSI Index scale descriptions and definitions. The index differs from other meteorological indices because it uses population information in addition to meteorological measurements. Including population information ties the index to societal impacts. Currently, the index uses population based on the 2000 Census. The largest RSI values result from storms that produce heavy snowfall over large areas that include major metropolitan centers.

Table 152. Regional Snowfall Index (RSI)

Category	NESIS Range	Description	Definition
1	1 – 3	Notable	These storms are notable for their large areas of 4-inch accumulations and small areas of 10-inch snowfall.
2	3 - 6	Significant	Includes storms that produce significant areas of greater than 10-inch snow while some include small areas of 20-inch snowfalls. A few cases may even include relatively small areas of very heavy snowfall accumulations (greater than 30 inches).
3	6 - 10	Major	This category encompasses the typical major Northeast snowstorm, with large areas of 10-inch snows (generally between 50 and 150 × 103 mi.2 — roughly one to three times the size of New York State with significant areas of 20-inch accumulations
4	10 – 18	Crippling	These storms consist of some of the most widespread, heavy snows of the sample and can be best described as crippling to the northeast U.S, with the impact to transportation and the economy felt throughout the United States. These storms encompass huge areas of 10-inch snowfalls, and each case is marked by large areas of 20- inch and greater snowfall accumulations.
5	18.0+	Extreme	The storms represent those with the most extreme snowfall distributions, blanketing large areas and populations with snowfalls greater than 10, 20, and 30 inches. These are the only storms in which the 10-inch accumulations exceed 200 × 103 mi2 and affect more than 60 million people.

From Nor'easters to blizzards, winter weather in Connecticut ranges in severity. During autumn, light winter weather gradually becomes more severe as the season progresses into winter. Blizzards are not uncommon during the winter months, with NCEI declared blizzards or heavy snow events occurring every year from 2017-2022 during December, January, February, and/or March.

Winter weather has the capacity to immobilize a region, cut communities off from emergency management personnel, and make travel impossible. When winter weather is paired with freezing rain and ice storms, utilities including water, gas, and electricity can be compromised. These issues put vulnerable communities and populations, such as the elderly, at an increased risk.

Warning time for winter weather events is typically greater than 24 hours. Winter weather is observed, monitored, and tracked by the National Weather Service (NWS) a U.S. agency and is part of NOAA. The NWS tracks snowfall forecasts, ice accumulation, and winter storm threats and aids communities in planning, preparing, and mitigating against natural

events such as winter weather. The NWS issues warnings for winter weather events, with frequencies and length that vary by specific conditions.

Warnings: Take Action!

- **Blizzard Warnings** are issued for frequent gusts greater than or equal to 35 mph accompanied by falling and/or blowing snow, frequently reducing visibility to less than 1/4 mile for three hours or more. A Blizzard Warning means severe winter weather conditions are expected or occurring. Falling and blowing snow with strong winds and poor visibilities are likely, leading to whiteout conditions making travel extremely difficult. Do not travel. If you must travel, bring a winter survival kit with you. If you get stranded, stay with your vehicle and wait for help to arrive.
- **Winter Storm Warnings** are issued for a significant winter weather event including snow, ice, sleet or blowing snow or a combination of these hazards. Travel will become difficult or impossible in some situations. Delay your travel plans until conditions improve.
- **Ice Storm Warnings** are usually issued for ice accumulation of around 1/4 inch or more. This amount of ice accumulation will make travel dangerous or impossible and likely lead to snapped power lines and falling tree branches. Travel is strongly discouraged.
- **Wind Chill Warnings** are issued for a combination of very cold air and strong winds that will create dangerously low wind chill values. This level of wind chill will result in frostbite and lead to hypothermia if precautions are not taken. Avoid going outdoors and wear warm protective clothing if you must venture outside.
- **Lake Effect Snow Warnings** are issued when widespread or localized lake induced snow squalls or heavy showers are expected to produce significant snowfall accumulation. Lake effect snow usually develops in narrow bands and impacts a limited area. These bands can produce very heavy snow with sudden restrictions in visibility. Driving conditions may become hazardous at times.

Watches: Be Prepared

- **Winter Storm Watches** are issued when conditions are favorable for a significant winter storm event (heavy sleet, heavy snow, ice storm, heavy snow and blowing snow or a combination of events.)
- **Wind Chill Watches** are issued when there is the potential for a combination of extremely cold air and strong winds to create dangerously low wind chill values.

Advisories: Be Aware

- **Winter Weather Advisories** are issued when snow, blowing snow, ice, sleet, or a combination of these wintry elements is expected but conditions should not be hazardous enough to meet warning criteria. Be prepared for winter driving conditions and possible travel difficulties. Use caution when driving.
- **Wind Chill Advisories** are issued when low wind chill temperatures are expected but will not reach local warning criteria. Extremely cold air and strong winds will combine to generate low wind chill readings. If you must venture outdoors, take precautions against frostbite and hypothermia.
- **Lake Effect Snow Advisory** are issued for widespread or localized lake effect snowfall accumulation (and blowing snow) remaining below warning criteria. Expects lake effect snow showers and assume travel will be difficult in some areas. Some localized snow bands will be intense enough to produce several inches in a few areas with sudden restrictions in visibility.

Impacts from winter storms are categorized by NWS in the Winter Storm Severity Index (WSSI), shown in Table 153.

Table 153. NWS Winter Storm Severity Index

WSSI Descriptor	General Description of Expected Storm Severity and Impacts
No Impacts	Impacts not expected
Limited Impacts	Rarely is a direct threat to life and property. Typically results in little inconveniences.
Minor Impacts	Rarely is a direct threat to life and property. Typically results in an inconvenience to daily life.
Moderate Impacts.	Often threatening to life and property, some damage is unavoidable. Typically results in disruptions to daily life.
Major Impacts	Extensive property damage is likely, lifesaving actions needed. Will likely result in major disruptions to daily life.
Extreme Impacts	Extensive and widespread severe property damage, lifesaving actions will be needed. Results in extreme disruptions to daily life.

Source: NWS

4.10.3 Impacts

Winter weather, including heavy snow, ice, sleet, and freezing rain can impact the State in many ways. Impacts will vary depending on infrastructure and population density exposed to winter weather.



- Buildings may be damaged when snow loads exceed the design capacity of their roofs or trees fall due to excessive ice accumulation on branches.
- Ice and heavy snow have the potential to disrupt power and utilities, downing powerlines and uprooting trees onto vital infrastructure and components of the electrical grid.
- If critical facilities and state-owned buildings lose power, they may become inoperable.



- Winter weather events can cause transportation and utility infrastructure disruption.
- Roads and bridges may experience structural damage due to rapid temperature variation during winter weather, chemicals used to treat roads, and ice loads.



- Runoff from plowed snow which contains sand, debris, salt, heavy metals and petroleum has the potential to affect local water sources, streams, rivers, and drinking water.



- Power outages and road closures due to winter weather can result in limited access to food, basic supplies, and an adequate heat source.
- Health threats can become severe when frozen precipitation makes roadways and walkways very slippery, prolonged power outages occur, and fuel supplies are jeopardized.
- Winter weather will have a greater impact on those who are considered socially vulnerable, including homeless individuals or low-income individuals who cannot afford to heat their homes.



- Winter weather has the potential to disrupt traffic, close offices, and schools, and impact productivity and revenue statewide.
- A large concentration of Connecticut commuters are greatly impacted if winter weather disrupts train service to New York City.

Adverse winter weather necessitates an increase in municipal and state workforces to clear roads and additional emergency management personnel to attend to the community. Severe traffic congestion from winter storms has occurred in the past due to rapid onset of

heavy snow over urban areas and icing of roadways as a result of freezing of snowmelt on roadways or the presence of freezing rain or ice storms. Traffic congestion and safe commuter travel can be mitigated by the use of staggered timed releases from work, pre-storm closing of schools, and later start times for businesses. Most Connecticut employers and school districts implement such practices to keep residents safe. However, the costs associated with transportation disruptions and the loss of work and school time are detrimental to the state.

4.10.4 Previous Occurrences and Losses

Connecticut has historically experienced at least 14 winter weather events annually. Events include heavy snowstorms, blizzards, Nor'easters, and ice storms. These events are more common in the northern portion of the state.

NOAA's State Climate Extremes Committee (SCEC) tracks, records, and verifies climate records.[197] The record 24-hour snowfall and snow depth for Connecticut are highlighted in Table 154.

Table 154. Record snowfall and snow depth in Connecticut

Measure of Interest	Value	Date	Location	Station ID
Greatest 24-Hour Snowfall	36 in.	February 8 - 9, 2013	ANSONIA 1 NE	060128
Snow Depth	55 in.	February 5, 1961	NORFOLK 2 SW	065445

The NCEI Storm Events Database contains records of winter weather, winter storms, blizzards, ice storms, and heavy snow. Each of these storm types were included to create a comprehensive representation of winter storm events.

According to NCEI records, there have been 1,306 winter weather events (winter weather, winter storms, blizzard, ice storms, and heavy snow) statewide from January 1996 to December 31, 2022, resulting in $56,274,910 in estimated property damages (in adjusted dollars) (Table 155). 7 deaths and 54 injuries attributed to winter weather events occurred during this period.

Table 155. NCEI total winter weather events by county (1996-2022)

County	Number of Winter Weather Events	Property Damage (2022 Dollars)
Fairfield	212	N/A
Hartford	115	$35,562,219
Litchfield	278	$2,428,367
Middlesex	146	N/A

[197] NCEI State Climate Extremes Committee. Records. https://www.ncei.noaa.gov/access/monitoring/scec/records/ct/all

County	Number of Winter Weather Events	Property Damage (2022 Dollars)
New Haven	191	$4,713,674
New London	144	N/A
Tolland	115	$10,719,409
Windham	105	$2,851,241
Total	**1,306**	**$56,274,910**

*Note: Event totals may reflect a storm event that has affected multiple counties that have been counted as individual events in each affected county.

The most significant blizzard impacting Connecticut, known as the Great White Hurricane, occurred on March 11-14, 1888. Snowfall in this event was estimated at 45 to 50 inches. Significantly high snow drifts occurred shutting down major cities throughout the Northeast. Fifty inches of snowfall was verified in one Connecticut town, where a snow drift was reported as 38 feet high. More than 400 died in the East Coast as a result of this blizzard. Total damage was estimated at more than $20 million (1888 dollars).

Since the 1888 blizzard, Connecticut has experienced many major winter storms. Some claimed lives and produced damages in the millions of dollars. Notable recent storms include:

- **Ice Storm Felix** – Connecticut's most severe ice storm occurred on December 18, 1973, causing two deaths and widespread extended power outages.
- **Blizzard of 1978** – Occurred on February 5, 1978; record snowfall amounts were recorded in several areas of Connecticut. Governor Grasso ordered all roads closed except for emergency travel, closing the State.
- **Nor'easter of 1992** – This storm in December 10 -13, 1992 killed three and destroyed 26 homes. Tides in the Long Island Sound were stacked up by the continued strong east/northeast winds reaching 55 mph. The "stacking" of water resulted in the third highest tide (10.16 Feet NGVD measured at Bridgeport, Connecticut) ever recorded in Long Island Sound causing more than $4.3 million (1992 dollars) in damages to more than 6,000 homes. Inland areas received up to four feet of snow in northeastern Connecticut. The heavy wet snow snapped tree limbs and power lines, cutting power to 50,000 homes.
- **Winter Storm Ginger** – On January 8-9, 1996, 27 inches of snow was recorded in Connecticut. The storm forced the state to shut down all roads for 24 hours except for emergency travel.
- **February 12-13, 2006, Nor'easter** – The major disaster was declared due to damages in some areas from record snowfall (second largest snowfall recorded since 1906). Also known as the North American Blizzard of 2006. Governor M. Jodi

Rell ordered closure of state highways to facilitate efficient snow removal. Figure 130 shows the recorded snowfall amounts and the NESIS rating for The North American Blizzard of 2006.

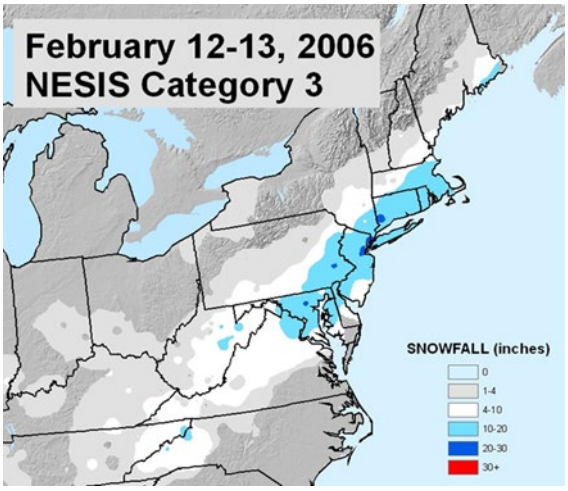


Figure 130. NESIS analysis rating of the February 12-13, 2006, winter storm

- **February 1-2, 2011 "Groundhog Day Blizzard"** – Three to five inches of snow and sleet fell across interior portions of Southern Connecticut during this two-day storm. This storm caused power outages, tree damage, the collapse or partial collapse of more than 100 roofs, resulting in $5.25 million in property damage across four counties (Hartford, New Haven, Tolland, and Windham) (source: NCDC).
- **October 29-30, 2011 "Winter Storm Alfred"** – A historic and unprecedented early-season winter storm impacted the area with more than one foot of heavy wet snow falling on interior portions of Southern Connecticut, while coastal areas received mainly rainfall. In addition to heavy rain and snow, strong winds impacted the immediate coastline. Hundreds of thousands of people across southern Connecticut lost power during as heavy snow accumulated on trees that still had partial to full foliage during mid-autumn. This caused extensive wind to throw trees and limbs across the region, downing power lines, closing roads, and isolating residential areas without emergency vehicle access. Communications networks were also significantly disrupted, particularly cellular networks. A total of $247 million in insurance claims including personal, commercial, and auto claims were processed due to weather damage.
- **February 7-8, 2013 "Winter Storm Nemo"** –On February 7, 2013, a blizzard warning was in effect for Connecticut, and a state of emergency was declared February 8, 2013. The highest amount of snowfall nationally recorded was 40 inches in Hamden, CT. More than 800 National Guard soldiers and airmen were activated in Connecticut, Massachusetts, and New York to support road emergencies.

- **The Blizzard of January 26-27, 2015 "Winter Storm Juno"** - On January 26, a strong nor'easter brought heavy snow and strong winds to the State. The heaviest snow and strongest winds occurred across eastern Long Island and southeastern Connecticut where up to 2 feet of snow fell, with blizzard conditions observed.[198]
- **The Blizzard of January 22-24, 2016 "Winter Storm Anna"** - Low pressure moving across the deep South January 21 - 22 intensified and moved off the Mid Atlantic coast January 23, bringing heavy snow and strong winds to southern Connecticut, and blizzard conditions to coastal locations. Bridgeport ASOS (KBDR) reported blizzard conditions for three hours.[199]
- **The Blizzard of February 9, 2017** - The day before the blizzard, record warmth was observed across the Tri-State area. Record highs included 62 degrees at Central Park, NY. Temperatures dropped 30-40 degrees within 12-15 hours to the mid-upper 20s during the storm.[200] Blizzard conditions occurred across southern Connecticut with heavy snow and strong winds. The blizzard also created delays and cancellations to the region's transportation systems as well as numerous accidents on roadways.[201]
- **March 14th, 2017, Nor'easter** - Rapidly deepening low pressure tracked up the eastern seaboard on March 14 creating blizzard conditions in New Haven County. Heavy snow and sleet were observed across southern Connecticut. Trees fell onto power lines causing approximately 3,700 power outages due to strong winds and heavy snow. CTDOT reported 10.3 inches of snow and sleet in Milford and 8.8 inches of snow and sleet in New Haven. The Oxford-Waterbury AWOS showed blizzard conditions, with visibility less than one quarter mile in heavy snow and frequent wind gusts over 35 mph March 14.[202]
- **January 3-4, 2018 (Bomb Cyclone)** - The blizzard developed Wednesday, January 3 as a low pressure off the coast of Florida. The rapid intensification of the storm led to heavy snow and blizzard conditions across portions of the region, setting a daily snowfall record for January 4 at Bridgeport, CT (9.0").
- **The Blizzard of January 29, 2022** – A blizzard hit the Northeastern United States on January 29, 2022. Forming from the energy of a mid- to upper-level trough, the system developed into a low-pressure area off the Southeast United States, intensifying as it traveled northeasterly, bringing heavy snowfall blow by high winds to the Northeast and to Connecticut. In Connecticut, the highest snowfalls were in

[198] NWS. The Blizzard of January 26-27, 2015. https://www.weather.gov/okx/Blizzard_01262715
[199] NCEI. Storm Events Database. https://www.ncdc.noaa.gov/stormevents/eventdetails.jsp?id=617436
[200] NWS. February 9, 2017, Blizzard. https://www.weather.gov/okx/Blizzard_Feb92017
[201] NCEI. Storm Events Database. https://www.ncdc.noaa.gov/stormevents/eventdetails.jsp?id=680087
[202] NCEI. Storm Events Database. https://www.ncdc.noaa.gov/stormevents/eventdetails.jsp?id=687573

the southeast of the state in areas such as New London and Norwich seeing up to 21 and 22 inches respectively. Bridgeport to the west saw 10.5 inches of snow and Hartford to the north saw 8.5 inches of snow.

Table 156 below outlines the winter weather disaster declarations that have occurred within the past ten years. There have been no federally declared major disasters for winter weather since the 2019 plan update.

Table 156. Winter weather FEMA Disaster Declarations

Disaster Number	Program Type	Declaration Date	Incident Type	Title	Declared County Area
3361	EM	2/10/2013	Severe Storm	Severe Winter Storm	All Counties
4106	DR	3/21/2013	Severe Storm	Severe Winter Storm and Snowstorm	All Counties
4213	DR	4/8/2015	Severe Storm	Severe Winter Storm and Snowstorm	New Haven, New London, Tolland, Windham

4.10.5 Future Losses

Based on NCEI historical events of winter weather, each county in Connecticut will likely experience at least four major winter weather events each year. Table 157 summarizes the probability of future events by county based on annualized events.

Table 157. NCEI annualized winter weather events by county (1996-2022)

County	Annualized Events	Annualized Damages (2022 dollars)
Fairfield	8.15	N/A
Hartford	4.42	$1,367,778
Litchfield	10.69	$93,399
Middlesex	5.62	N/A
New Haven	7.35	$181,295
New London	5.54	N/A
Tolland	4.42	$412,285
Windham	4.04	$109,663

NCEI also tracks billion-dollar disaster events from 1980 through 2023. Billion-dollar winter storm event frequency per year can be found in Figure 131. Connecticut has a billion-dollar winter storm event/year frequency of 0.39 events/year. This ties Connecticut with New Jersey for the 4th highest billion-dollar winter storm event/year in the United States. Only

New York (0.45/year), Pennsylvania (0.43/year), and Virginia (0.41/year) have a higher frequency.

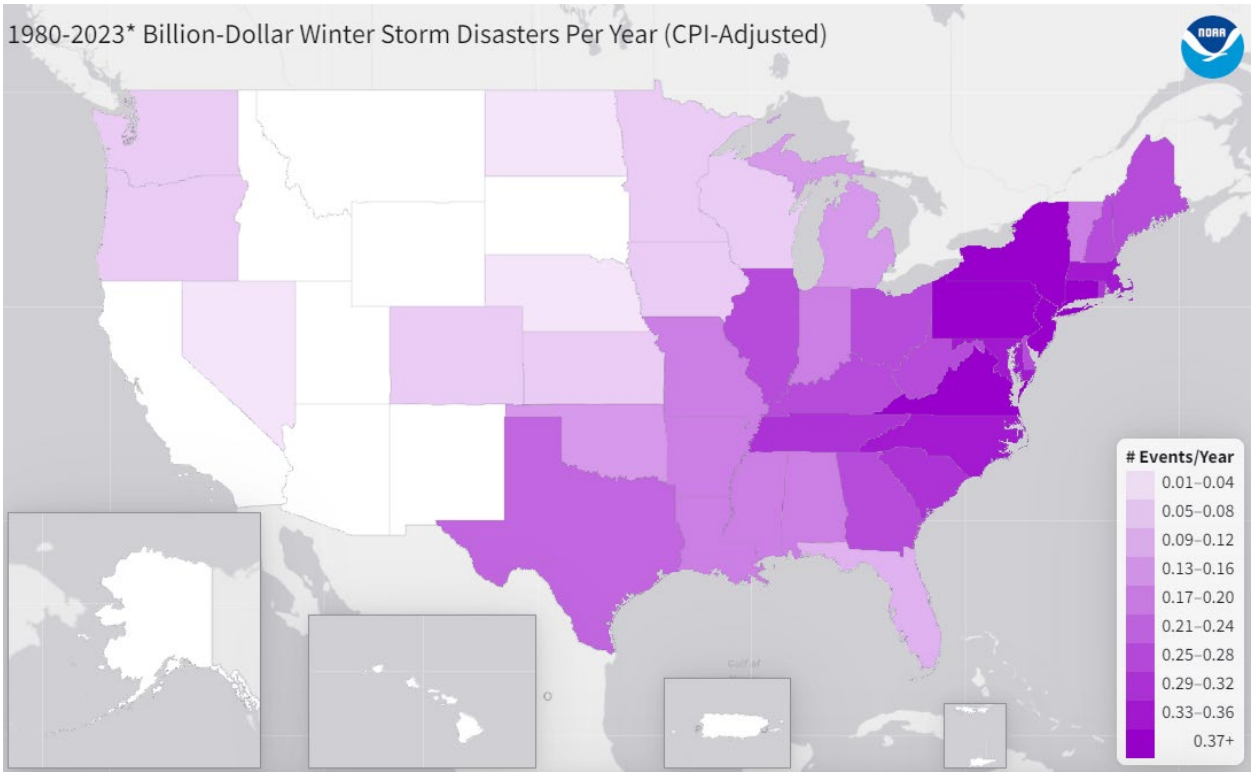


Figure 131. NCEI billion-dollar winter storm disasters per year (CPI adjusted) (1980-2023)

4.10.6 Climate Change Impacts

Annual mean temperature in Connecticut has increased by about 3°F (1.7°C) since 1895, faster than rising global mean temperatures.[203] Due to rising temperatures, increased rain could create more ice storms.[204] Climate change will have significant impacts on winter weather patterns and precipitation during the winter months. Connecticut continues to analyze possible scenarios of how climate variations will impact weather patterns, but as recent winter storm conditions have shown, winter weather has been, and will continue to be impactful to communities, infrastructure, and public safety.

Based on historical CTDOT records, an average of up to 14 events per winter season, major or otherwise, could require CTDOT hazardous road response. The 10-year average for winter storm events that prompted a response from CTDOT is 12 events annually. The number of events requiring CTDOT response could decrease in the upcoming decades as increasing temperatures due to climate change is projected to reduce the number of major

[203] UMass Amherst. How will climate change of 2°C affect Connecticut? https://www.geo.umass.edu/climate/stateClimateReports/CT_ClimateReport_CSRC.pdf
[204] UMass Amherst. How will climate change of 2°C affect Connecticut? https://www.geo.umass.edu/climate/stateClimateReports/CT_ClimateReport_CSRC.pdf

snowstorms. Recent climate change studies have projected winter seasons to be shortened by as much as two weeks for the state along with reduced duration of ground cover and snowpack. In addition, climate models have indicated that fewer, but more intense precipitation events will occur during winter with more rainfall than snow.[205] This change in winter precipitation could result in less frequent but more intense snowstorms with heavier (denser) snow. Table 158 summarizes the impacts of climate change on winter weather in Connecticut.

Table 158. Climate change impacts on winter weather

Impact	Projected Change
Location	Climate science does not indicate a change in location of winter weather.
Intensity	The intensity of winter weather is projected to increase with heavier (denser) snow.
Frequency	The frequency of winter weather is projected to decrease.
Duration	Climate science does not indicate a change in duration of winter weather.
Model Confidence	Medium confidence.

Source: UMass Amherst Climate System Research Center

4.10.7 Vulnerability Assessment

Winter weather is one of the most impactful hazards to the state annually. Harsh winter storms ranging from ice storms and blizzard conditions to nor'easters battering coastal communities affect the entire State.

4.10.7.1 State Vulnerability

The entire state is vulnerable to losses due to winter weather. According to NCEI estimates, approximately $2 million is expected to be lost statewide in damages annually due to winter weather. NCEI also provides billion-dollar winter storm events data with a cost per event for the state of Connecticut coming out to $100-$250 million per event as shown in Figure 132.

[205] Sources: U.S. Global Change Research Program, Global Climate Change Impacts in the United States, 2009; Northeast Climate Impacts Assessment Group, Confronting Climate Change in the U.S. Northeast, 2007; and U.S. Climate Change Science Program, Weather and Climate Extremes in a Changing Climate, 2008.

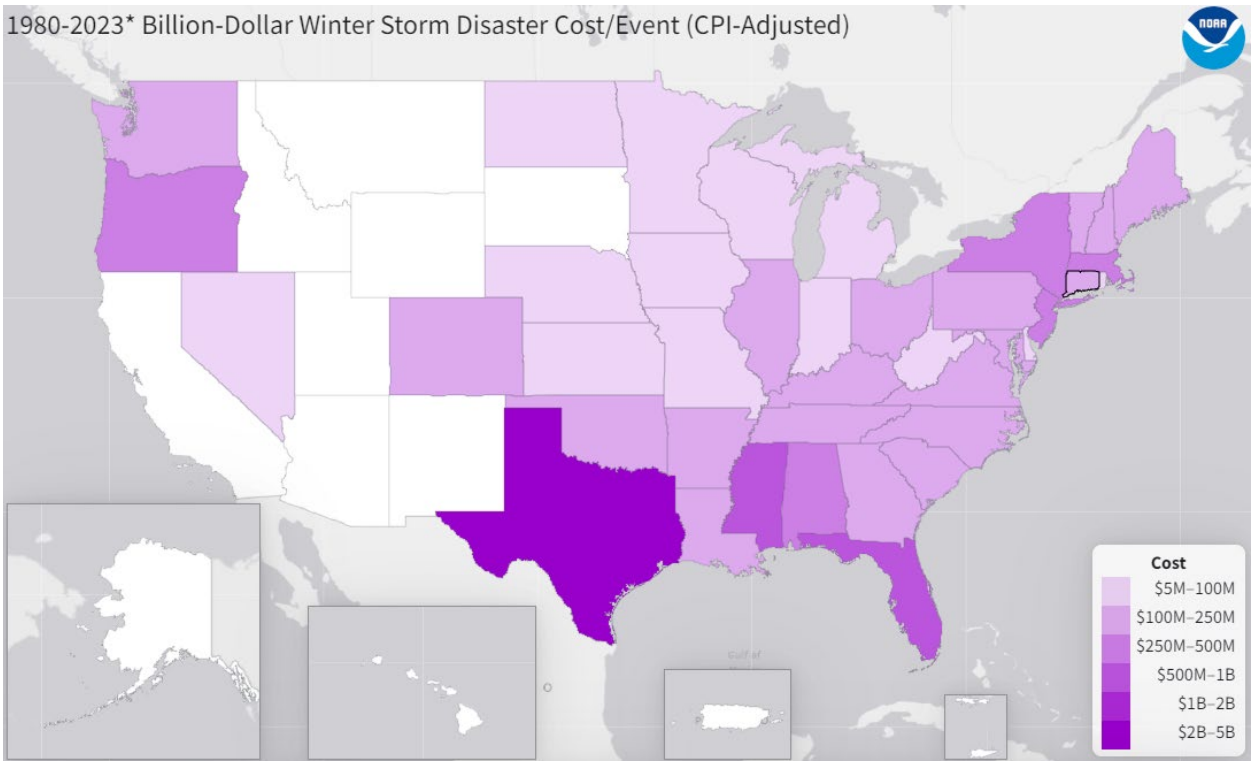


Figure 132. Billion-dollar winter storm disaster cost per event (1980-2023)

NCEI weather stations report on snow data and provide annual snowfall for the region. Figure 133 shows average annual snowfall in feet for Connecticut. The northern region of the state and part of Fairfield County in the southwest of the state have the highest average annual snowfall, with greater than 4 feet of snowfall annually.

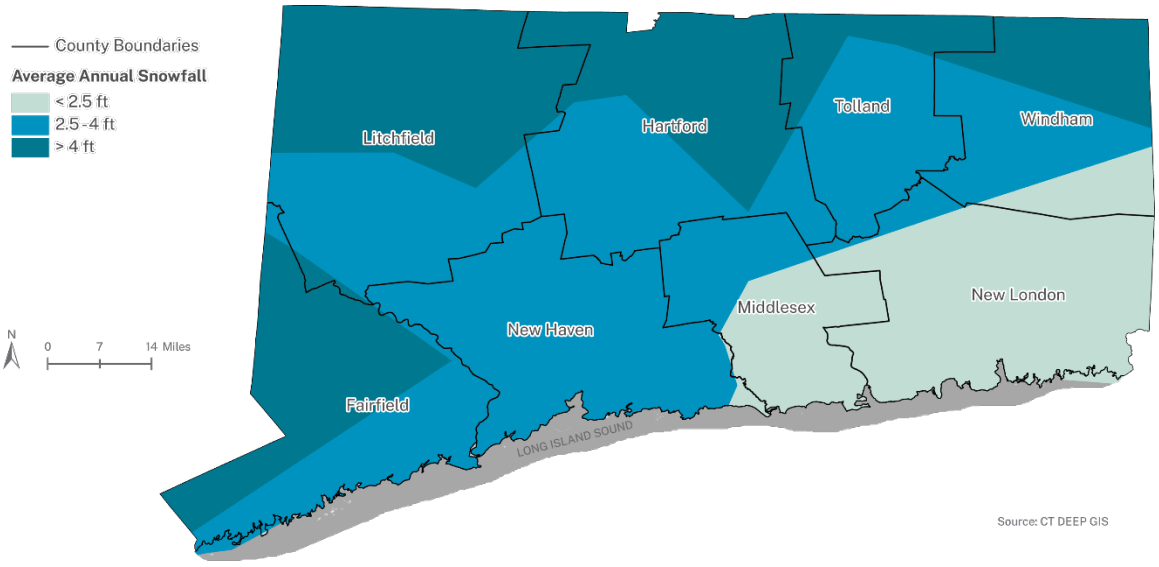


Figure 133. Average annual snowfall in Connecticut

To be considered at least a notable snowstorm on the RSI scale, snow depths must be 4 inches or greater in the region. Figure 134 below shows the average annual days where snow depths are greater than or equal to 4 inches. The northeastern portion of Litchfield County and a small section of Tolland County see the most days annually with snowfall greater than or equal to 4 inches. The whole northern part of the state has the highest overall annual average snowfall days greater than or equal to 4 inches with 4-5 days annually.

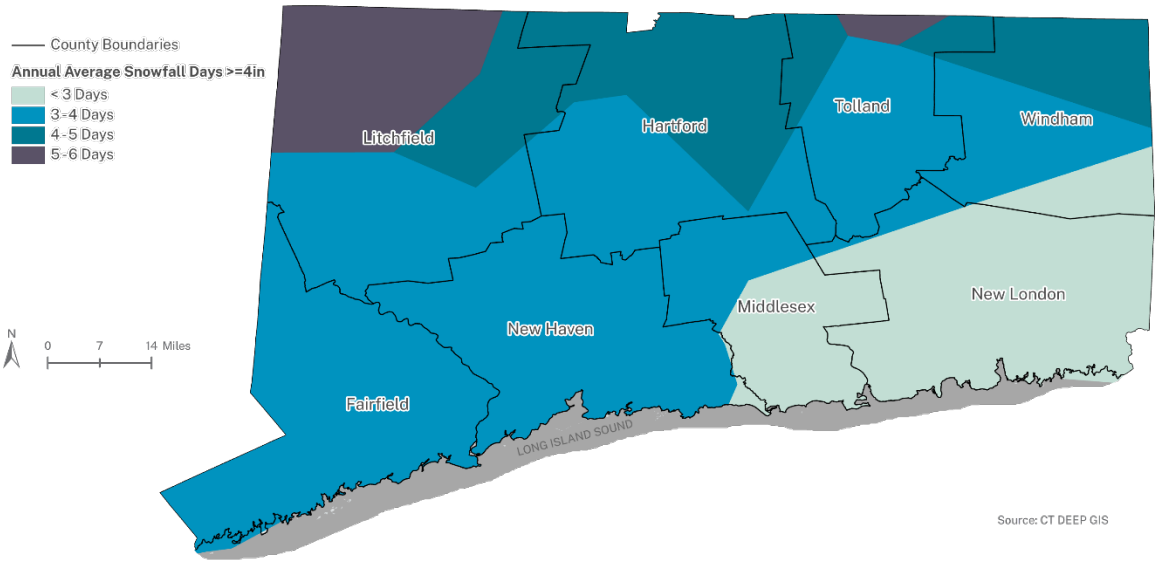


Figure 134. Average annual snowfall days ≥ 4 inches

Snow can cause damage to state-owned buildings by damaging roofs with the pressure of heavy snow and causing leaks and damage to building structure. Table 159 and Table 160

show the annual exposure of state assets to annual average total snow-depth. 81% (2,710) of state-owned buildings are located in an area of the state with an average annual snow-depth of 2.5 feet or greater, thus approximately $5.7 billion in estimated building value is exposed to severe snow accumulation (62% of the total known value of all state-owned buildings in the state). New London County has the most state-owned buildings exposed to < 2.5 ft annual accumulation, New Haven County has the most buildings exposed to between 2.5 and 4 ft annual accumulation, and Hartford County has the most buildings exposed to the highest annual snow accumulation of >4 ft.

Table 159. State-owned buildings exposed to annual snow accumulation amounts.

County	Total State-Owned Buildings	< 2.5FT	2.5 to 4FT	> 4FT
Fairfield	267	0	267	0
Hartford	688	0	347	341
Litchfield	261	0	101	160
Middlesex	312	95	217	0
New Haven	605	68	537	0
New London	493	492	1	0
Tolland	354	0	310	44
Windham	187	31	124	32
Total	**3,167**	**686**	**1,904**	**577**

Table 160. Value of state-owned buildings exposed to annual snow accumulation.

County	Total Buildings	< 2.5FT	2.5FT to 4FT	> 4FT	Total Building Value at Risk
Fairfield	267	N/A	$532,038,010	$144,949,810	$676,987,220
Hartford	688	N/A	$1,427,793,839	$1,239,828,874	$2,667,622,713
Litchfield	261	N/A	$10,277,590	$63,493,820	$73,771,410
Middlesex	312	$8,488,130	$310,219,080	N/A	$318,707,210
New Haven	605	N/A	$1,152,697,030	N/A	$1,152,697,030
New London	493	$340,920,150	$154,820	N/A	$341,074,970
Tolland	354	N/A	$512,062,830	$113,528,150	$625,590,980
Windham	187	$3,192,790	$190,725,403	$3,373,800	$197,291,993
Total	**3,167**	**$352,601,070**	**$4,135,968,602**	**$1,565,174,454**	**$6,053,743,526**

Table 161 shows the numbers of critical facilities exposed to areas of the state averaging annual snow-depth less than 2.5ft, 2.5 – 4ft, and greater than 4ft. 82% (1,654) of all critical facilities are located in an area averaging 2.5 ft or greater annual snow-depth.

Table 161. Number of critical facilities exposed to annual snow accumulation.

County	Total Critical Facilities	< 2.5FT	2.5FT to 4FT	> 4FT
Fairfield	400	0	255	173
Hartford	365	0	181	184
Litchfield	180	0	83	97
Middlesex	150	77	73	0
New Haven	395	8	386	1
New London	285	284	1	0
Tolland	117	0	83	34
Windham	132	29	68	35
Total	**2,024**	**398**	**1,130**	**524**

4.10.7.2 Councils of Government Vulnerability

When assessing COG vulnerability to winter weather, NRI census tract data was used to show risk index rating of census tracts that make up the COGs. NRI risk ratings describe the census tract's value in comparison to other census tracts, so the range of risk index ratings for Connecticut's census tracts were compared to census tracts across the country. As shown in Figure 135, risk ratings range from very low to relatively moderate for census tracts in Connecticut. Census tracts with relatively moderate risk rating are primarily located in Western Connecticut, Metropolitan, and Lower Connecticut River Valley COGs, with a small amount located in Capitol Region and Southeastern Connecticut COGs. The majority of COGs are made up of tracts with relatively low risk to winter weather, with Capitol Region COG encompassing the most census tracts with very low risk rating.

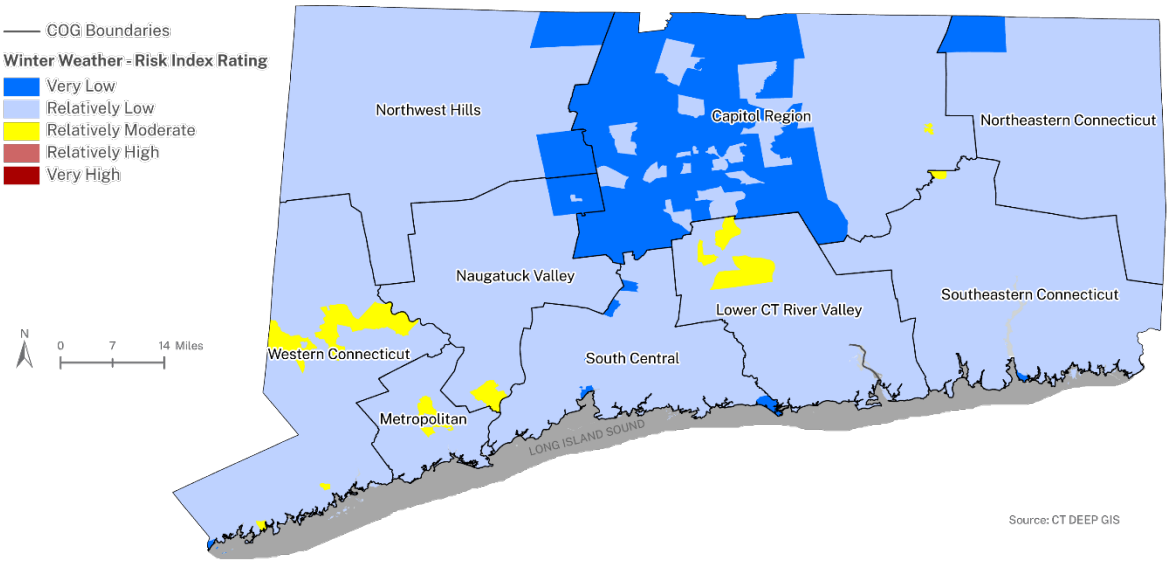


Figure 135. Winter weather risk index rating by COG

NRI data on expected annual loss due to winter weather was also calculated by COG. Table 162 shows this breakdown with Western Connecticut COG having the highest expected annual loss due to winter weather, with $218,068 expected annual loss. Only Western Connecticut and the Metropolitan COG see expected annual loss greater than $100,000 with Metropolitan expected annual loss equaling $123,775.

Table 162. NRI expected annual loss due to winter weather by COG.

COG	Expected Annual Loss Due to Winter Weather
Western Connecticut	$218,068
Northwest Hills	$36,042
Metropolitan	$123,775
Naugatuck Valley	$90,145
Capitol Region	$98,737
South Central	$90,822
Lower Connecticut River Valley	$74,314
Southeastern Connecticut	$79,131
Northeastern Connecticut	$36,759
Total	**$8,415,053**

4.10.7.3 Local Vulnerability

Winter weather can affect every community in Connecticut. Heavy snow may cause road closures, which can prevent emergency services or utility workers from accessing communities in need. The population living in rural areas of the State may be more vulnerable to becoming isolated during winter storms. In addition, Connecticut's elderly population, unhoused individuals, low-income individuals, and outdoor workers are especially vulnerable to winter storm impacts. Vulnerable populations may rely on shelters for a warm place to stay during winter weather events. The state can reduce its vulnerability to winter weather events by providing shelters with the necessary resources to accommodate the population that is at risk during winter weather events.

Connecticut's Climate Change Vulnerability Index (CCVI) shows areas in the State that are more vulnerable to the impacts of climate change through Social Sensitivity scores. In Figure 136, the CCVI Social Sensitivity Score is paired with areas that are at high or moderate risk for winter weather according to the NRI. The most vulnerable populations reside in pockets within Hartford County, New Haven County, and Fairfield County. Fairfield County and Middlesex County have the most overlap of winter weather risk areas and high Social Sensitivity areas. These counties may benefit from an increased number of shelters during the winter months.

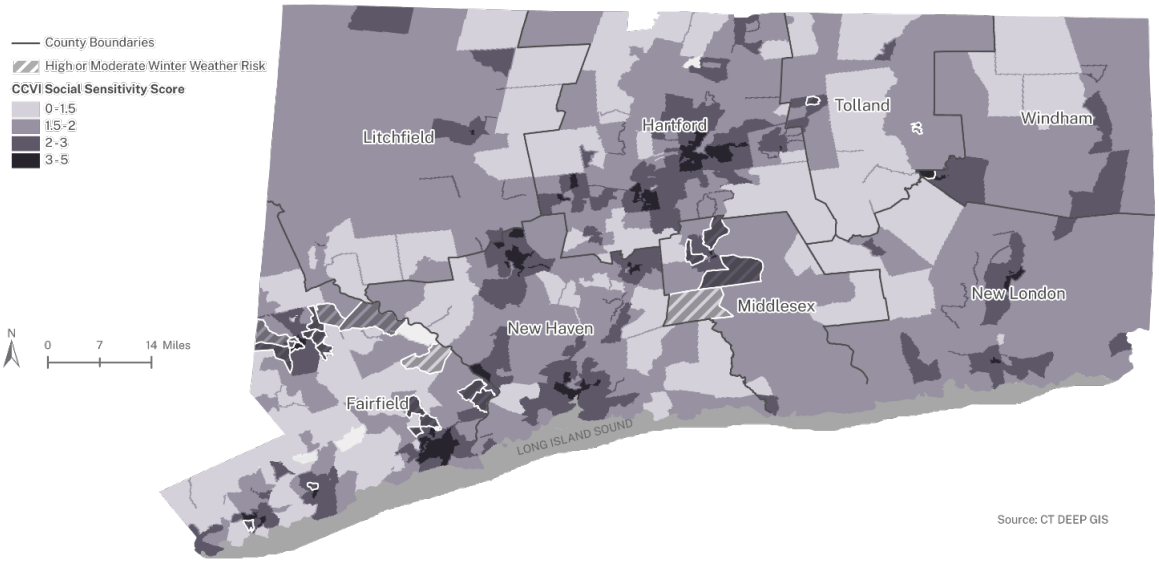


Figure 136. Social Sensitivity scores and areas of high or moderate winter weather risk

To determine loss due to winter weather in Connecticut, NRI Expected Annual Loss data was analyzed by County. Table 163 shows the county loss values. Fairfield County has an expected annual loss of $308,576 which is almost 3 times the expected annual loss of New Haven County, the county with the next highest expected annual loss ($101,786).

Table 163. Expected annual loss due to winter weather by county.

County	Expected Annual Loss Due to Winter Weather
Fairfield	$308,576
Hartford	$25,340
Litchfield	$40,507
Middlesex	$61,396
New Haven	$101,786
New London	$57,849
Tolland	$45,482
Windham	$30,601
Total	**$671,537**

4.10.7.4 Changes in Development

Connecticut's population growth has been minimal recently, with modest to low growth projected in the next few decades. This minimal growth has reduced the vulnerability to winter weather.

Total building permits issued in each county in Connecticut between 2018 and 2022 shows areas of the State that have experienced growth in development. As shown in Figure 137, Fairfield County has the highest growth in development with 6,000 to 10,000 total building permits issued and is also at the most risk for winter weather impacts. New Haven and Hartford County also have a relatively higher number of building permits issued from 2018-2022 falling within the range of 3,000 to 6,000 total building permits issued. Although by census tract there is found to be low risk to winter weather in those two counties, in Figure 136 above, New Haven County is considered to be at a moderate risk to winter weather. If recent trends in development continue, Fairfield and New Haven County will continually increase their vulnerability to winter weather events through increasing development and population.

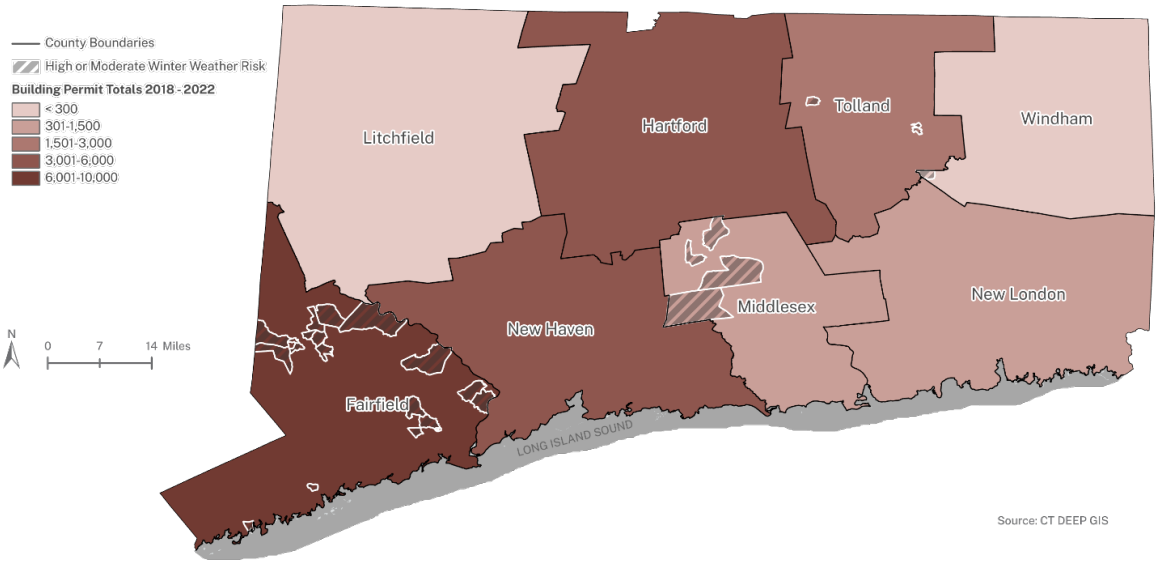


Figure 137. Building permits issued 2018-2022 with areas of high or moderate winter weather risk.

4.10.8 Conclusion

Winter weather was ranked on the risk parameters as detailed in Table 24. To summarize the overall risk of winter weather for each county, each risk parameter score was multiplied by its impact weight and combined into a county composite ranking.

Table 164 shows the winter weather hazard ranking for each county. The high to low comparison does not mean that a low or medium-low hazard will not occur or will not have some impact on the community. However, it does provide an overview of what hazards may pose the greatest risk to each county given available data. This document should serve as a guide to help planners and officials in managing risk and prioritize mitigation actions.

Table 164. Winter weather hazard ranking by county.

	Fairfield	Hartford	Litchfield	Middlesex	New Haven	New London	Tolland	Windham
Hazard Concern	M	M	M	M	M	M	M	M
Local Plan Rating	H	H	H	H	H	H	H	H
Geographic Extent	L	L	L	L	L	L	L	L
Population Density	H	M-H	M	M-L	M-H	M	M-L	L
Future Development	H	M-H	M-L	M-L	M-H	M	M	L

	Fairfield	Hartford	Litchfield	Middlesex	New Haven	New London	Tolland	Windham
Facility Intersect	H	M-H	M-H	M-L	M	L	M-H	M-L
Future Events	M-H	M-L	H	M	M-H	M	M-L	L
Future Losses	L	H	M	L	M-H	L	M-H	M
Injury & Death	H	M-H	L	L	L	L	L	L
Social Sensitivity	M-H	L	L	L	L	L	L	H
Composite*	**M-H**	**M-H**	**M**	**L**	**M**	**L**	**M-L**	**M-L**

* Each parameter's weighted score was added together to create a composite rank for each county. A risk determination of high, medium-high, medium, medium-low, and low was then assigned based on percentiles. A summation of all the composite scores for all assessed hazards in each jurisdiction provides an overall risk rank per county. For more information, refer to Section 4.1.1.4.

4.11 Dam Failure

Dams serve as barriers to hold back water and can be used to regulate water supply, control floods, provide hydroelectric power, or create recreational opportunities. They are typically constructed of earth, concrete, steel, or rock. Dams can cause serious harm when they fail, putting lives and properties at risk. Dam failure is characterized by a sudden, rapid, and uncontrolled release of water.

Dam failures are caused by natural events, human-induced events, or a combination of both. Failures caused by natural events, such as prolonged periods of rainfall and flooding, result in overtopping of the dam, which is the most common cause of dam failure. Overtopping occurs when a dam's spillway capacity is exceeded and portions of the dam not designed to convey flow begin to pass water, erode, and ultimately fail. Other causes of dam failure include design flaws, foundation failure, internal soil erosion, inadequate maintenance, or negligent operation. Complete failure occurs if internal erosion or overtopping results in a complete structural breach, releasing a high-velocity wall of debris-laden water, causing potentially catastrophic impacts to life and property downstream. An additional hazard concern is the cascading effect of one dam failure causing multiple dam failures downstream due to the sudden release of flow and increased pressure.

While dam failures that occur during flood events cause serious effects, dam failures that occur on dry days are the most dangerous. 'Dry day' dam failures typically occur without warning, and consequently, increase threats to public safety. Downstream property owners and communities in the vicinity of dam failure are more vulnerable to being unexpectedly caught in life threatening situations than failures during predicted flood events.

4.11.1 Dam Safety

The potential for catastrophic flooding caused by dam failures led to the passage of the National Dam Inspection Act in 1972. For over 50 years, the National Dam Safety Program (NDSP) has contributed to public health and safety in the United States by promoting the importance of update-to-date dam safety policies to local communities. The NDSP is a partnership of states, federal agencies, and other stakeholders to encourage individual and community responsibility for dam safety through establishment of effective safety programs. Under FEMA leadership, state assistance funds have allowed all participating states, including the State of Connecticut, to improve their programs through increased inspections, emergency action planning, and purchasing needed equipment. FEMA has also expanded existing training programs and training grant assistance to provide support for the improvement of dam safety programs that regulate most of the dams in the U.S.[206] Alongside the NDSP Grant Program, the Rehabilitation of High Hazard Potential Dam

[206] FEMA. Dam Safety.

(HHPD) Grant Program exists under FEMA to provide technical, planning and design, and construction assistance via grants for rehabilitation of high hazard dams.

4.11.1.1 Connecticut Dam Safety Regulatory Program

The Dam Safety Regulatory Section of the Land and Water Resources Division is charged with the responsibility for administration and enforcement of Connecticut's dam safety laws. The existing statutes require that permits be obtained to construct, repair or alter dams, dikes or similar structures. Existing dams, dikes, and similar structures also need to be registered and periodically inspected to assure that their continued operation and use does not constitute a hazard to life, health or property. The dam safety statutes are codified in Section 22a-401 through 22a-411, inclusive of the Connecticut General Statutes. Sections 22a-409-1 and 22a-409-2 of the Regulations of Connecticut State Agencies have been enacted, which governs the registration, classification, and inspection of dams.[207]

Dam Inspection Regulations require that high, significant, and some moderate hazard class dams in Connecticut to be inspected annually. Dams that pose the greatest potential threat to downstream communities and properties are given priority for inspection. A limited number of lower hazard dams which have not been inspected for the past twenty years are also a target for inspection. Other structures are inspected as time and funding permit, and upon notification of potentially significant deficiencies or emergency conditions.

Dams found to be unsafe after inspection are required to be repaired by the owner. Depending on the severity of the identified deficiency, an owner is allowed a reasonable time to make the required repairs or to remove the dam. If a dam owner fails to make the necessary repairs, the Department may issue an administrative order requiring the owner to restore the structure to a safe condition and may refer noncompliance, with an order to the Attorney General's Office for enforcement. As a means of last resort, the Commissioner is empowered by statute to remove or correct, at the expense of the owner, any unsafe structures which present a clear and present danger to public safety.

The CT DEEP Dam Safety Program also maintains the responsibility of reviewing Emergency Action Plans (EAPs) with the purpose of providing guidance in preparing for, and responding to, potential natural and manmade incidents at dam structures. Stakeholders who own or manage any flood risk management system are urged to actively coordinate emergency plans with the State and/or local emergency management organizations to correspond planning requirements to apply to their facility. Activities included in the EAP may include development of emergency plans, communication strategies, exercises, and training emergency response teams; as well as management and identification of disaster supplies and equipment.[208]

[207] http://www.ct.gov/deep/cwp/view.asp?a=2720&q=325632&deepNav_GID=1654
[208] https://portal.ct.gov/DEEP/Water/Dams/Emergency-Action-Plans

4.11.1.2 Army Corps of Engineers Dam Safety Program

The U.S. Army Corps of Engineers (USACE) is responsible for safety inspections of some federal and non-federal dams in the United States that meet the size and storage limitations specified in the National Dam Inspection Act. USACE has inventoried dams and surveyed each state and federal agency's capabilities, practices, and regulations regarding design, construction, operation, and maintenance of the dams. USACE has also developed guidelines for inspection and evaluation of dam safety.[209]

4.11.1.3 Federal Energy Regulatory Commission Dam Safety Program

The Federal Energy Regulatory Commission (FERC) has the largest dam safety program in the United States. FERC cooperates with a large number of federal and state agencies, including Homeland Security, to ensure and promote dam safety. There are over 3,000 dams that are part of regulated hydroelectric projects and included in the FERC program. Two-thirds of these are more than 50 years old. As dams age, concerns about their safety and integrity grow, so oversight and regular inspection are essential. FERC staff inspects hydroelectric projects on an unscheduled basis to investigate the following:

- Potential dam safety problems,
- Complaints about constructing and operating a project,
- Safety concerns related to natural disasters, and
- Issues concerning compliance with the terms and conditions of a license.

Every five years, an independent consulting engineer, approved by the FERC, must inspect and evaluate projects with dams higher than 32.8 feet (10 meters) or with a total storage capacity of more than 2,000 acre-feet.

FERC monitors and evaluates seismic research in geographic areas where there are concerns about seismic activity. This information is applied in investigation and structural analyses of hydroelectric projects in these areas. FERC staff also measure the effects of potential and actual large floods to evaluate the dam's safety. Pre- and post-flood, FERC staff visit dams and licensed projects to determine the extent of damage and identifies remedial measures the licensee must undertake to reinforce the dam. FERC's Engineering Guidelines for the Evaluation of Hydropower Projects guides the FERC engineering staff and licensees in evaluating dam safety. The publication is frequently revised to reflect current information and methodologies.[210]

FERC requires licensees to prepare emergency action plans and conducts training sessions on how to develop and test these plans. The plans outline an early warning system if there

[209] http://www.publications.usace.army.mil/Portals/76/Publications/EngineerRegulations/ER_1110-2-1156.pdf
[210] https://www.ferc.gov/industries-data/hydropower/dam-safety-and-inspections/eng-guidelines

is an actual or potential sudden release of water from a dam failure. The plans include operational procedures that may be used, such as reducing reservoir levels and reducing downstream flows, as well as procedures for notifying affected residents and emergency management agencies. These plans are frequently updated and tested to ensure that everyone knows what to do in emergency situations.

4.11.2 Location

The National Inventory of Dams (NID) documents all known dams in the United States and its territories that meet certain criteria. The NID, managed by USACE, consists of dams meeting at least one of the following criteria:

- **High Hazard Classification** - Loss of human life is likely if the dam fails.
- **Significant Hazard Classification** – No probable loss of human life but can cause economic loss, environmental damage, disruption of lifeline facilities, or impact other concerns.
- Equal or exceed 25 feet in height and exceed 15 acre-feet in storage.
- Equal or exceed 50 acre-feet storage and exceed 6 feet in height.

There are 834 dams in Connecticut that meet NID criteria, shown in Figure 138. Of these 834 dams, 287 are classified as high hazard potential, 48 are classified as significant hazard potential, 58 have low hazard potential, and 7 are undetermined, as shown in Table 165. Fairfield County has the highest number of high hazard potential dams, followed by New Haven County. Windham County has the lowest number of high hazard potential dams. A list of all high hazard potential dams in Connecticut can be found in Appendix 3.

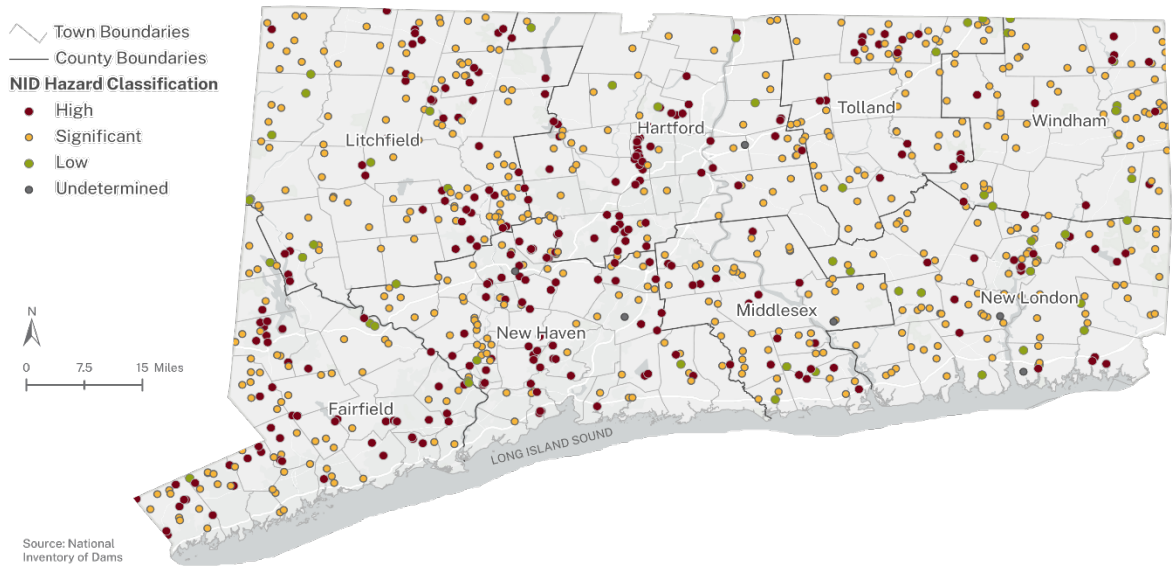


Figure 138. Locations of dams in Connecticut (NID)

NID Dam Classifications

The NID classifies dams into hazard categories based on the based on the probable loss of human life and the impacts on economic, environmental, and lifeline interests in the case of a dam failure. The NID classifications directly align with the FEMA dam hazard classification.

Table 165. NID dam hazard potential classification

County	High Hazard	Significant Hazard	Low Hazard	Undetermined	Total Dams
Fairfield	65	52	5	0	122
Hartford	51	46	5	2	104
Litchfield	47	97	13	0	157
Middlesex	17	43	3	1	64
New Haven	59	60	4	2	125
New London	19	75	14	2	110
Tolland	18	54	4	0	76
Windham	11	55	10	0	76
State Total	**287**	**482**	**58**	**7**	**834**

Dam ownership varies for dams in Connecticut. federal agencies own 16; State agencies own 146; local agencies own 191; public utilities companies own 113; and private entities or individuals own 367. 44% of the dams in Connecticut are owned by private entities or individuals and the federal government owns the least number (~2%) of all NID dams in Connecticut. The NID categorizes dams based on their primary function and is summarized for CT dams in Table 166.

Table 166. Number of dams in NID by primary function.

Primary Function	Number of Dams	Percentage of Dams in CT
Recreation	483	57.9%
Water Supply	177	21.2%
Flood Control	55	6.6%
Hydroelectric	39	4.7%
Other	30	3.6%
Fish and Wildlife	26	3.1%
Undetermined	15	1.8%
Irrigation	8	1.0%

Primary Function	Number of Dams	Percentage of Dams in CT
Fire Protection	1	0.1%

Table 167 provides a breakdown of all regulated dams in Connecticut by CT DEEP-defined hazard potential. Of the 4,217 dams that were able to be geospatially mapped, 188 are classified as having high hazard potential (major damage and probable loss of life) and 245 are classified as having a significant hazard potential (minor damage and possible loss of life). New Haven County had the highest number of Class C High Hazard dams in Connecticut with 38. New London had the highest number of Class B Significant Hazard dams at 37. Overall, Fairfield County had the highest number of all dams, regardless of hazard class. The remaining dams are not considered to pose a threat to life and safety following a failure, and only minimal to moderate damages or economic loss.

Table 167. Number of dams by CT DEEP hazard classification, by county

County	Class C (High)	Class B (Significant)	Class BB (Moderate)	Class A (Low)	Class AA (Negligible)	Unclassified	Total
Fairfield	27	31	137	492	82	127	896
Hartford	36	30	85	236	67	113	567
Litchfield	35	36	115	290	93	123	692
Middlesex	13	27	73	161	59	43	376
New Haven	38	36	121	209	56	87	547
New London	15	37	54	227	66	58	457
Tolland	13	22	68	133	31	52	319
Windham	11	26	71	143	40	72	363
Total	**188**	**245**	**724**	**1891**	**494**	**675**	**4217**

According to the Dam Incident Notification (DIN) system maintained by the National Performance of Dam Program (NPDP), there are 755 dams in the State of Connecticut. Of the 755 dams, there are 48 classified as low hazard (Class A), 444 classified as significant hazard (Class B), 232 classified as high hazard (Class C), and 31 having an unknown classification (NPDP 2019).

The NID and DIN total number of dams differ from CT DEEP records of state regulated dams, As of November 2022, CT DEEP identifies a total of 4,222 dams in the State of Connecticut. CT DEEP data is used for the purpose of this HMP update as it provides the most updated and complete dataset of dams in Connecticut. While over 75% of the dams are regulated by CT DEEP, the ownership of dams in Connecticut is diverse. Of the 4,222 total dams, 78% are held privately and the remainder are held by public or non-profit entities. The location and ownership of all dams in Connecticut are displayed in Figure 139. CT DEEP holds ownership of 304 dams, approximately 7.2% of total dams in the state.

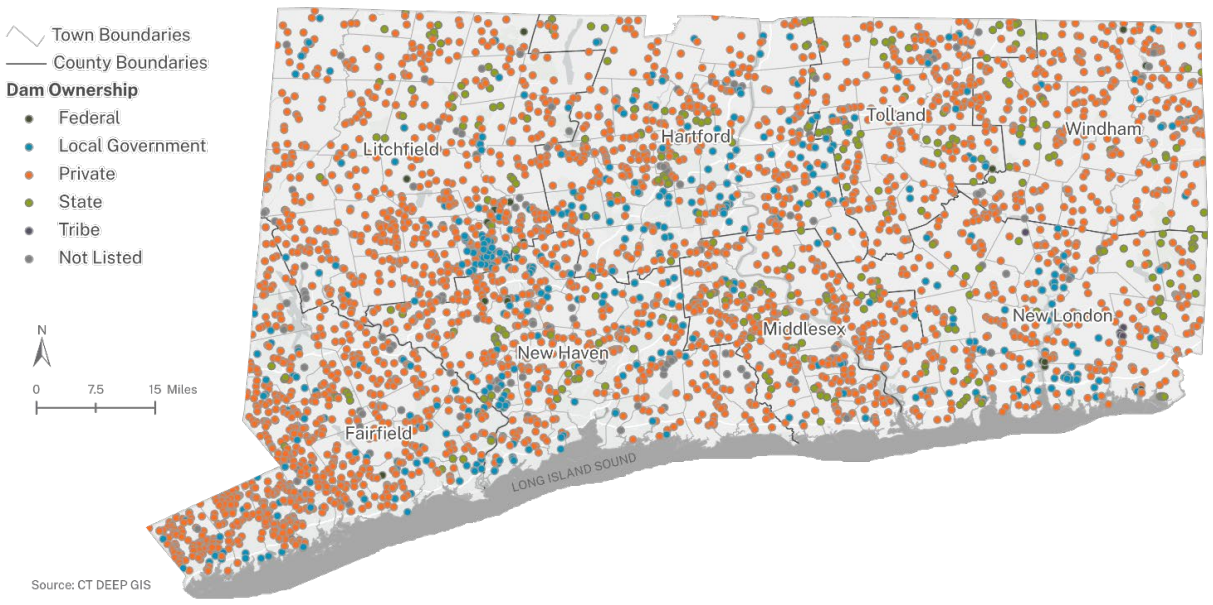


Figure 139. Location of all dams managed by CT DEEP, categorized by dam ownership.

Table 168 provides a breakdown of the regulated dams in Connecticut by hazard potential as defined by the CT Department of Energy and Environmental Protection. As displayed in Figure 140, of the 4,214 dams that have geospatial data attributes, 189 are classified as having high hazard potential (major damage and probable loss of life) and 245 are classified as having a significant hazard potential (minor damage and possible loss of life). While a total of 434 dams are classified as high or significant hazard potential, not all of them have inundation areas mapped. The data used in this analysis contained 199 dam inundated areas in Connecticut, with 188 of the areas assigned to a significant or high hazard dam classification. 167 mapped inundated areas are associated with Class C (High Hazard) dams and 21 areas associated with Class B dams (Significant Hazard). The remaining dams are not considered to pose a threat to life and safety following a failure, and only minimal to moderate damages or economic loss.

Table 168. Number of regulated dams by hazard classification and hazard description

Hazard Classification	Hazard Description	Number of Dams	Percentage
C – High Hazard	Dam failure would result in probable loss of life, major damage to habitat able structures, damage to major utilities facilities causing widespread service interruption, damage to arterial roadways, or great economic loss	189	4.5%

Hazard Classification	Hazard Description	Number of Dams	Percentage
B – Significant Hazard	Dam failure would result in possible loss of life, minor damage to habitable structures, damage to local utility facilities causing localized interruption of services, damage to collector roadways and railroad, or significant economic loss	245	5.8%
BB – Moderate Hazard	Dam failure would result in damage to normally unoccupied storage structures, damage to paved local roadways, or moderate economic loss	725	17.2%
A – Low Hazard	Dam failure would result in damage to agricultural land, damage to unpaved local roadways, or minimal economic loss	1,892	44.9%
AA – Negligible Hazard	Dam failure would result in no measurable damage to roadways, no measurable damage to land and structures, and negligible economic loss	496	11.8%
Unclassified	Dam was not assigned a hazard description	667	15.8%
Total Regulated Dams		**4,214**	**100%**

Source: Connecticut Department of Energy and Environmental Protection 2016

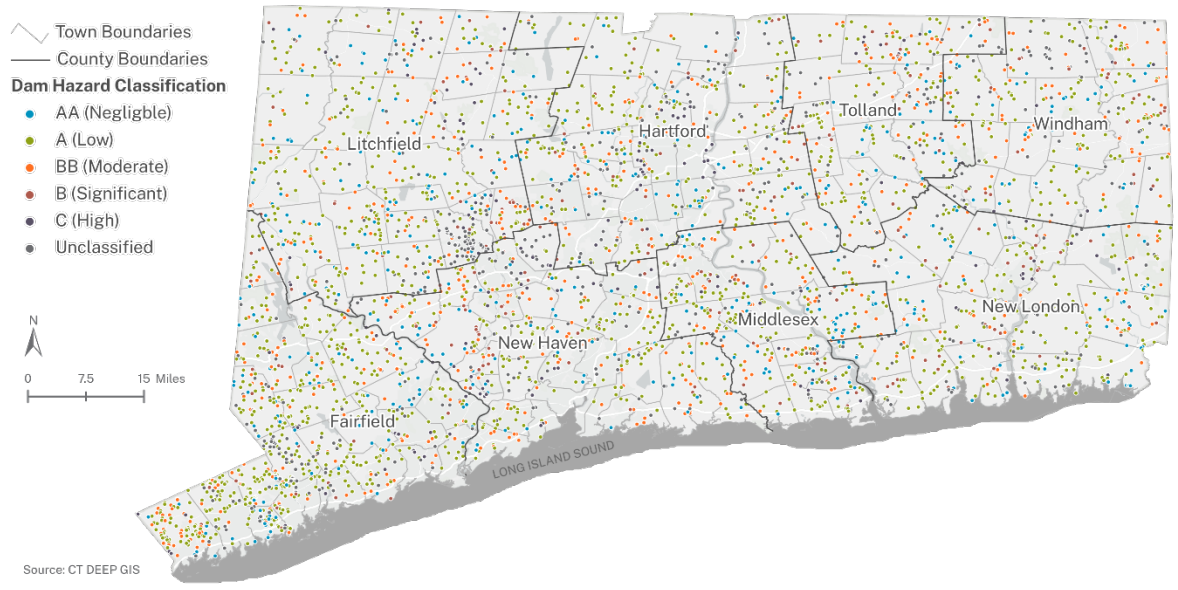


Figure 140. All regulated dams managed by CT DEEP, by hazard classification.

To understand and identify the impacts of high hazard dams, all potential inundated areas should be mapped to address the data gap in flood inundation due to dam failure across Connecticut. Not identifying or mapping potentially inundated areas can result in a lack of warning systems, increased loss of life, inadequate emergency planning, and economic consequences from increased infrastructure damage.

4.11.3 Intensity

There are three major flood risks that can be brought about by a dam. These risks include incremental risk, non-breach risk, and residual risk. Each of these risk measures focuses on a different aspect of risk.[211]

- **Incremental risk** is the risk to the pool area and downstream floodplain residents that can be directly attributed to a dam breach both before and after overtopping, or if a component malfunctions or fails to operate properly when the consequences of that malfunction are over and above those that would occur without dam breach. The consequences typically are due to downstream inundation, but loss of the pool can result in significant consequences in the pool area upstream of the dam.
- **Non-breach risk** is the risk to the pool area and the downstream affected floodplains even if the dam functions as intended. This is due to 'normal' dam operation of the dam or 'overtopping of dams without breach' scenarios. It's the same thing for levees, the landside area may remain in a state of high risk even if the levee functions as intended. The USACE dam and levee safety programs will carefully and systematically assess, communicate, and consider in safety decisions the "non-breach" risks associated with the dams and levees in its portfolio.
- **Residual risk** is the risk in the pool area and downstream of the dam and the landside area behind a levee at any point in time (i.e., prior to, during, or after implementation of risk reduction measures). The residual risk (i.e., the risk that remains) associated with a dam consists of both incremental and non-breach risk. The value of residual risk is the same as the incremental risk for scenarios where there are no non-breach risks.

The extent of a dam failure event can be measured in terms of the dam classification. As classification levels increase, the effects of dam failure increase and cause more damage. Two factors that influence the potential severity of a full or partial dam failure is determined by factors grouped into two categories: (1) the amount of water impounded, and (2) the density, type, and value of development and infrastructure located downstream.[212]

FEMA has three classification levels of dams: Low, Significant, and High. As classification levels increase, the effects of dam failure increase and cause more damage. The hazard potential classification system should be used with the understanding that the failure of any dam or water-retaining structure could represent a danger to downstream life and

[211] US Bureau of Reclamation. 2019. "Best Practices and Risk Methodology. Chapter A-9 Risk Guidelines Presentation." Retrieved from https://www.usbr.gov/ssle/damsafety/risk/methodology.html
[212] City of Sacramento. 2005. "Sacramento 2030 General Plan.". On-Line Address: http://www.sacgp.org/

property.[213] Flood severity from a dam failure can be measured with a low, medium, or high severity level, which are further defined as follows:

- **Low Hazard Potential:** Dams where failure or mis-operation results in no probable loss of human life and low economic and/or environmental losses. Losses are principally limited to the owner's property.
- **Significant Hazard Potential:** Dams where failure or mis-operation results in no probable loss of human life but can cause economic loss, environmental damage, disruption of lifeline facilities, or can impact other concerns. Significant hazard potential classification dams are often located in predominately rural or agricultural areas.
- **High Hazard Potential:** Dams where failure or mis-operation will probably cause loss of human life.

USACE has also developed a classification system for the hazard potential of dam failures, shown in Table 169. USACE's hazard rating system is based only on the potential consequences of a dam failure, it does not take into account the probability of such failures. High-hazard dam failure presents a worst-case scenario, and almost inevitably leads to fatalities.

Table 169. U.S. Army Corps of Engineers Hazard Potential Classification

Hazard Category*	Direct Loss of Life†	Lifeline Losses‡	Property Losses§	Environmental Losses‖
Low	None (rural location, no permanent structures for human habitation)	No disruption of services (cosmetic or rapidly repairable damage)	Private agricultural lands, equipment, and isolated buildings	Minimal incremental damage
Significant	Rural location, only transient or day-use facilities	Disruption of essential facilities and access	Major public and private facilities	Major mitigation required
High	Certain (one or more) extensive residential, commercial, or industrial development	Disruption of essential facilities and access	Extensive public and private facilities	Extensive mitigation cost or impossible to mitigate

* Categories are assigned to overall projects, not individual structures at a project.
† Loss-of-life potential is based on inundation mapping of area downstream of the project. Analyses of loss-of-life potential should take into account the population at risk, time of flood wave travel, and warning time.
‡ Lifeline losses include indirect threats to life caused by the interruption of lifeline services from project failure or operational disruption; for example, loss of critical medical facilities or access to them.

[213] http://www.fema.gov/media-library-data/20130726-1516-20490-7951/fema-333.pdf

§ Property losses include damage to project facilities and downstream property and indirect impact from loss of project services, such as impact from loss of a dam and navigation pool, or impact from loss of water or power supply.
‖ Environmental impact downstream caused by the incremental flood wave produced by the project failure, beyond what would normally be expected for the magnitude flood event under which the failure occurs.

Source: U.S. Army Corps of Engineers 1995

CT DEEP also has their own classification for dam hazard potential in Connecticut. The classifications relate to the potential for property damage and/or loss of life in the event of a dam failure and dictate inspection frequency requirements:

- **Class AA:** Negligible Hazard Potential -. A dam would be considered to have negligible downstream hazard potential if, were it to fail, it would cause no measurable damage to roadways, land and structures, and negligible economic loss. Examples are a dam located just above a large body of water such as a major river which could easily absorb the entire discharge of the released impoundment or a dam and pond so small that the volume of water if released suddenly would cause no damage. Once the Negligible hazard classification is field verified, there is no periodic inspection requirement for dams in this hazard classification.
- **Class A:** Low Hazard Potential - A dam would be considered to have a low downstream hazard potential if, were it to fail, it would cause damage to agricultural land, roadways, and/or generate minimal economic loss. The periodic inspection frequency for low hazard dams is 10 years.
- **Class BB:** Moderate Hazard Potential - A dam would be considered to have a moderate downstream hazard potential if, were it to fail, it would cause damage to normally unoccupied storage structures, low volume roadways, and/or generate moderate economic loss. The periodic inspection frequency for moderate hazard dams is 7 years.
- **Class B:** Significant Hazard Potential - A dam would be considered to have a significant downstream hazard potential if, were it to fail, it would cause possible loss of life; minor damage to habitable structures, residences, hospitals, convalescent homes, schools, etc.; damage to, or interruption of, the use or service utilities; damage to primary roadways and railroads; or generate significant economic loss. The periodic inspection frequency for significant hazard dams is 5 years.
- **Class C:** High Hazard Potential – A dam would be considered to have a high downstream hazard potential if, were it to fail, would cause probable loss of life; major damage to habitable structures, residences, including, but not limited to, industrial or commercial buildings, hospitals, convalescent homes, or schools; damage to major utility facilities, including public water supply, sewage treatment

plants, fuel storage facilities, power plants, or electrical substations causing widespread interruption of these services; damage to arterial roadways; or great economic loss. The periodic inspection frequency for high hazard dams is 2 years.

4.11.4 Impacts

Flooding caused by dam failure has historically caused loss of life and significant property damage. Dam failure can primarily cause severe downstream flooding, based on the magnitude of the failure. Potential losses from dam failure include human life, structures, and natural resources. Dam failures can occur because of structural failures, such as progressive erosion of an embankment, overtopping, or breaching caused by a severe flood. Earthquakes may also weaken the structural integrity of dams. Impacts of dam failure are further detailed below.



- Dam failures can cause direct damage to buildings and critical infrastructure through inundation of water leading to water damage, erosion, and potential collapse.
- Floodwater from dam failures can carry debris, sediment, and contaminants causing damage to structures, rendering them unusable.
- Floodwaters following a dam failure can damage power lines, substations, and water treatments plants, potentially impacting the functionality of utility services.



- Dam failure can lead to the closure of roads and bridges, as well as disrupt railways and airports.



- The sudden release of large volumes of water can cause habitat destruction, loss of wildlife, and contamination of surrounding waterbodies.
- Dam failures can affect short and long-term ecological environments by carrying pollutants, sediment, and chemicals in the floodwaters.



- Dam failures pose a significant risk to human life. The magnitude of inundation flooding can cause injuries and fatalities.
- Pollutants and chemicals can be carried in dam failure which may cause illness in affected communities.

- Vulnerable populations may be more affected by dam failure as they are unable to evacuate and relocate quickly. Dam failures can cause population displacement of people residing in affected areas.



- Dam failure can have a significant economic impact from the destruction of buildings and infrastructure, leading to loss of businesses and reduced economic activity.
- Rebuilding and repairing damaged infrastructure can be costly and time-consuming processes that require many hours of labor and work force.

4.11.5 Previous Occurrences and Losses

Connecticut has experienced many dam failures, mainly resulting from significant rainfall events that led to major flooding. They often occur suddenly and without warning. Dam failures may occur during normal operation conditions, referred to as a "sunny day" failure. Historically, however, the consequences of dam failures have not been well documented. Descriptions of previous dam failure events provided in this section are based on anecdotal data from CT DEEP in combination with data available from the National Performance of Dams Program (NPDP) at Stanford University, the Association of State Dam Safety Officials, and NCEI.

This section provides details about significant dam failure events that occurred in Connecticut. Numerous sources provided historical information regarding previous occurrences and losses associated with dam failure events throughout the State, therefore, loss and impact information may vary depending on the source. The accuracy of monetary figures and event details is based on the available information identified during research for the 2023 HMP. Major historical dam failure events are detailed below:

- One of the worst known dam failures in Connecticut occurred in March 1963, when Spaulding Pond Dam in Norwich (New London County) failed, causing six fatalities and more than $6 million in damages (1963 dollars). Two years earlier, in April 1961, Crystal Lake Dam in Middletown (Middlesex County) burst, injuring three people, severely damaging 11 homes, and causing an estimated $600,000 in damage (1961 dollars).
- On the weekend of June 5-6, 1982, Connecticut suffered one of its worst floods since 1955. Throughout the state, 17 dams failed, and another 31 dams were seriously damaged due to a rainfall event that produced up to 18 inches of rain and resulted in damage totaling $70 million. This event included the failure of the Bushy

Mill Pond Dam in Deep River (Middlesex County), which caused an estimated $1 million in damage according to the NPDP database (Figure 141).



Figure 141. Flooding due to the 1982 Bushy Hill Pond Dam Break

- In June 2001, torrential rainfall associated with the remnants of Tropical Storm Allison caused a private dam in Hampton (Windham County) to fail, which closed a portion of Route 97, but NCEI reports no damages.
- In October 2005, Connecticut experienced moderate to major flooding statewide. Major flooding occurred in several river basins in Hartford and Tolland counties, and widespread moderate flooding was experienced across the rest of the state. Flood flow frequencies exceeded a 100-year event in parts of north-central and northeastern Connecticut. CT DEEP is aware of 14 dams which completely failed or partially failed in Hartford and Tolland counties. Another 30 dams were damaged throughout Connecticut. Several bridges failed and several dozen roads were washed out or undermined. Thousands of homes experienced flooded basements and evacuations were conducted in dozens of towns due to severe flooding. As a result of the flooding that resulted in an estimated $42 million in damages, with more than 5,200 homes and 355 businesses impacted, President Bush declared Litchfield, New London, Tolland, and Windham counties disaster areas.

According to the NPDP database, there are 58 incidents recorded as dam failures in the state from 1877 to 2023, of which 42 are attributed to the 1982 flood event. The NPDP database does not include any of the reported dam failure events from 2005. Further, exact

numbers of dam failures caused by Connecticut's record flood events in 1938 and 1955 are not available, but anecdotal information suggests that many more dams were damaged during those storm events than in the more recent 1982 or 2005 flood events. Table 170 provides a history of recorded consequences for dam failure events in Connecticut according to the NPDP database.

Table 170. NPDP Total Dam Failure Events

County	Number of Events	Property Damages
Fairfield	3	Undocumented
Hartford	0	Undocumented
Litchfield	4	$150,000.00
Middlesex	7	$1,190,400.00
New Haven	1	Undocumented
New London	3	$3,078,000.00
Tolland	5	$117,430.00
Windham	1	$250,000.00
Total	**24**	**$4,785,830.00**

To date, Connecticut has had no FEMA Disaster Declarations specifically due to dam failure.[214]

4.11.6 Future Losses

Dam failure events are infrequent and usually coincide with major events, such as earthquakes, landslides, excessive rainfall, and snowmelt. While considered an unlikely occurrence, the potential for dam failure in Connecticut is a significant concern given the large number of dams across the state and numerous dam failure events in the past. The probability of future dam failure events is not easily measured but correlates with the probability of future major flood events coupled with preventative measures, including the routine inspection, maintenance, repair, and proper operation of dams by their owners, and as regulated by CT DEEP's Dam Safety Section.

The Dam Safety Section is tasked with monitoring routine inspection and maintenance of dams that present the greatest dam failure risk or that are in need of structural repair. State regulations require that over 600 dams in Connecticut must be inspected annually, with priority placed on high-hazard dams, which pose the greatest potential threat to downstream persons and properties. Other structures are inspected as time and funding permit, and upon notification of potentially significant deficiencies or emergency conditions. Dam owners are responsible for complying with maintenance and repair

[214] FEMA. Media Library. https://www.fema.gov/media-library/assets/documents/28318?id=6292

requirements and developing Emergency Action Plans (EAPs), which are required for high and significant hazard dams.

Dams that receive construction permits for repair or reconstruction are designed to pass at least the 100-year rainfall event with one foot of freeboard, which acts as a safety measure against overtopping. The most critical and hazardous dams are required to meet a spillway design standard much higher than passing the runoff from a 100-year rainfall event. Although not all the dams under CT DEEP jurisdiction have been measured to withstand the 100-year rainfall event, most of the dams meet this standard due to original design requirements or recent spillway upgrades. Therefore, when smaller rainfall events, such as 10-year and 25-year, occur more frequently there will be little impact on the ability of Connecticut dams to operate safely.

As more state- and privately-owned dams are repaired, the number of dams that will not meet the State minimum requirements for spillway design will decrease. However, the average age of all dams in Connecticut continues to increase, leading the State to remain vigilant in administering dam safety regulations and programs.

There is no season or geographic location that is more susceptible to dam failures than another in Connecticut. However, CT DEEP has started to monitor climate change predictions as they affect the numbers of and severity of heavy rain events in Connecticut. Since dam overtopping caused by excessive rainfall is the leading cause of dam failures in Connecticut, it is appropriate to relate future dam structure vulnerability directly with the potential for increased rainfall in Connecticut.

4.11.7 Climate Change Impacts

Connecticut's climate is changing. Throughout the northeastern United States, spring is arriving earlier and bringing more precipitation, heavy rainstorms are more frequent, and summers are hotter and drier. Severe storms increasingly cause floods that damage property and infrastructure. In the coming decades, the changing climate is likely to increase flooding, harm ecosystems, disrupt farming, and increase risks to human health.[215]

Dams are designed partly based on assumptions about a river's flow behavior, expressed through hydrographs. Changes in weather patterns can have significant effects on the hydrograph used for the design of a dam. If the hygrograph changes, it is conceivable that the dam can lose some or all its designed margin of safety, also known as freeboard. Loss of designed margin of safety may cause floodwaters to more readily overtop the dam or create unintended loads. Such situations could lead to a dam failure.

Climate change may lead to higher intensity rainfall events and increase the probability of dam failures in Connecticut. As a result, the failure probability of low hazard, significant hazard, and under-designed high hazard dams may increase. However, a lack of historical

[215] EPA. What Climate Change Means for Connecticut. August 2016. https://19january2017snapshot.epa.gov/sites/production/files/2016-09/documents/climate-change-ct.pdf

data and interaction between dam infrastructure and environmental characteristics makes it difficult to determine long-term changes in frequency or intensity of future events. Dam failure events often occur over a smaller time frame and smaller geographic areas, which also makes the future changes of events unclear. Overall impacts of climate change on dam failure are described in Table 171.

Table 171. Projected Changes to Dam Failure events

Impact	Projected Change
Location	Climate science currently does not report conclusive changes in the location of dam failure. Inundation areas in general will increase due to increased storm events and higher surface water levels, spreading over larger areas (NCA 2018).
Intensity	Climate model simulations cannot specifically identify the projection of dam failure and inundated areas; however, more intense precipitation events are predicted which would lead to more stress on dams and potential failure (NCA 2018).
Frequency	Over the past century, climate science has not identified a significant trend in dam failure events.
Duration	Climate science does not have a conclusive change in dam failure duration.
Model Confidence	Low confidence.

4.11.8 Vulnerability Assessment

Dam failure can cause the area downstream of the dam to become flooded. This area is called an inundation zone. Areas with the highest exposure to high hazard dam failure inundation are displayed in Figure 142. To identify areas vulnerable to dam inundation through Connecticut, the extent of Class C Potential Dam Hazard, also known as High Hazard, was overlaid municipal boundaries. Dam failure inundation events through 2018 were included in the inundation dataset. The largest area of inundation is in Hartford County with over 43,500 acres of inundated area. Following Hartford County in greatest inundation acreage is New Haven with approximately 38,000 acres of inundated area. Windham County has the lowest total acreage of inundated areas at roughly 1,800 acres.

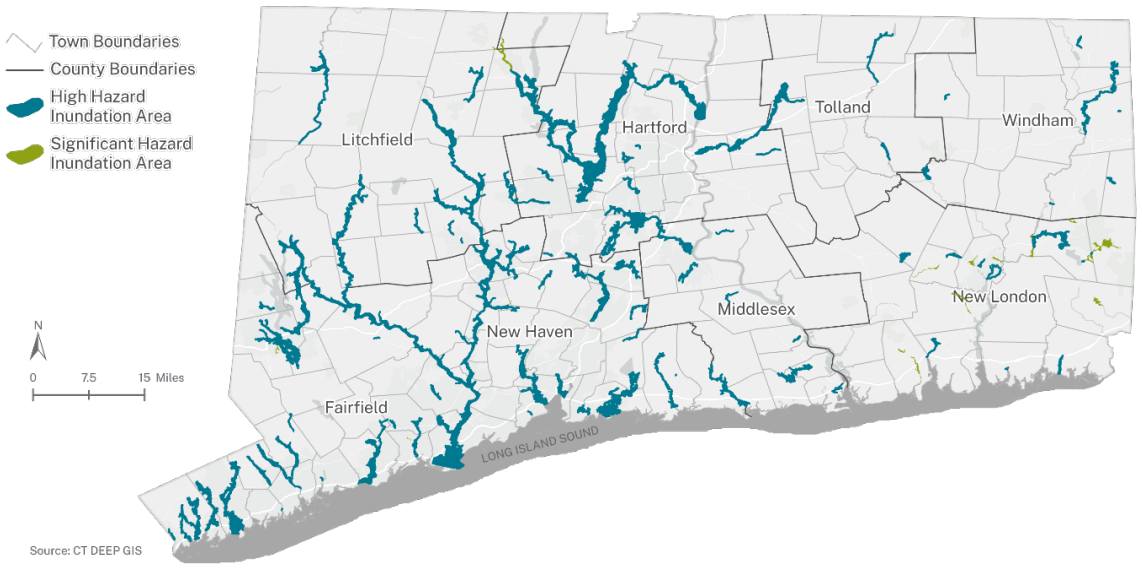


Figure 142. High and Significant Hazard Inundation Areas in Connecticut

For the purposes of this 2023 Plan update, all state buildings and local assets located in the dam inundation hazard areas are considered to be exposed to dam failure events. As the State of Connecticut continues to become more urbanized, the State facilities will need to be developed in locations that will serve the growing population.

4.11.8.1 State Vulnerability

To assess the vulnerability of state-owned facilities, dam inundation areas were overlaid with state-owned facilities in GIS to determine which state-owned facilities are exposed to inundation. All State facilities located in a dam failure inundation zone may be vulnerable to damage.

Table 172 and Table 173 provide a breakdown of the numbers and values of state-owned buildings intersecting the high hazard inundation areas by county. A total of 182 state-owned buildings (4.9% of the total number of state-owned buildings in the state) are located within a high or significant hazard inundation area. This amounts to over $433.8 million in building values exposed to the hazard area, roughly 9.4% of the total value of all state-owned buildings in Connecticut. Litchfield County has the highest percentage of total buildings at risk with 22.6% buildings being in the High Hazard or Significant Hazard Inundation class. Fairfield measured as the second highest exposed county in Connecticut with 18.4% of total buildings at risk.

Table 172. Number of State-Owned Buildings in High and Significant Hazard Inundation Areas, by County

County	Total State-Owned Buildings	# Buildings High Hazard Dam Inundation	# Buildings Significant Hazard Dam Inundation	Total # Buildings in Inundation Areas	Percent of Total Buildings in Inundation Area
Fairfield	267	49	0	49	18.4%
Hartford	688	6	4	10	1.5%
Litchfield	261	33	26	59	22.6%
Middlesex	312	1	0	1	0.3%
New Haven	605	46	0	46	7.6%
New London	493	3	4	7	1.4%
Tolland	885	2	1	3	0.3%
Windham	186	7	0	7	3.8%
Total	**3,697**	**147**	**35**	**182**	**4.9%**

Displayed in Table 173, Litchfield County has the highest percentage of its buildings' value within a high or significant dam/levee inundation zone at 69.7%. Fairfield has the second highest percentage of building value located in an inundation zone at 36.5%. Middlesex County had the lowest percentage of building value in an inundation zone at 0.0%.

Table 173. Value of State-Owned Buildings in High and Significant Hazard Inundation Areas, by County

County	Value of State-Owned Buildings	Value in High Hazard Dam Inundation	Value in Significant Hazard Dam Inundation	Value in Dam Inundation Area	Percent of Value at Risk
Fairfield	$629,154,560	$229,857,360	$0	$229,857,360	36.5%
Hartford	$1,976,443,953	$1,006,560	$534,930	$1,541,490	0.1%
Litchfield	$52,796,110	$36,577,080	$195,940	$36,773,020	69.7%
Middlesex	$177,782,640	$0	$0	$0	0.0%
New Haven	$1,038,408,860	$155,787,130	$0	$155,787,130	15.0%
New London	$300,238,760	$2,716,280	$236,740	$2,953,020	1.0%
Tolland	$270,766,490	$0	$2,233,110	$2,233,110	0.8%
Windham	$181,361,313	$4,670,070	$0	$4,670,070	2.6%
Total	**$4,626,952,686**	**$430,614,480**	**$3,200,720**	**$433,815,200**	**9.4%**

4.11.8.2 Councils of Government Vulnerability

Vulnerability of inundation from dam failure events vary by County and by Council of Governments (COGs). Table 174 summarizes the number of state-owned buildings located within the High and Significant Inundation Hazard classification areas. The Western Region had the highest percentage of total-state owned buildings located within a hazard area at 23.5%. Northwest Hills had the second highest percentage with 18.8% of state-owned buildings in an inundation hazard area.

Table 174. Number of State-Owned Buildings in the High and Significant Dam Inundation Areas by Council of Governments

Council of Governments	Total State-Owned Buildings	Buildings High Hazard Dam Inundation Area	Buildings in Significant Hazard Dam Inundation Area	Buildings in Inundation Areas	Percent of Total Buildings in Inundation Area
Capitol Region	1,527	8	5	13	0.9%
Metropolitan	69	4	0	4	5.8%
Lower CT River Valley	331	1	0	1	0.3%
Naugatuck Valley	330	34	0	34	10.3%
Northeastern	185	0	0	0	0.0%
Northwest Hills	255	22	26	48	18.8%
South Central	311	20	0	20	6.4%
Southeastern	485	10	4	14	2.9%
Western	204	48	0	48	23.5%
Total	**3,697**	**147**	**35**	**182**	**4.9%**

The number of critical facilities in high or significant dam inundation hazard areas was additionally measured for each Council of Governments to assess the vulnerability of community lifelines. Critical facilities are essential community lifelines that need to remain operating in order to continue serving its population and providing fundamental services. Summarized in Table 175, the COG region with the highest number of critical facilities vulnerable to inundation from dam failure is Naugatuck Valley, with 20.6% of its total critical facilities located in exposed areas. Northwest Hills has the second highest percentage of critical facilities vulnerable to inundation from dam failure, followed by Western, Capitol Region, South Central, and Southeastern COGs. Metropolitan, Lower Connecticut River Valley, and Northeastern Councils of Government have no critical facilities vulnerable to dam failure inundation. Analyzing critical facilities in areas with high or significant hazard classifications identified that the most vulnerable community lifelines to dam failure are Safety and Security, and Health and Medical.

Table 175. Number of Critical Facilities in High and Significant Inundation Areas by Council of Governments

County	All Critical Facilities	# within High Hazard	% within High Hazard	# within Significant Hazard	% within Significant Hazard	Total # in Inundation Areas	Total % in Inundation Area
Capitol Region	321	24	7.5%	9	2.8%	33	10.3%
Metropolitan	92	0	0.0%	0	0.0%	0	0.0%
Lower CT River Valley	134	0	0.0%	0	0.0%	0	0.0%
Naugatuck Valley	160	33	20.6%	0	0.0%	33	20.6%
Northeastern	93	0	0.0%	0	0.0%	0	0.0%
Northwest Hills	98	11	11.2%	3	3.1%	14	14.3%
South Central	201	10	5.0%	0	0.0%	10	5.0%
Southeastern	186	4	2.2%	0	0.0%	4	2.2%
Western	230	29	12.6%	2	0.9%	31	13.5%
Total	**1515**	**111**	**7.3%**	**14**	**0.9%**	**125**	**8.3%**

The population vulnerable to dam failure events in each Council of Governments region was estimated by intersecting the High Hazard and Significant Hazard inundation areas with census tracts. 2020 Census data provided the population totals at the tract level to estimate the population within the exposure areas. As shown in Table 176, Western has the highest percentage of total population considered vulnerable to dam inundation. The Northwest Hills and Naugatuck Valley COGs have the next highest exposed population at 14% and 13.7%. All COG regions have at least 1.0% of their population vulnerable to dam failure events.

Table 176. Total Population in High and Significant Inundation Areas by Council of Governments

Council of Government	Total Pop.	Pop. in High Hazard	% Pop. in High Hazard	Pop. in Significant Hazard	% Pop. in Significant Hazard	Total Pop. High/Sig Risk	% At Risk
Capitol Region	952,149	58,083	6.1%	12,153	1.3%	70,236	7%
Metropolitan	306,572	30,160	9.8%	444	0.1%	30,604	10%
Lower CT River Valley	168,611	6,240	3.7%	0	0.0%	6,240	4%
Naugatuck Valley	397,734	69,265	17.4%	793	0.2%	70,058	18%

Council of Government	Total Pop.	Pop. in High Hazard	% Pop. in High Hazard	Pop. in Significant Hazard	% Pop. in Significant Hazard	Total Pop. High/Sig Risk	% At Risk
Northeastern	103,892	862	0.8%	105	0.1%	967	1%
Northwest Hills	169,262	18,905	11.2%	2,140	1.3%	21,045	12%
South Central	550,614	75,272	13.7%	393	0.1%	75,665	14%
Southeastern	243,117	2,827	1.2%	1,450	0.6%	4,277	2%
Western	586,084	133,603	22.8%	656	0.1%	134,259	23%
Total	**3,478,035**	**395,217**	**11.4%**	**18,134**	**0.5%**	**413,351**	**12%**

4.11.8.3 Local Vulnerability

The number of critical facilities in high or significant dam inundation hazard areas was determined for each County in the State to assess the vulnerability of community lifelines.

Table 177 provides a breakdown of the numbers of critical facilities intersecting mapped dam failure inundation areas of high and significant hazard dams by county. A total of 125 critical facilities (8.3% of the total number of critical facilities in the state) are located within a known potential dam failure hazard area. Litchfield County had the highest total percentage of critical facilities with 18.0% at risk, followed by Hartford County at 12.1% and New Haven at 11.8%. Middlesex County was the only county that did not have any critical facilities vulnerable to dam failure.

Table 177. Number of Critical Facilities in High and Significant Hazard Inundation Areas by County

County	Total Critical Facilities	# within High Hazard	% within High Hazard	# within Significant Hazard	% within Significant Hazard	# Facilities with High/Sig Risk	% Facilities with High/Sig Risk
Fairfield	323	26	8.4%	2	0.6%	29	9.0%
Hartford	256	22	8.6%	9	3.5%	31	12.1%
Litchfield	128	20	15.6%	3	2.3%	23	18.0%
Middlesex	115	0	0.0%	0	0.0%	0	0.0%
New Haven	304	26	11.8%	0	0.0%	36	11.8%
New London	199	3	1.5%	0	0.0%	3	1.5%
Tolland	94	2	2.1%	0	0.0%	2	2.1%
Windham	96	1	1.0%	0	0.0%	1	1.0%
Total	**1,515**	**111**	**7.3%**	**14**	**0.9%**	**125**	**8.3%**

Table 178 provides a breakdown by county of the population within mapped dam failure inundation areas. This analysis was conducted on the portion of the census block group that intersected the inundation area. For example, if 20% of the census block group intersects with a dam inundation area, only 20% of the population number for that census block group is counted. This results in estimated values. While there is potential for error with this methodology, it is considered a more refined approach than assuming 100% of the population is contained within the 20% of the census block group that intersects the hazard area. The total population at risk is estimated at 420,785, which is 11.7% of the state's population.

Table 178. Population within mapped dam inundation areas

County	Total Population	# in High-Risk Area	% in High-Risk Area	# in Sig. Risk Area	% in High Sig. Risk Area	# Pop. at Risk	% Pop. at Risk
Fairfield	956,446	169,423	17.7%	1,100	0.1%	170,523	17.8%
Hartford	898,636	55,295	6.2%	12,162	1.4%	67,457	7.5%
Litchfield	185,175	28,934	15.6%	2,018	1.1%	30,952	16.7%
Middlesex	164,568	6,227	3.8%	0	0.0%	6,227	3.8%
New Haven	864,751	134,328	15.5%	1,067	0.1%	135,395	15.7%
New London	269,131	2,410	0.9%	1,554	0.6%	3,964	1.5%
Tolland	150,120	4,723	3.1%	232	0.2%	4,955	3.3%
Windham	116,503	1,312	1.1%	0	0.0%	1,312	1.1%
Total	**3,605,330**	**402,652**	**11.2%**	**18,134**	**0.5%**	**413,351**	**11.7%**

The potential for loss of life in a dam failure incident is affected by the capacity to evacuate and number of evacuation routes available to populations living in areas of potential inundation. Vulnerable populations include all populations downstream from dam failures that are incapable of escaping the area within the needed timeframe, including the elderly and children who may be unable to evacuate from the inundation zone. Economically disadvantaged populations are more vulnerable because they are likely to evaluate their risk and make decisions to evacuate based on the cost to their family. Populations over 65 are also highly vulnerable because they are often more medically fragile, requiring assistance to evacuate, which may not be available during a flood event.

Areas with high CCVI Social Sensitivity Scores indicate the location of socially vulnerable populations in Connecticut. Figure 143 displays the location of high and significant inundation areas in Connecticut overlaid CCVI Social Sensitivity scores at the census tract

level. Fairfield County, New Haven County, and Hartford County have the largest number of high social sensitivity areas located within dam inundation zones.

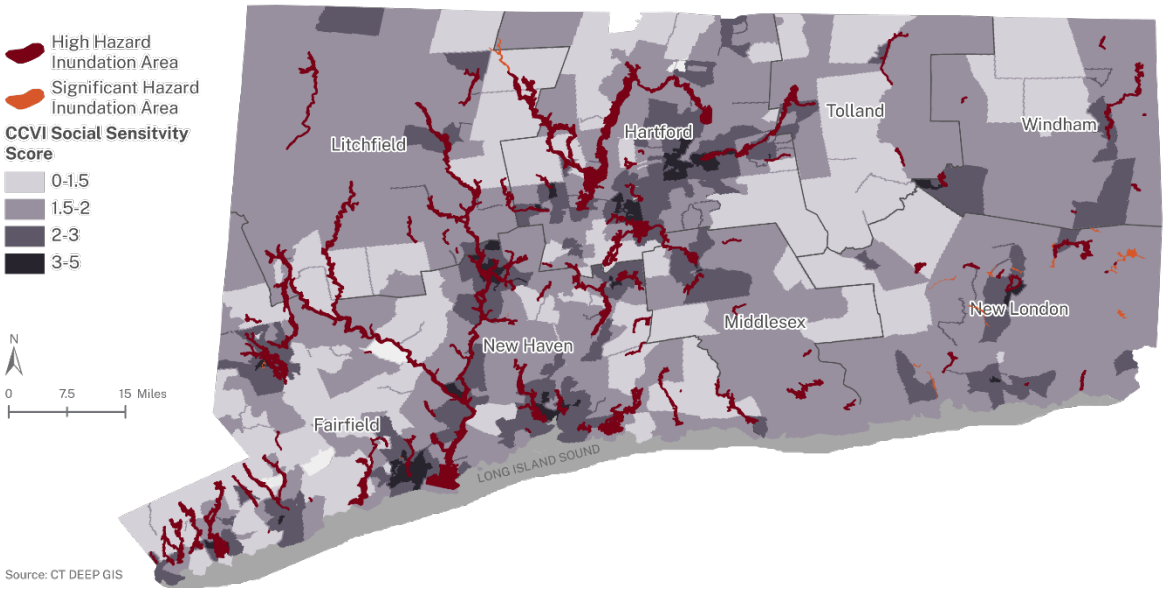


Figure 143. High Hazard Dam Inundation Areas and Social Sensitivity Scores, by Census Tract

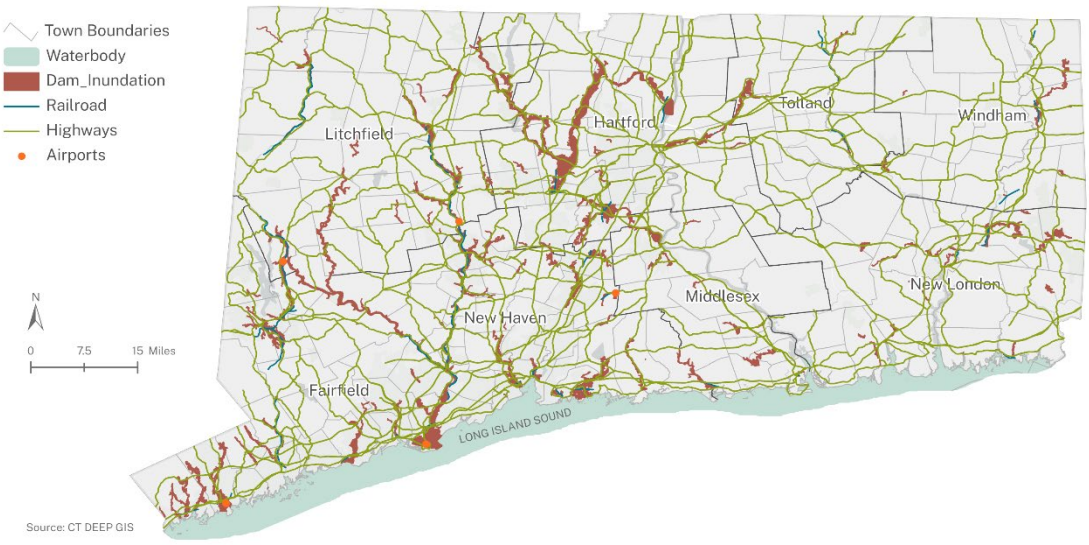


Figure 144. State Transportation Infrastructure with Dam Failure Spatial Hazard Areas.

Geospatial analyses were conducted to show transportation infrastructure within spatial hazard areas for dam failure (figure 129). Appendix 3 contains further information about state transportation infrastructure within spatial hazard areas.

4.11.8.4 Changes in Development

An understanding of population and development trends can assist in planning for future development and ensuring that appropriate mitigation, planning, and preparedness measures are in place. Downstream development increases the potential consequences of a dam or levee's failure due to an increased number of structures and population in the inundation zone. There will be increased economic, social, and environmental impacts as development increases downstream from dams. Additionally, more dams will be re-classified as significant hazard potential and high hazard potential, which will increase the need for Emergency Action Plans and planning to avoid disruption to essential facilities as well as prevent loss of life.

Building permit data shows where development is going to occur within the State. Figure 145, Fairfield had the highest number of building permits issued between 2018 and 2022, and the most total building permits issued in a high or significant inundation hazard area. New Haven and Hartford counties have some total building permits overlapping inundation areas, suggesting that these areas also have an increased exposure to dam failure events. Any new development and increases in population located within the identified dam failure inundation areas will be vulnerable to the impacts from a dam failure event. If recent development trends continue, dam failure vulnerability in these counties will continue to increase, especially in Fairfield, New Haven, and Hartford counties, which currently have the greatest risk to dam failure inundation exposure in the State.

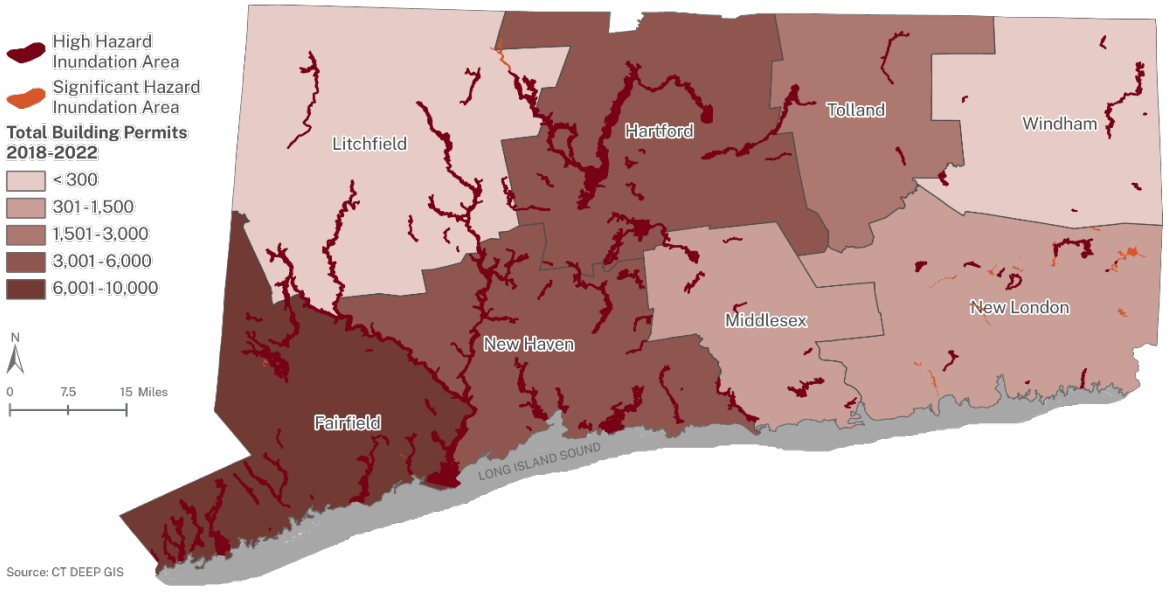


Figure 145. High Hazard Dam Failure Areas and Total Building Permits (2018-2022)

Population growth can also influence the increased exposure of communities to dam failure events. Future population growth through 2040 for Connecticut can identify areas that may have an increased vulnerability or exposure to dam failure as a result of

increasing exposure. Shown in Figure 146, the high and significant dam inundation areas are located in all counties, with their population percent change varying based on county. The majority of high or significant inundation areas are located within Fairfield County, New Haven County, and Hartford County, which are expected to experience a -4% growth and 1% growth by 2040. As population increases, vulnerability for communities and infrastructure will also increase as more development will occur with higher populations.

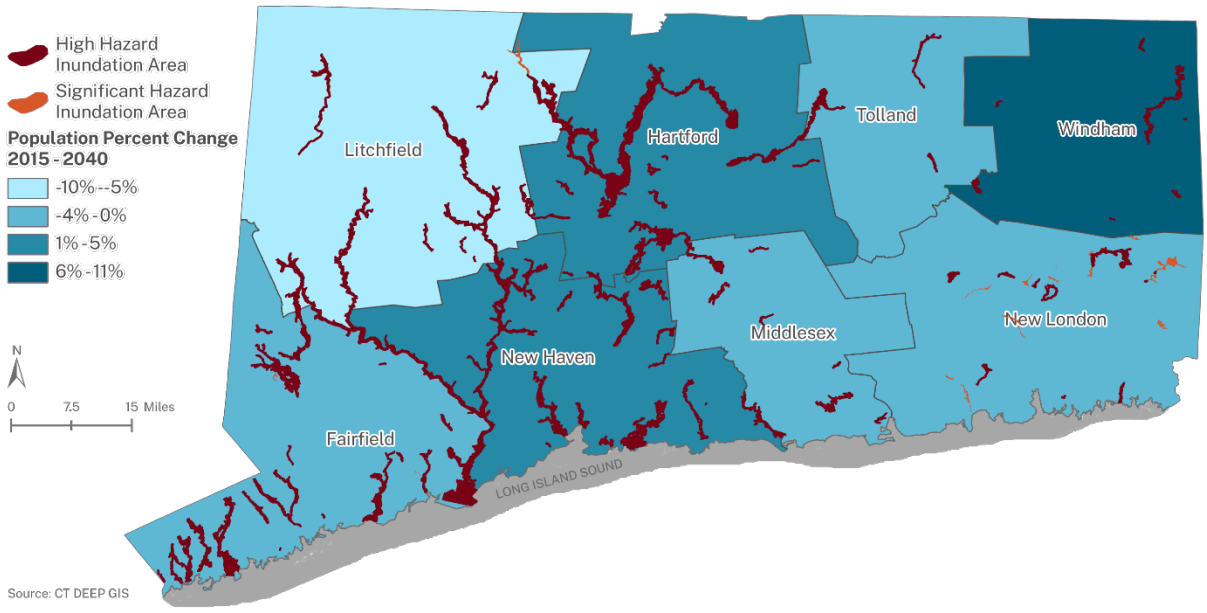


Figure 146. High Hazard Dam Inundation Areas and Population Percent Change (2015-2040) by County

To reduce vulnerability from high-hazard potential dams and the potential consequences associated with dam failure incidents, Connecticut should reduce the number of high-hazard potential dams. Future development across the State should include projects to build community resilience to dam-related flooding from existing high-hazard potential dams, such as flood-proofing or acquiring structures downstream of dams.

4.11.9 Conclusion

Dam failure was ranked on the risk parameters as detailed in Table 24. To summarize the overall risk of dam failure for each county, each risk parameter score was multiplied by its impact weight and combined into a county composite ranking.

Table 179 shows the dam failure hazard ranking for each county. The high to low comparison does not mean that a low or medium-low hazard will not occur or will not have some impact on the community. However, it does provide an overview of what hazards may pose the greatest risk to each county given available data. This document should serve as a guide to help planners and officials in managing risk and prioritize mitigation actions.

Table 179. Dam failure hazard ranking by county.

	Fairfield	Hartford	Litchfield	Middlesex	New Haven	New London	Tolland	Windham
Hazard Concern	M-L	M-L	M-L	M-L	M-L	M-L	M-L	M-L
Local Plan Rating	M-H	M-H	M-H	M-H	M-H	M-H	M-H	M-H
Geographic Extent	M-H	M-H	M	M	H	M-L	M-L	L
Population Density	H	M-H	M	M-L	M-H	M	M-L	L
Future Development	H	M-H	M-L	M-L	M-H	M	M	L
Facility Intersect	M	M	H	L	M-H	M-L	M	M-L
Future Events	M	L	M-H	H	M-L	M	M-H	M-L
Future Losses	L	L	M	M-H	L	H	M	M-H
Injury & Death	L	L	L	L	L	L	L	L
Social Sensitivity	M-H	M-H	M	M-L	H	M	L	M-L
Composite*	**M**	**M-L**	**M**	**M-L**	**M**	**M**	**M-L**	**L**

* Each parameter's weighted score was added together to create a composite rank for each county. A risk determination of high, medium-high, medium, medium-low, and low was then assigned based on percentiles. A summation of all the composite scores for all assessed hazards in each jurisdiction provides an overall risk rank per county. For more information, refer to Section 4.1.1.4.

In summary, there are several notable statewide vulnerabilities to-from HHPDs. They are provided in Table 180.

Table 180. Summary of statewide vulnerabilities to/from HHPDs and potential impacts

Statewide Vulnerability	Potential Cascading Impacts	Potential Economic, Environmental, or Social Impacts & Multi-Jurisdictional Impacts
Structural Failure	Seismic events can weaken structural integrity due to foundation movement. Slope instability or landslides directly impact structural stability. Severe flood events, thunderstorms, and increased sedimentation can cause increased pressure on the dam's structure. Hurricanes and tropical storms pose risk to dam infrastructure through high winds, debris, and storm surge. Tornadoes high winds, flying debris, and vortex pressure can cause dam structure to fail.	Dam structural failure can lead to disruption of transportation, loss of life and/or illness, infrastructure damage, and habitat destruction due to changes in composition, chemical balances, and sudden release of large water, sediment, and various debris. Utility and critical facility services may be reduced or non-functional based on magnitude of dam failure damage. Vulnerable populations can be exposed with little to no warning time, increasing potential for loss of life and damage. Repairing damaged infrastructure, assisting affected populations, and cleaning the environmental aftermath is time-intensive, labor-intensive, and costly.
Overtopping or Breaching	Flash floods or extreme floods cause overtopping through rapid increase in water levels. Floods and heavy rain can also lead to rapid snow melt, elevating water levels. Winter weather events may result in formation of ice which obstruct water flow, causing potential for overtopping when melted. Sea level rise scenarios may cause the natural water level to increase.	Overtopping or breaching cause habitat destruction through loss of ecosystems, vegetation, and biodiversity. Increased release of water may carry sediment, debris, and/or pollutants which can compromise downstream water quality and public health. Loss of life, infrastructure damage, and population displacements may occur alongside economic downturn. Losses in agriculture, business, and infrastructure inflict extensive costs on all communities effected and multiple jurisdictions that are economically interconnected.
Erosion and Sedimentation	Erosion and increased sedimentation interfere with dam functionality and its ability to regulate water flow. Increase in sedimentation can raise the riverbed and increase constant risk of overtopping from high water events leading to a negative impact downstream. Wildfires lead to vegetation loss, less ground cover to combat erosion, and may affect dam storage capacity. Increased erosion increases the likelihood of flash flood events. Lower water levels and reduced flows during drought increase sedimentation.	Sedimentation reduces available storage capacity, diminishing the dam's ability to store water for purposes such as irrigation, drinking water supply, and hydropower generation. These resourceresource constraints can affect utility costs, which can lead to increased financial stress that disproportionately impacts low-income communities. High levels of sediment degradedegrade water quality, decreasing overall environmental and public health. Erosion and release of sedimentation downstream can alter the landscape, impacting stability of downstream areas and increasing risk of flooding in surrounding communities.

Notably, there are a few limitations with the dam risk assessment:

- Additional dam inundation data can be compiled and included in a future version of the NHMP. Not all dam inundation areas have been mapped for high-hazard dams within the state: 19 do not have their inundation areas mapped, 5 of which are owned by CT DEEP.
- Not all high hazard potential dams have an EAP, so there is more data that can be gleaned from future planning documents for individual dams. There are 249 high-hazard dams in Connecticut, and 19 do not have EAPs. Five of these dams are owned by CT DEEP.
- The high number of dams made getting a significant portions of non-state owners to actively participate in the mitigation planning process.
- Enhanced coordination with dam owners and operators, including regarding funding, to assess and mitigate the risks associated with high hazard potential dams that have concerning condition assessment ratings (18 HHPDs currently have "poor" condition assessments.

The Mitigation Strategy Chapter provides strategies to help address these deficiencies.

4.12 Earthquake

An earthquake, also known as a seismic event, is the shaking of the surface of the Earth resulting from a sudden release of energy in the Earth's lithosphere that creates seismic waves. The lithosphere is made up of the Earth's crust, which ranges in size from about 22 miles thick for continents to about five miles thick for the oceans, and a portion of the upper mantle which is composed of solidified magma. Most earthquakes occur along faults. Faults are fractures or zones of fractures between two blocks of rock and appear most commonly at the edges of tectonic plates. Movement of the earth along fault lines can send out seismic waves powerful enough to alter the surface of the Earth causing large-scale damage. This damage can include collapse of buildings and other man-made structures, the opening of large cracks in the ground, broken power and gas lines (and consequent fires), landslides, snow avalanches, tsunamis (giant sea waves) and volcanic eruptions.

4.12.1 Location

Although the Northeast United States is not widely known for its seismic activity, earthquakes, mostly with a magnitude of < 3.0, occur at a high frequency within this area.[216] In fact, the Northeast States Emergency Consortium notes that from 1538 to 1989 1,215 earthquakes occurred in the New England region.[217]

Earthquakes that occur within the northeastern United States are intraplate earthquakes, meaning that the earthquake occurs not along the faults between plates, but within plate boundaries.[218] The earthquake process itself is complex in plate interiors. The quaternary geology of Connecticut is shown in Figure 147. There are two important points that can affect earthquake prediction in these areas (i.e., the where and when an earthquake will occur):

- There is no obvious relationship between earthquakes and geologically mapped faults in most intraplate areas; and
- It is not at all clear whether faults mapped at the earth's surface in the Northeast are the same faults along which the earthquakes are occurring.

[216] Boston College Weston Observatory. Why Does the Earth Quake in New England. http://aki.bc.edu/why_quakes.html
[217] NESEC. Earthquakes. https://nesec.org/hazards/earthquakes.com
[218] Boston College Weston Observatory. Why Does the Earth Quake in New England. http://aki.bc.edu/why_quakes.html

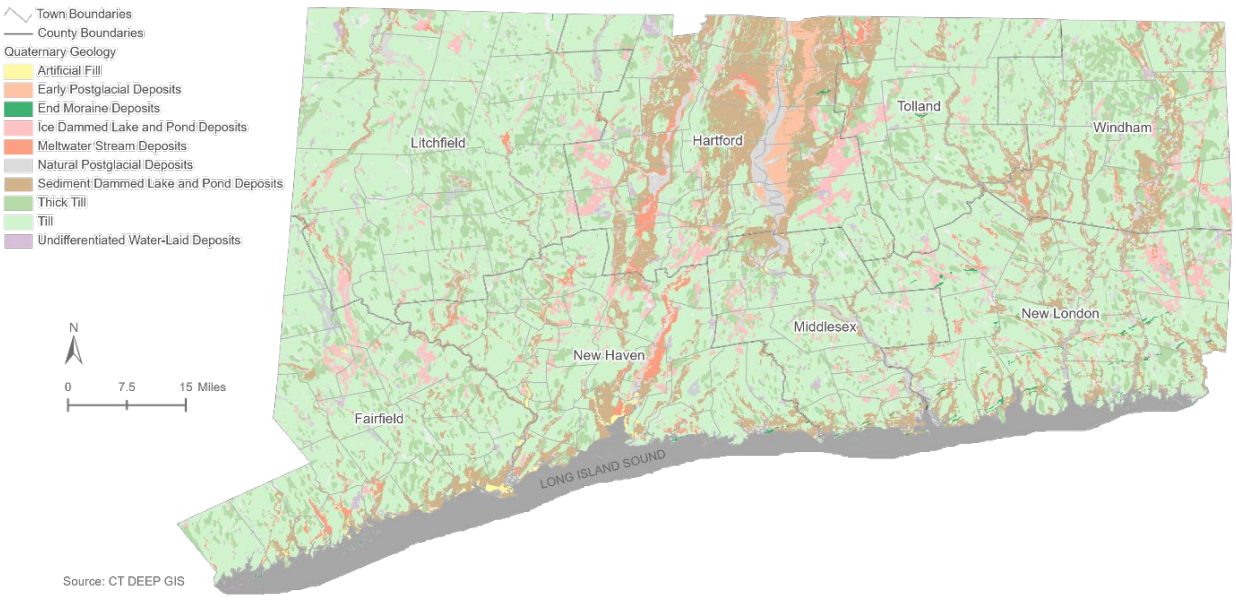


Figure 147. Map of quaternary geology in Connecticut

The current accepted theory to explain the occurrence of earthquakes in the Northeast is that ancient zones of weakness are being reactivated due to present day stress. The last major episode of geologic activity to affect New England bedrock occurred during the Mesozoic Era, approximately 100 million years ago.[219] The remains of Mesozoic rifting can be found in a series of ancient continental rift zones in the Northeast, including the Hartford rift basin (located in central Connecticut and central Massachusetts), and the Newark rift basin (located in the greater New York area).[220] Figure 148 is the Connecticut seismic hazard map for 2% in 50-years peak ground acceleration (PGA). PGA is expressed as a percent of gravitational acceleration (g = 9.81 m/s2) and is a measure of the maximum force experienced at the surface of the ground during an earthquake. Figure 148 shows PGA values having a 2% probability of being exceeded in 50 years. This map shows that most of Connecticut, aside from some coastal areas in the south, has a 2% chance in 50 years of an event having greater than .08-.16g of acceleration. Events within this range of PGA would have moderate to strong perceived shaking, but relatively light damage. Events exceeding this range would be more severe.

[219] Boston College Weston Observatory. Why Does the Earth Quake in New England. http://aki.bc.edu/why_quakes.html
[220] Boston College Weston Observatory. Why Does the Earth Quake in New England. http://aki.bc.edu/why_quakes.html

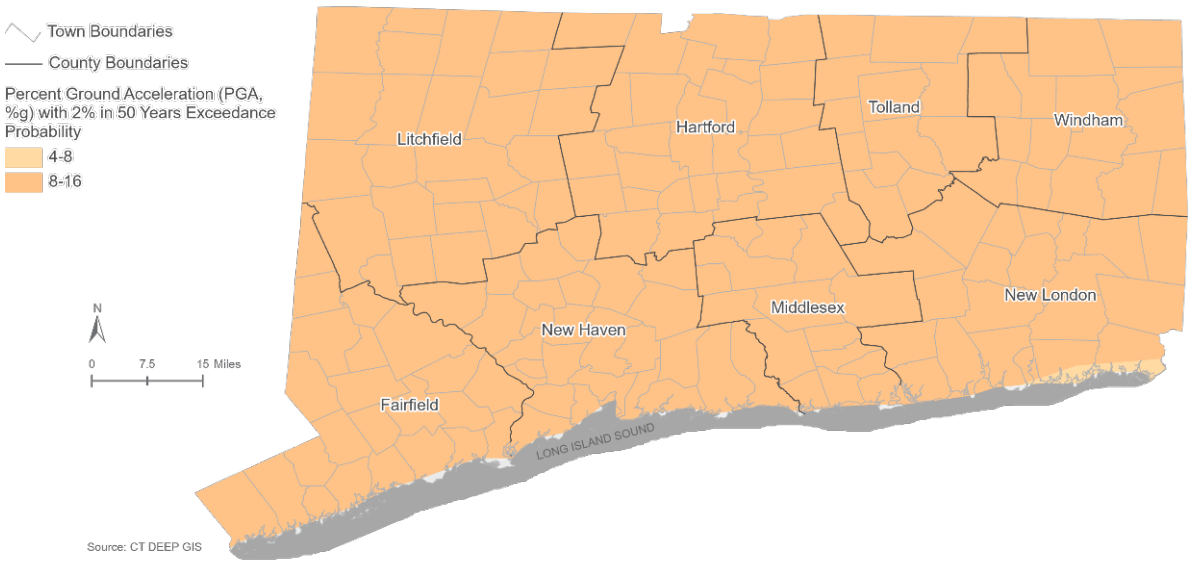


Figure 148. Connecticut seismic hazard map (USGS)

Areas of fine sand and clay (glacial lake bottom deposits) are particularly vulnerable to earthquake events and have been classified as having the highest risk for seismic wave amplification (NEHRP). The distribution of these glacial materials has been mapped on the Surficial Materials Map of Connecticut and The Quaternary Geologic Map of Connecticut and The Long Island Sound Basin.[221,222] New England State Geologists have promoted the use of surficial geology in Hazus loss estimations. Based on the distribution of surficial materials, a pilot NEHRP seismic risk classification has been prepared for Hartford County. The pilot risk classification found that although the areas of highest seismic event frequency are to the southwest and southeast, the Hartford County area is largely underlain by glacial lake clays and fine sands that have a high liquefaction potential.[223] Targeted geophysical surveys of these areas and similar areas statewide have the potential to better define the seismic risk and potential for ground failure. Figure 149 below depicts Connecticut's surficial materials in the landscape.

Areas of steep slopes can collapse during an earthquake, creating landslides. Seismic activity can also break utility lines, such as water mains, electric and telephone lines, and storm water management systems. Dam failures also pose a significant threat to developed areas during an earthquake. Structures in these areas are at increased risk from earthquakes due to amplification of seismic energy and/or collapse.

[221] USGS. Surficial Materials Map of Connecticut. https://pubs.er.usgs.gov/publication/70046712
[222] USGS. Quaternary Geologic Map of Connecticut and Long Island Sound Basin. Geological Survey (U.S.). 2005. https://pubs.usgs.gov/sim/2005/2784/
[223] Laurence R. Becker, Steven P. Patriarco, Robert G. Marvinney, Margaret A. Thomas, Stephen B. Mabee, and Edward S. Fratto, Improving seismic hazard assessment in New England through the use of surficial geologic maps and expert analysis Geological Society of America Special Papers, 2013, 493, p. 221-242, doi:10.1130/2012.2493(11)

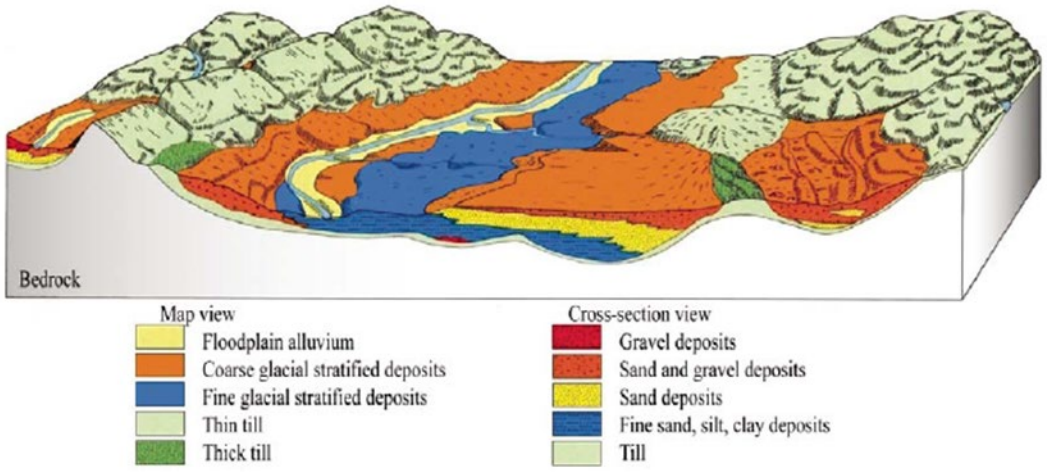


Figure 149. Block diagram depicting Connecticut surficial materials on the landscape.

The best mitigation for future development in areas of sandy or filled material may be application of the most stringent building codes, or possibly the prohibition of certain types of new construction.

Figure 150 shows recent seismic activity of the Northeast between 1975 and 2016. Most earthquakes have a calculated magnitude of less than 3.0. This map also shows clusters of earthquakes occurring around the Portland-Haddam-East Haddam area, as well as the New Haven –Greenwich area of Connecticut.

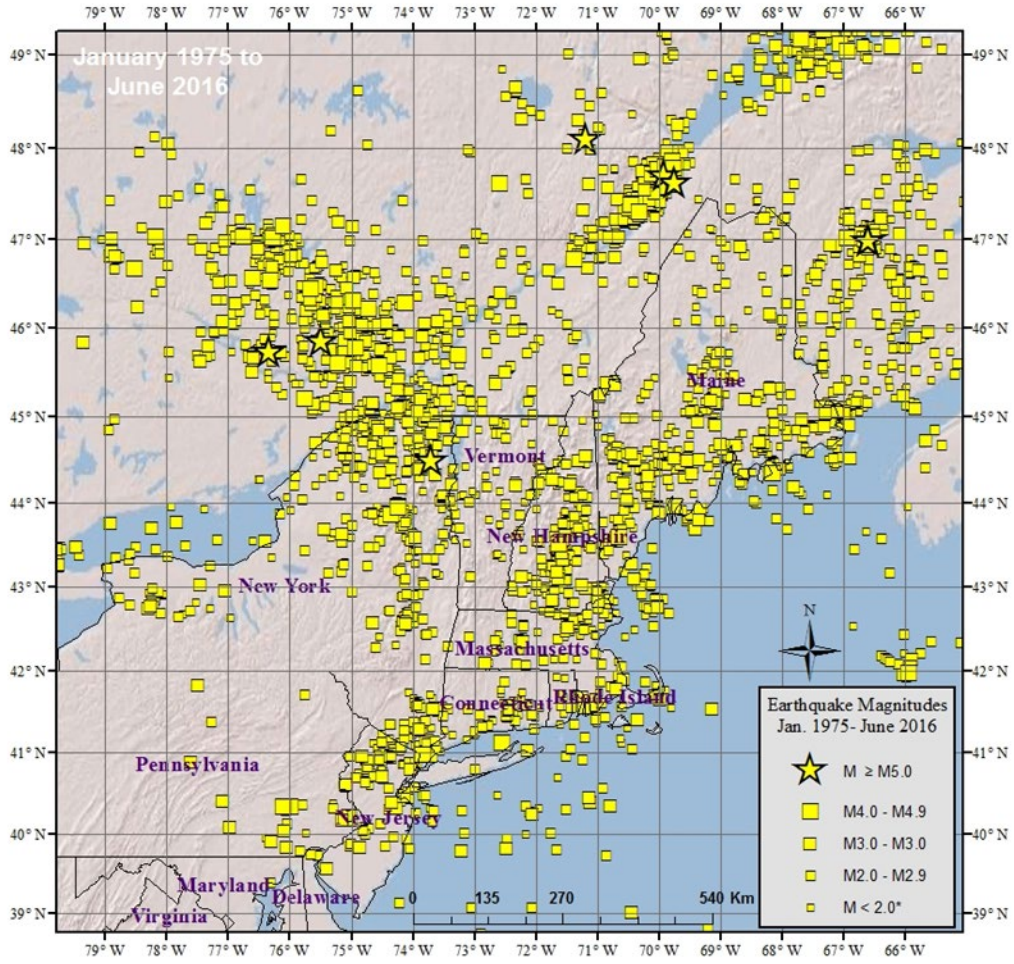


Figure 150. Northeast seismicity 1975-2016 (Weston Observatory)

There are four seismic stations currently operating in Connecticut. Two stations are operated and maintained by the Weston Observatory and are part of the observatory's New England seismic network. Two stations are operated and maintained by the Lamont-Doherty Cooperative Seismographic Network.[224]

4.12.2 Intensity

The magnitude of an earthquake is a measure of the energy released as seismic waves from the focus of an earthquake. Magnitude is measured by a device known as a seismograph. Each earthquake has a magnitude assigned to it. The magnitudes of earthquakes which occur east of the Rocky Mountains and into Canada are often determined by using local or regional magnitude scales. Many earthquakes in Northeast earthquake catalogs calculate magnitude for such events based on the Coda-length magnitude scale or the Nuttli magnitude scale and use the Richter Scale as a default

[224] USGS. Quaternary Geologic Map of Connecticut and Long Island Sound Basin. Geological Survey (U.S.). 2005. https://pubs.usgs.gov/sim/2005/2784/

magnitude scale. The Richter Scale is used to express the magnitude of an earthquake in terms of energy released, not in terms of its impact. An earthquake in a densely populated area which results in many deaths and considerable damage may have the same magnitude as a shock in a remote area that has no direct impact. Large-magnitude earthquakes that occur beneath the oceans may not even be felt by humans.

Peak Ground Acceleration (PGA) is another common measure of earthquake shaking along the earth's surface. PGA expresses acceleration along the earth's surface as a percentage of g, the acceleration due to gravity (32.2 ft. /s2). PGA varies significantly depending on the ground type and the geology of an area.

The effect of an earthquake on the Earth's surface is called the intensity. Once a magnitude for an earthquake event has been calculated using one of several scientifically accepted formulas, it can then be connected to an intensity measurement. Intensity scales consist of a series of certain key responses such as people awakening, movement of furniture, damage to chimneys, and, finally, total destruction. Although numerous intensity scales have been developed over the last several hundred years to evaluate the effects of earthquakes, the one currently used in the United States is the Modified Mercalli Intensity (MMI) Scale. Further information on the MMI Scale is detailed below.

Surficial earth materials behave differently in response to seismic activity. Some surface materials can create an effect called amplification, or an increase in amplitude as seismic waves pass from harder bedrock materials into softer sediments. In addition, artificial fill material has the potential for liquefaction. Liquefaction is a phenomenon in which the strength and stiffness of a soil are reduced by earthquake shaking or other rapid loading. It occurs in soils at or near saturation, especially in finer textured soils. When liquefaction occurs, the strength of the soil decreases and the ability of soil to support building foundations and bridges is reduced. Increased shaking and liquefaction can lead to greater damage to buildings and other structures, and a greater loss of life.

The Modified Mercalli Intensity (MMI) Scale was developed in 1931 by the American seismologists Harry Wood and Frank Neumann. This scale, composed of 12 increasing levels of intensity that range from imperceptible shaking to catastrophic destruction, is designated by Roman numerals. It does not have a mathematical basis; instead, it is an arbitrary ranking based on observed effects. The MMI value assigned to a specific site after an earthquake has a more meaningful measure of severity to the nonscientist than the magnitude because intensity refers to the effects experienced at a particular place.

The lower numbers of the intensity scale deal with the felt effects of an earthquake by humans. The higher numbers of the scale are based on observed structural damage. Structural engineers contribute information for assigning intensity values of VIII or above.

Table 181 shows the connection between computed magnitudes and related intensities of earthquake events.

Table 181. Earthquake Magnitude/Mercalli Intensity comparison

Richter Magnitude Scale	Typical Maximum Modified Mercalli Intensity
1.0 – 3.0	I
3.0 – 3.9	II - III
4.0 – 4.9	IV - V
5.0 – 5.9	VI - VII
6.0 – 6.9	VII - IX
7.0 or higher	VIII or higher

Table 182 provides an abbreviated description of each intensity level of the Modified Mercalli Intensity Scale.

Table 182. Modified Mercalli Intensity scale

Intensity Level	Description of Effects on People, Structures, or Natural Environment
I	Not felt except by a very few under especially favorable conditions.
II	Felt only by a few persons at rest, especially on upper floors of buildings.
III	Felt quite noticeably by people indoors, especially on upper floors of buildings. Many people do not recognize it as an earthquake. Standing motor cars may rock slightly. Vibrations similar to the passing of a truck. Duration estimated.
IV	Felt indoors by many, outdoors by few during the day. At night, some awakened. Dishes, windows, doors disturbed; walls make cracking sound. Sensation like heavy truck striking building. Standing motor cars rocked noticeably.
V	Felt by nearly everyone; many awakened. Some dishes and windows broken. Unstable objects overturned. Pendulum clocks may stop.
VI	Felt by all, many frightened. Some heavy furniture moved; a few instances of fallen plaster. Damage slight.
VII	Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable damage in poorly built or badly designed structures; some chimneys broken.
VIII	Damage slight in specially designed structures; considerable damage in ordinary substantial buildings with partial collapse. Damage is great in poorly built structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned.
IX	Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb. Damage is great in substantial buildings, with partial collapse. Buildings shifted off foundations.
X	Some well-built wooden structures were destroyed; most masonry and frame structures destroyed with foundations. Rails bent.

Intensity Level	Description of Effects on People, Structures, or Natural Environment
XI	Few, if any (masonry) structures remain standing. Bridges destroyed. Rails bent greatly.
XII	Damage total. Lines of sight and level are distorted. Objects thrown into the air.

The further the distance from an earthquake epicenter, the smaller the impact and the more warning time available. Unfortunately, it is unlikely that adequate warning time will be given. For very large, distant earthquakes there may be 60 seconds of warning time possible. This small warning time is particularly impactful in urban areas, where it takes more than 60 seconds to descend from a many-storied building. For a warning to be effective, it must arrive before serious shock waves occur, which is rarely possible with current technology.

Probabilistic ground motion maps are typically used to assess the magnitude and frequency of seismic events. These maps measure the probability of exceeding a certain ground motion, expressed as percent peak ground acceleration (%PGA), over a specified period of years. The severity of earthquakes is site specific and is influenced by proximity to the earthquake epicenter and soil type, among other factors. Average PGA, for the 100-year return period, has been used in the hazard ranking as the geographic extent parameter. The average PGA values for the state would result in no felt shaking or potential damage.

4.12.3 Impacts

Earthquakes can cause damage directly to buildings, infrastructure, and the landscape. Infrastructure systems that can be particularly affected are communication, water, and electricity. In addition, there is a significant threat of injury and loss of life as a result of collapsing structures and falling debris.

Strong earthquakes often trigger secondary effects which have a high loss potential as well and are usually the prime factor for determining whether an earthquake is categorized as a catastrophe. Secondary effects can include landslides (in hilly or mountainous areas), amplification, seismic sea waves (tsunamis), surface rupture, subsidence, fires (from ruptured gas lines and downed utility lines), and liquefaction of soil.

Although other natural hazards account for greater annual loss in the United States, earthquakes pose the largest risk in terms of sudden loss of life and property. Risk factors that impact the severity and extent of damage include:

- **Amount of seismic energy released**: The greater the vibrational energy, the greater the chance for destruction.
- **Duration of ground movement**: This is one of the most important parameters of ground motion for causing damage.

- **Depth of the focus, or hypocenter**: A shallower focus (the point of an earthquake's origin within the earth), typically results in a greater potential for destructive seismic waves reaching the earth's surface. For example, stronger magnitude events with a greater focus depth may produce only moderate movement at ground level.
- **Distance from epicenter**: The potential for damage tends to be greatest near the epicenter (the point on the ground directly above the focus) and decreases with distance in all directions.
- **Geologic setting**: A wide range of foundation materials exhibits a similarly wide range of responses to seismic vibrations. For example, in soft unconsolidated material, earthquake vibrations last longer and develop greater amplitudes, which produces more ground movement than in areas underlain by hard bedrock. Typically, areas having active faults are at greater risk.
- **Population and building density**: In general, risk increases as population and building density increase.
- **Types of buildings**: Wooden frame structures tend to respond to earthquakes better than more rigid brick or masonry buildings. Taller buildings are more vulnerable than one- or two-story buildings when located on soft, unconsolidated sediments, but taller buildings tend to be more stable when on a hard bedrock foundation.
- **Time of day**: Experience shows there are fewer casualties if an earthquake occurs in late evening or early morning because most people are at home and awake and thus in a better position to respond properly.

Each of these factors interact with one another and contribute to the severity of the earthquake.



- Earthquakes can cause severe damage to buildings and building foundations.
- 513 critical facilities across all types are located in areas likely to experience >8%g PGA.



- Ground motion caused by earthquakes can damage roadways and critical infrastructure such as bridges and tunnels.

- Earthquakes can have environmental impacts through the disruption of hazardous materials storage, and the secondary effects of earthquakes such as ignitions from damaged electrical infrastructure can cause additional damages.
- 44 of the critical facilities in areas likely to experience >8%g PGA are designated for hazardous materials, including 28 solid waste landfill facilities and 16 wastewater treatment plants.

- 74 of the critical facilities in areas likely to experience >8%g PGA are designated as Energy lifelines, including 30 power plants. Failure of these plants would put vulnerable populations such as the elderly and hospitalized at risk.

- Depending on the severity of the event, earthquakes can have vast economic impacts from both direct and indirect damages.

4.12.4 Previous Occurrences and Losses

The USGS National Earthquake Information Center maintains a national database of significant earthquake epicenters. USGS defines significant earthquakes as those that caused deaths, property damage, or geological effects, or that were experienced by populations in the epicentral area.[225] The Weston Observatory maintains the history of earthquakes in Northeast. Past earthquakes which occurred in and near Connecticut are presented in Figure 151. There has been a total of 59 reported earthquake epicenters in Connecticut since 1973. Notable earthquake events include:

- The largest earthquake in Connecticut occurred in East Haddam on May 16, 1791. It was estimated to be a VII in intensity.[226] A description of the earthquake and the events that followed states: "It began at 8 o'clock p.m., with two very heavy shocks in quick succession. The first was the most powerful; the earth appeared to undergo very violent convulsions. The stone walls were thrown down, chimneys were toppled, doors, which were latched were thrown open, and a fissure in the ground of several rods in extent was afterwards discovered. Thirty lighter ones followed in a short time, and upwards of one hundred were counted in the course of the night."[227]

[225] USGS. 2013. http://www.nationalatlas.gov/mld/quksigx.html
[226] Note: Seismic recorders were not in use until the early 1900's and routine reporting of earthquake activity was not implemented until the 1930's for the Northeast region, hence intensity levels for early earthquakes (prior to 1900's) were based on expert determinations based on damage and activity reports.
[227] USGS. 2009. http://earthquake.usgs.gov/regional/states/connecticut/history.php

- The next moderate earthquake occurred in Hartford in April 1837. This was followed by three subsequent earthquake events in 1840 (a few miles southeast of Hartford), June 1858 (occurred at New Haven), and the June 1875 (which have an estimated intensity level of a V and was felt within a general 2,000 square mile area of Connecticut and Massachusetts).
- A noticeable earthquake occurred in Connecticut on March 11, 2008. It was a 2.0 magnitude with its epicenter three miles northwest of the center of Chester.
- A magnitude 5.0 earthquake struck at the Ontario-Quebec border region of Canada on June 23, 2010. This earthquake did not cause damage in Connecticut but was felt by residents in Hartford and New Haven Counties.
- A magnitude 3.9 earthquake occurred 117 miles southeast of Bridgeport, Connecticut on the morning of November 30, 2010. The quake did not cause damage in Connecticut but was felt by residents along Long Island Sound.
- On June 3, 2011, a 1.7 magnitude earthquake occurred near East Hartford about 3 miles below ground. It was minimal, as many residents believed the shaking to be from nearby road construction.[228]
- A magnitude 5.8 earthquake occurred 38 miles from Richmond, Virginia on August 23, 2011. The quake was felt from Georgia to Maine and reportedly as far west as Chicago. Many residents of Connecticut experienced the swaying and shaking of buildings and furniture during the earthquake although widespread damage was constrained to an area from central Virginia to southern Maryland. According to Cornell University, the August 23 quake was the largest event to occur in the east central United States since instrumental recordings have been available to seismologists.
- On September 8, 2012, a 2.1 magnitude, 4 km deep earthquake occurred near Stamford. Dozens of residents reported feeling the ground move, but no injuries were reported.
- A magnitude 3.3 earthquake occurred about three miles away from Plainfield, 6.5 km below ground on January 12, 2015. Reports differ on the intensity of the earthquake, with MMI values ranging from II to V.

[228] Hartford Courant. East Hartford Earthquake. 2011. http://articles.courant.com/2011-06-03/community/hc-east-hartford-earthquake-0604-20110603_1_water-heater-gas-line-road-construction

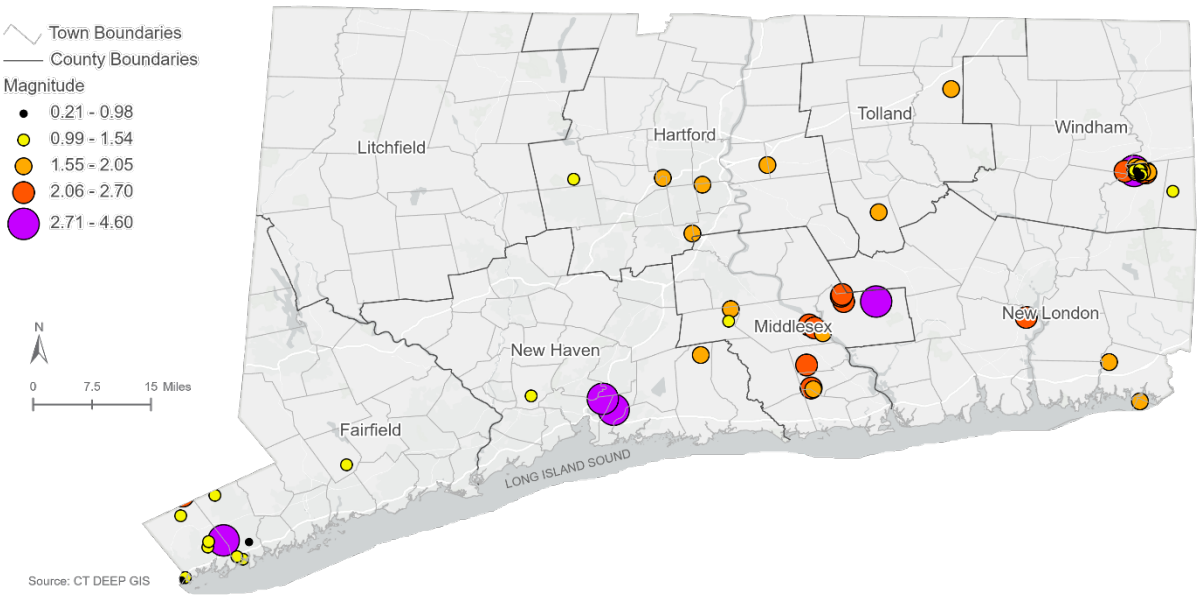


Figure 151. Earthquake epicenters in Connecticut (1976-2023)

There have been no federally declared disasters related to earthquakes since the 2019 plan update.

4.12.5 Future Losses

Earthquake events do occur in the state, though of much less intensity than elsewhere in the region or on the west coast. Additionally, earthquake events are more likely to be felt as a result of an earthquake that occurs in the surrounding region rather than originating within Connecticut. Based on historical information, it is reasonable to assume that Connecticut has a medium-low probability of future earthquake events. Between 1678 and 2016, there were 115 felt earthquakes in Connecticut, or one for every three years on average.[229]

Connecticut is categorized as having a low or moderate risk for an earthquake > 3.5 occurring in the future and a moderate risk of an earthquake < 3.0 occurring in the future. USGS currently ranks Connecticut as 43 out of 50 states for earthquake activity (based on geologic and historical data) and notes that no earthquake with a magnitude of > 3.5 has occurred in Connecticut within at least the last 30 years.[230] It is impossible to predict when, where, and what magnitude would be for a future earthquake, especially in New England, due to this geographic area being located in an intraplate area of the United States.[231] However, future probabilities of potential events can be developed given geologic information and historical information on past events for a particular area.

[229] NESEC. Earthquakes. https://nesec.org/connecticut-earthquakes/
[230] USGS
[231] Boston College Weston Observatory. Why Does the Earth Quake in New England. http://aki.bc.edu/why_quakes.html

The USGS earthquake hazard map in Figure 148 indicates that there is a low probability of an earthquake occurring within Connecticut that would cause substantial damage within a fifty-year period. There is roughly a 2% chance each year that an earthquake will occur in Connecticut that would exceed 8-16%g.

A series of probability maps were created using the USGS's interactive web-based mapping tools for East Haddam, Portland, and Haddam, and the New Haven to Greenwich area of the state. The maps were created to help analyze the probability of a magnitude > 5.0 (shown as a magnitude > 4.75), and a magnitude > 6.0 earthquake occurring within 50-, 100-, 250- and 350-year period. Due to the relative historic infrequency of an earthquake of the selected magnitudes occurring within the state, USGS encourages the use of a longer period to provide a truer projection of probabilities.

Table 183 and Table 184 present the projected percentages of such earthquake magnitudes occurring within Connecticut. Figure 152 shows a probability map developed for Haddam-East Haddam-Portland and New Haven-Greenwich areas of Connecticut. The chance (percent) of a minimum 5.0 earthquake occurring within a 350-year period (maximum mapped for this plan) is relatively moderate for the New Haven-Greenwich area of Connecticut. This may be a result of the geographic proximity of this area to a Mesozoic rift basin.

Table 183. Probability of an earthquake of specific magnitude occurring in the Haddam-East-Haddam-Portland area of Connecticut

Timeframe (years)	Equal or Greater Than a 5.0 Quake	Equal or Greater Than a 6.0
50	3.00%	0.30%
100	8.00%	0.50%
250	20.00%	1.50%
350	20.00%	2.00%

Table 184. Probability of an earthquake of specific magnitude occurring in the New Haven-Greenwich area of Connecticut

Timeframe (Years)	Greenwich		Stamford		Bridgeport		New Haven	
	> 5.0	> 6.0	> 5.0	> 6.0	> 5.0	> 6.0	> 5.0	> 6.0
50	7.50%	0.70%	8.00%	0.70%	5.00%	0.50%	4.00%	0.30%
100	18.00%	1.50%	12.00%	1.00%	10.00%	1.00%	8.00%	0.50%
250	30.00%	3.50%	30.00%	3.50%	20.00%	2.50%	15.00%	1.50%
350	40.00%	5.00%	40.00%	4.50%	30.00%	3.00%	20.00%	2.50%

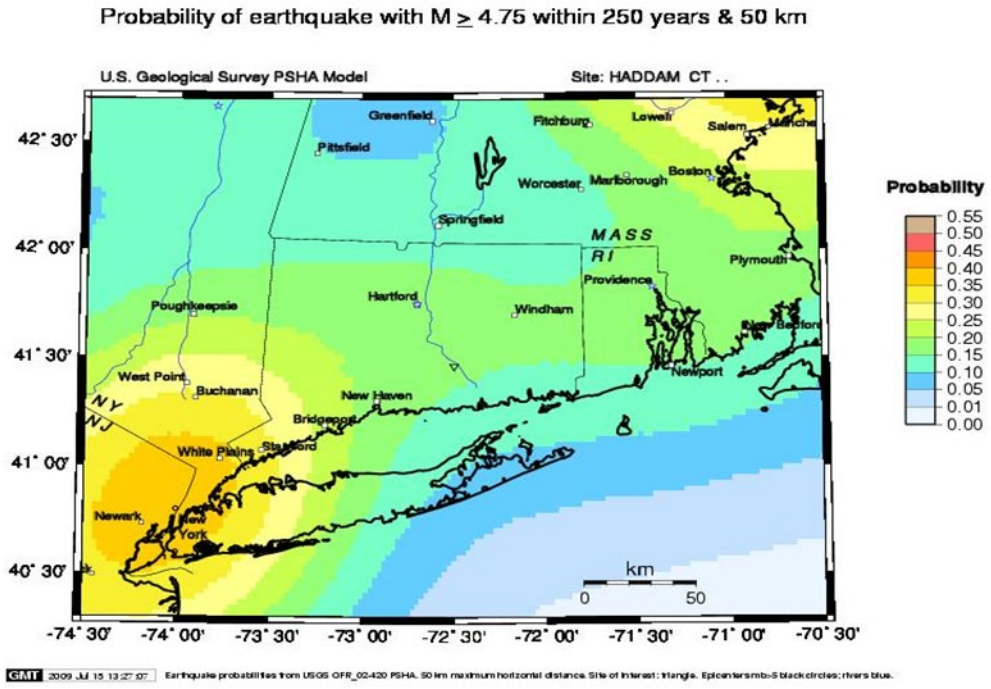


Figure 152. A probability map developed for Haddam-East Haddam-Portland and New Haven-Greenwich areas of Connecticut.

Based on the historic record of earthquakes and the information collected for this Plan, one can make the following conclusion with regards to risk of a future earthquake event occurring in Connecticut:

- There are geographic areas within the state that have had seismic activity in the past,
- Although the risk is relatively very low, the long-term probability does exist of an earthquake with a magnitude > 5.0 to occur within the state, and
- Although the probability of an earthquake with a magnitude > 5.0 is extremely small (under 1%), based on Connecticut's historical record of earthquake events, it is likely that one or more earthquake(s) with a magnitude < 3.0 will occur within the next hundred years.

4.12.6 Climate Change Impacts

Evidence that climate change has an impact on the occurrence or magnitude of earthquakes is currently inconclusive. Some recent research indicates that geologic events such as earthquakes are sensitive to changes on the earth's surface, such as shifts in water or atmospheric pressure. Overall, there is limited knowledge of the connection between climate change and earthquake probability, as described in Table 5. As research emerges

on the link between climate and seismic activity, earthquake probability in the State should be re-evaluated.

Table 185. Climate change impacts on earthquakes

Impact	Projected Change
Location	No conclusive change in location of seismic activity, as most seismic activity occurs along fault lines.
Intensity	No conclusive change in intensity of earthquakes.
Frequency	No conclusive change in frequency of earthquakes.
Duration	No conclusive change in duration of earthquakes.
Model Confidence	Low confidence

4.12.7 Vulnerability Assessment

Earthquakes are low probability, high-consequence events. Although earthquakes may occur infrequently, they can have devastating impacts. Ground shaking can lead to the collapse of buildings and bridges; disrupt gas, lifelines, electric, and phone service. Deaths, injuries, and extensive property damage are possible vulnerabilities from this hazard. Some secondary hazards caused by earthquakes may include fire, hazardous material release, landslides, flash flooding, avalanches, tsunamis, and dam failure. Moderate and even very large earthquakes are inevitable, although very infrequent, in areas of normally low seismic activity. Consequently, buildings in these regions are seldom designed to deal with an earthquake threat; therefore, they are extremely vulnerable.

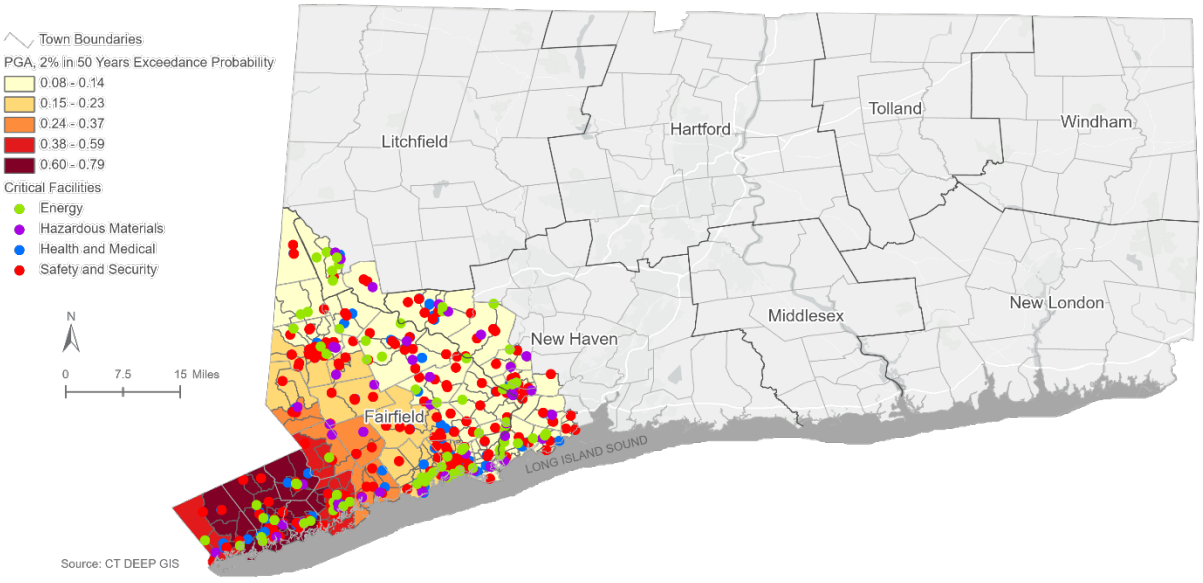


Figure 153. Critical facilities exposed to earthquake hazard of >.08g PGA based on 2% in 50 years exceedance probability.

Hazus probabilistic analysis was used to determine which areas are likely to experience >.08%g PGA in upcoming earthquake events. Analysis showed that these areas are mostly in southwest Connecticut, in Fairfield County west of New Haven and Seymour, and south of New Milford to the state boundary (Figure 153). There are 513 critical facilities in the area identified. These critical facilities are identified in Table 186, broken out by community lifeline and facility type.

Table 186. Critical facilities exposed to earthquake hazard of >.08g PGA based on 2% in 50 years exceedance probability.

Community Lifeline	Facility Type	Count
Health and Medical	Emergency Medical Service (EMS) Stations	129
Health and Medical	Healthcare Facilities	9
Health and Medical	Hospitals	10
Health and Medical	Public Health Departments	24
Health and Medical	Urgent Care Facilities	9
Health and Medical	Veterans' Health Administration Medical Facilities	2
Energy	Power Plants	30
Energy	Gas Stations with Generators	44
Hazardous Materials	EPA FRS Wastewater Treatment Plants	16
Hazardous Materials	Solid Waste Landfill Facilities	28
Safety and Security	Fire Stations	139
Safety and Security	Local EOC	29
Safety and Security	Local Law Enforcement	39
Safety and Security	Prisons	5

Most property damage and earthquake-related injuries and deaths are caused by the failure and collapse of structures due to ground shaking. The level of damage depends upon the amplitude and duration of the shaking, which are directly related to the earthquake size, distance from the fault, site, and regional geology. Other damaging earthquake effects include landslides, the down-slope movement of soil and rock (mountain regions and along hillsides), and liquefaction, in which ground soil loses shear strength and the ability to support foundation loads. In the case of liquefaction, anything relying on the substrata for support can shift, tilt, rupture, or collapse.

An earthquake risk assessment is difficult because it is challenging to monetize the potential damages accurately. FEMA's Hazus software can be used for estimating potential losses to natural disasters. The Hazus earthquake model was utilized to estimate damages and losses to buildings, lifelines, and essential facilities from deterministic (scenario-based) and probabilistic earthquakes. The model leverages many of the methodologies for

estimating damage and loss from the devastating effects of earthquakes. The update to this section uses 2010 census-based inventory data that comes standard and packaged with the software by state.

Hazus was utilized to perform a variety of earthquake scenarios for the current Plan Update; to include probabilistic scenarios for East Haddam, Haddam, Portland, and Stamford. Noting the unpredictability of earthquakes, these scenarios are in accordance with the recommended scenarios of the State of CT Geologic Survey and offer perspective of earthquake scenarios that the state could potentially experience. The probabilistic scenario is a multi-frequency annual chance scenario that takes into account a range of magnitudes across the entire state and no single epicenter is defined. In contrast, the various scenarios named by specific cities, demonstrate a specific shaking-scenario at a specific epicenter.

The two geographic areas most vulnerable to potential earthquakes in Connecticut are New Haven-Greenwich and Hartford-East Haddam-Haddam-Portland. Most at risk are people who work or live in unreinforced masonry buildings built on filled land or unstable soil.[232] Other population groups who may be more vulnerable to the impacts from a potential earthquake with a magnitude > 5.0 in both geographic areas include the elderly, the very young (under 18 years of age), people with various special needs.

For this plan update, Hazus simulations were re-run with 2010 inventory updates for the following earthquake scenarios:

- Magnitude 5.7, epicenter located in Portland (largest historic event, information within Hazus database),
- Magnitude 5.7, epicenter located in Haddam (largest historic event, information within Hazus database),
- Magnitude 6.4, epicenter located in East Haddam (largest historic event, information within Hazus database), and
- Magnitude 5.7, epicenter located in Stamford (magnitude scenario based on probabilities calculated by USGS in their probability maps).

The magnitudes chosen for these simulations and this plan are the maximum plausible magnitude for a potential earthquake in the scenario areas. The following should be noted for the review and use of these scenarios:

- No historic earthquake of a magnitude 5.0 or greater has been recorded for Fairfield County, however USGS potential probabilities for such an event are possible when calculated for a long time period (250 to 350 years); and

[232] NESEC. www.nesc.org/hazards/earthquakes.cfm.

- The last large earthquake with a magnitude of 6.0 occurred around the Portland-Haddam-East Haddam area over 200 years ago. Seismographs were not in use at that time however, an expert determination was made based on damage reports and geographic extent to which the quaking was felt.

The results for each Hazus earthquake simulation are located in Appendix 3. Each Hazus simulation included the entire state of Connecticut for its analysis region. Therefore, it should be noted that the damage and injury estimations are based on state-wide building and infrastructure inventories and Census 2010 population per census tract. These Hazus scenarios were run for planning purposes of this plan to highlight potential areas that may warrant further analysis either at the state, regional or local level. It is very difficult to predict what the actual impacts would be to the State of Connecticut from these earthquake scenarios. The range of potential impacts for these scenarios is wide and extends from minor impact to the maximum potential impacts as presented as a result of the Hazus analyses.

Table 5 presents the total estimated losses that may result from the earthquake scenarios created for this plan, as estimated by FEMA's Hazus software. Though the projected economic impacts resulting from these simulations may appear low, the results do indicate that attention does need to be given to potential economic impacts from a magnitude > 5.7, since the earthquake epicenters would be located near highly urbanized areas of the state. Thus, economic losses should be anticipated from the physical impacts of an earthquake > 5.7.

4.12.7.1 State Vulnerability

Table 187 shows the estimated total losses by census tract for all four earthquake scenarios: East Haddam, Haddam, Portland, and Stamford. The East Haddam scenario shown in Figure 154, shows the highest estimated losses (between $1,773,469,000 and $793,331,000) occurring in the towns of East Haddam, East Hampton, Middletown, and Colchester. The Haddam scenario shows Haddam, East Haddam, Middlesex, East Hampton and Middletown with the highest estimated losses (between $608,528,000 and $407,835,000). Figure 155 depicts the Stamford scenario and shows the highest estimated losses (between $1,288,135,000 and $753,802,000) occurring in the towns of Greenwich, Stamford, New Canaan, and Fairfield. The Portland scenario shows the towns of Middletown and Glastonbury with the highest estimated losses (between $849,987,000 and $135,805,000).

Table 187. Hazus estimated direct losses of earthquake scenario events (shown in thousands of dollars and 2010 Census).

Epicenter Location	County	Estimated Capital Losses	Estimated Income Losses
Stamford	Fairfield	$39,475,400,000	$6,972,309,200
Haddam	Middlesex	$ 21,243,210,000	$ 4,508,244,000

Epicenter Location	County	Estimated Capital Losses	Estimated Income Losses
Portland	Middlesex	$ 42,039,440,000	$ 8,553,999,000
East Haddam	Middlesex	$ 67,503,130,000	$ 14,305,925,700

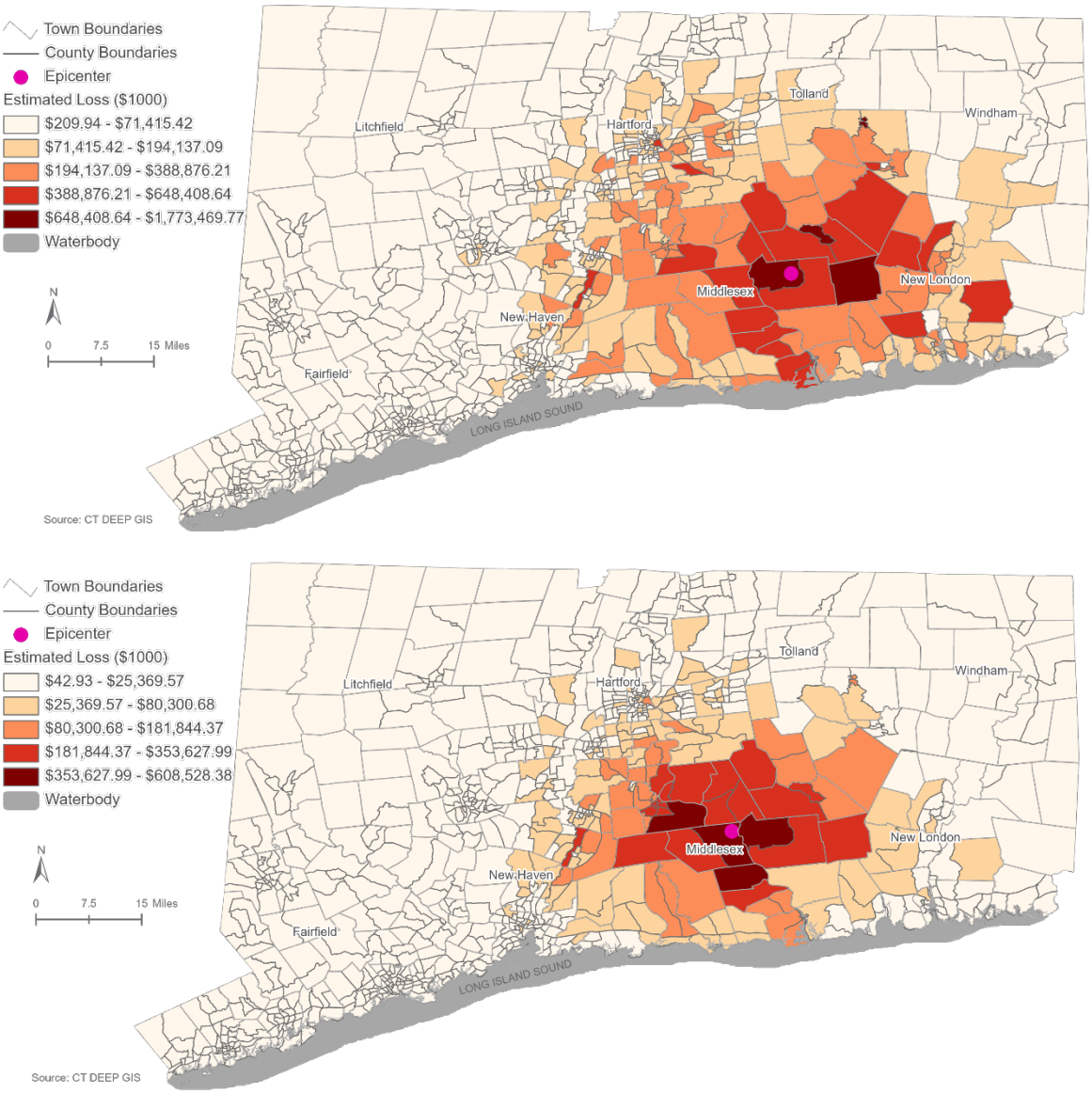


Figure 154. Earthquake scenario estimated total losses for East Haddam (top) and Haddam (bottom).

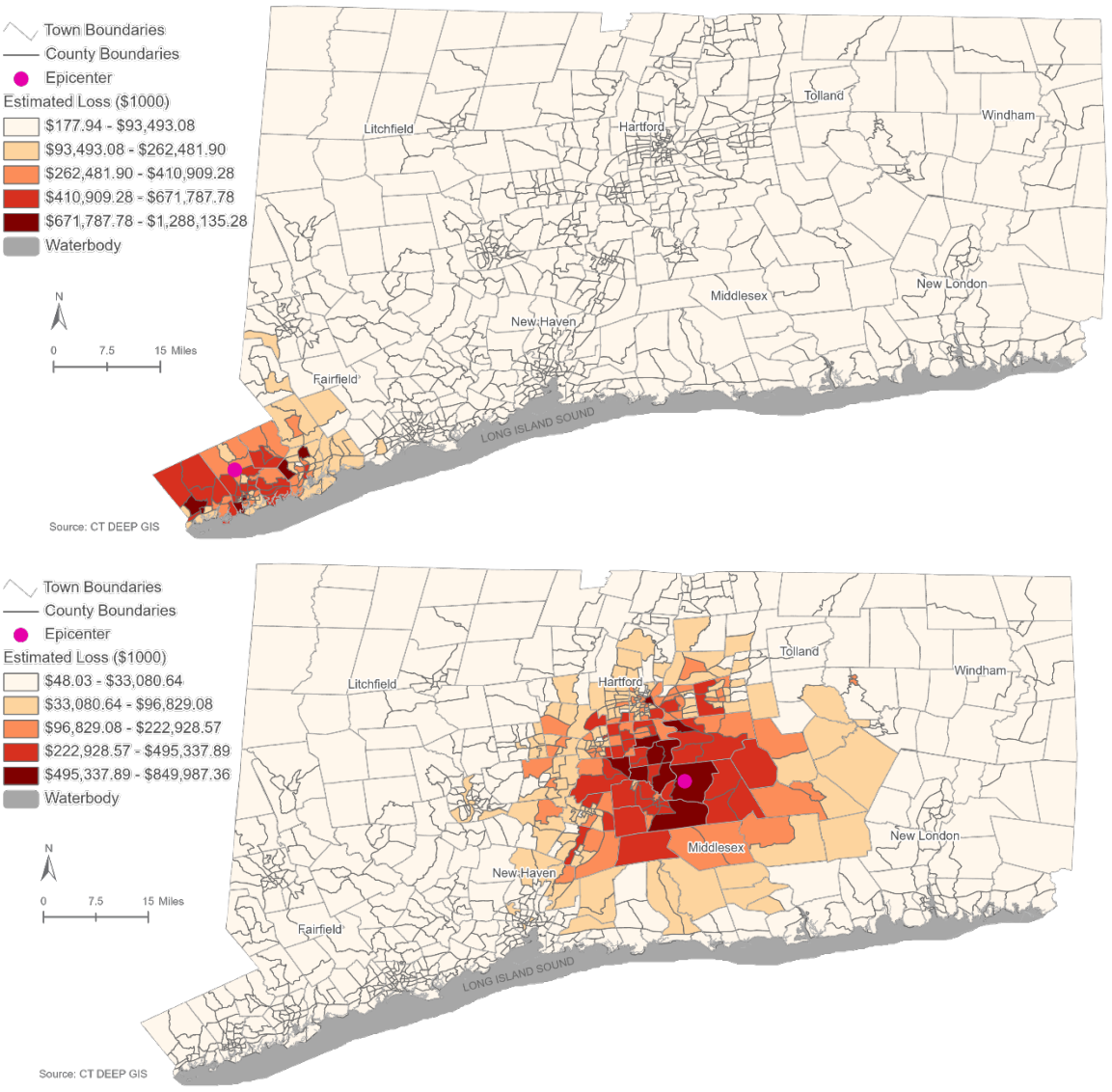


Figure 155. Earthquake scenario estimated total losses for Staford (top) and Portland (bottom).

Table 188 shows the projected estimated building damage from the four earthquake scenarios. The estimated numbers in this table are based on the total building inventory for the state. A significant percentage of Commercial buildings (41-47%) were estimated to sustain “Complete” damages based on these simulations. Though residential structures comprise the majority of buildings represented in the simulations, 75-79% of single-family homes were simulated as having no damages. Other building occupancy types include agriculture, commercial, education, government, industry, and religion. Though smaller in total number of buildings, these other occupancy types are vital to communities and impacts to these structures will be felt by a wide group of people within the immediate location and beyond. Detailed information on damage classifications by building occupancy

type can be found in Table 3 of each Hazus global summary report. These summary reports are included in Appendix 3.

Table 188. Total number of buildings damaged by expected degree of damage.

Expected Damage	East Haddam (magnitude 6.40)	Haddam (magnitude 5.70)	Portland (magnitude 5.70)	Stamford (magnitude 5.7)
None	814,722	983,329	932,185	1,003,825
Slight	192,860	109,127	130,035	80,854
Moderate	94,663	43,586	60,462	40,926
Extensive	32,332	10,795	18,899	14,353
Complete	15,991	3,721	8,987	10,609

4.12.7.2 Councils of Government Vulnerability

Connecticut's Council of Governments (COG) divides the state into 9 distinct regions. Figure 11 shows the earthquake epicenters and COG boundaries in Connecticut. Based on the Hazus probabilistic analysis, Lower Connecticut River Valley COG has three potential earthquake epicenters, and Western Connecticut COG has one potential earthquake epicenter.

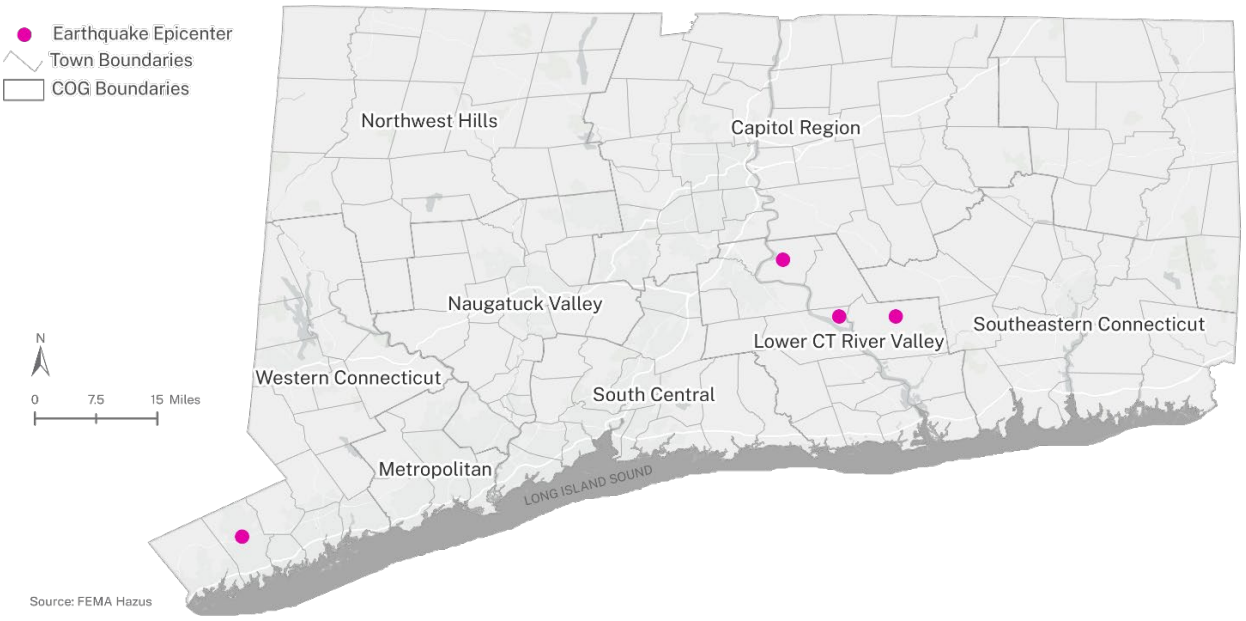


Figure 156. Earthquake epicenters and COG boundaries.

4.12.7.3 Local Vulnerability

Connecticut's geology, combined with the fact that earthquake events are more likely to be felt as a result of an earthquake that occurs in the surrounding region rather than originating within Connecticut, results in a relatively small difference in local impacts across the state. The New Haven-Greenwich and Hartford-East Haddam-Haddam-Portland areas are the most vulnerable to potential earthquakes in Connecticut. Additionally, Hartford and New Haven are large population centers, with a higher concentration of low income and underserved communities, making these areas particularly vulnerable to the impacts of an earthquake.

People requiring short-term shelter due to an earthquake in Connecticut is estimated to be between 5,800 to over 19,300 people, depending on the specific scenario. In addition, the estimated the number of displaced households ranged from roughly 11,900 to 38,400 in total. These estimates indicate that the potential does exist for individual assistance needs such as sufficient temporary shelter accommodations, and household relocation assistance (temporary or possibly permanent relocation).

Hazus also calculates physical injuries to people by number per injury level. The injury levels are as follows:

- **Severity Level 1** – injuries will require medical attention, but hospitalization is not needed.
- **Severity Level 2** – injuries will require hospitalization but are not considered life-threatening.

- **Severity Level 3** – injuries will require hospitalization and can become life threatening if not promptly treated.
- **Severity Level 4** – victims are killed by the earthquake.

Injury estimates were developed for three times of day (i.e., 2:00 a.m., 2:00 p.m., and 5:00 p.m.) representing various times of the day during which different community sectors are at their peak occupancy loads. The community sectors considered for the analysis were: commuting; educational; hotels; industrial; other residential; and single family. Most injuries projected for all scenarios fall within the Severity Level 1 or 2 categories.

Earthquakes can cause deadly fires if they cause damage to electrical and gas lines. An analysis of potential fire ignitions resulting from each earthquake scenario is shown in Table 189. Each earthquake scenario is projected to cause at least $35 million in value of structures burned. The Stamford earthquake, impacting Fairfield County is projected to have the highest value of burned structures and population displaced.

The projected estimates for direct injuries and fire are directly related to a magnitude > 5.7 earthquake and indicate an increased demand on state and local medical and emergency services (including police and fire) for injuries ranging from non-life-threatening to loss of life.

Table 189. Potential fire impact from each earthquake epicenter scenario.

Scenario	County	Ignitions	Population Displaced	Value of Burned Structures
East Haddam	Middlesex	8	613	$64,000,000
Haddam	Middlesex	6	449	$35,000,000
Portland	Middlesex	7	642	$53,000,000
Stamford	Fairfield	7	783	$84,000,000

Socially vulnerable populations throughout the State are also at increased risk to earthquake events. The populations most vulnerable to an earthquake event include people over the age of 65 and those living below the poverty level. These socially vulnerable populations are most susceptible, based on a number of factors, including their physical and financial ability to react or respond during a hazard, the location and construction quality of their housing, and the inability to be self-sustaining after an incident due to a limited ability to collect supplies.

4.12.7.4 Changes in Development

While Connecticut is predicted to experience a low population growth rate between 2015 and 2040, many smaller communities may begin to experience increased development pressures, especially when larger communities reach their build-out limits. This will increase the importance of hazard mitigation planning and natural resource management

on a local level to help mitigate and reduce potential losses such development activities can create.

From 2018 to 2022, over half of all of the building permits statewide were issued in Fairfield and Hartford Counties, and both of these counties accounted for nearly half of all the housing units in the State. If recent trends in development continue, these two counties will continually increase their vulnerability to earthquakes. To reduce vulnerability to earthquakes, future development should include preventative measures for structures to protect them from earthquakes. Preventative measures include using earthquake-resilient building materials, anchoring large appliances to walls using safety cables, securing utilities to the walls, and applying safety film to windows and glass doors. Strengthening local building codes will help mitigation damage from earthquakes.

Building Codes & Future Resilience Development

Connecticut has taken a proactive approach to reduce the risks to newly constructed buildings to enhance resilience as changes in development occur. Connecticut uses the International Code Council's International Building Code and International Residential Code as the base documents for the CT State Building Code and CT Residential Code. The ICC's revisions over the past several code cycles have enhanced the ability of structures to be more resilient to seismic events. Enhanced resiliency will ensure a quicker recovery and improve the life safety for occupants of newer constructed buildings.

4.12.8 Conclusion

Earthquake was ranked on the risk parameters as detailed in Table 24. To summarize the overall risk of earthquake for each county, each risk parameter score was multiplied by its impact weight and combined into a county composite ranking.

Table 190 shows the earthquake hazard ranking for each county. The high to low comparison does not mean that a low or medium-low hazard will not occur or will not have some impact on the community. However, it does provide an overview of what hazards may pose the greatest risk to each county given available data. This document should serve as a guide to help planners and officials in managing risk and prioritize mitigation actions.

Table 190. Earthquake hazard ranking by county.

	Fairfield	Hartford	Litchfield	Middlesex	New Haven	New London	Tolland	Windham
Hazard Concern	L	L	L	L	L	L	L	L

	Fairfield	Hartford	Litchfield	Middlesex	New Haven	New London	Tolland	Windham
Local Plan Rating	M-L	M-L	M-L	M-L	M-L	M-L	M-L	M-L
Geographic Extent	M-H	M-H	M	M	H	M-L	M-L	L
Population Density	H	M-H	M	M-L	M-H	M	M-L	L
Future Development	H	M-H	M-L	M-L	M-H	M	M	L
Facility Intersect	H	H	H	H	H	H	H	H
Future Events	M-L	M	L	M-H	M-L	L	M-L	H
Future Losses	H	M-H	M-L	M-L	M-H	M	M	L
Injury & Death	L	L	L	L	L	L	L	L
Social Sensitivity	M-H	H	M-L	M-L	M-H	M	L	M
Composite*	**M**	**M-L**	**L**	**M-L**	**M-L**	**L**	**L**	**L**

* Each parameter's weighted score was added together to create a composite rank for each county. A risk determination of high, medium-high, medium, medium-low, and low was then assigned based on percentiles. A summation of all the composite scores for all assessed hazards in each jurisdiction provides an overall risk rank per county. For more information, refer to Section 4.1.1.4.

4.13 Risk Summary

The hazards discussed in this chapter were ranked on the risk parameters as detailed in Table 24. To summarize the overall risk of natural hazards for each county, individual hazard-specific rankings were combined. For each hazard, the score for each parameter was multiplied by its impact weight. These rankings were then averaged across hazards to provide the composite statewide ranking, which also considers projected climate impacts.

Table 191 shows the overall hazard ranking for each county and statewide. The high to low comparison only ranks these hazards comparatively for Connecticut. It does not mean that a low or medium-low hazard will not occur or will not have some impact on the community. However, it does provide an overview of what hazards may pose the greatest risk to Connecticut given available data. This document should serve as a guide to help planners and officials in managing risk and prioritize mitigation actions.

Table 191. Composite County Hazard Rankings

	Fairfield	Hartford	Litchfield	Middlesex	New Haven	New London	Tolland	Windham	Statewide + Climate Weight
Tropical Cyclone	M-H	M-H	M-L	M	H	M-H	M-L	L	H
Extreme Heat	M-H	M-H	M-L	M-L	M-H	M	L	L	M-H
Flood	M-H	M-H	M	M-L	M	M	L	M-L	M-H
Drought	M-L	M-H	M	M-L	L	M	M-L	M-L	M
Thunderstorm	H	M-H	M	M-L	M-H	M-H	M-H	L	M
Extreme Cold	M-H	M-H	M	M-L	M-H	M	L	L	M
Tornado	M	H	M-H	M-L	M-H	L	M-L	L	M
Winter Weather	M-H	M-H	M	L	M	L	M-L	M-L	M-L
Dam Failure	M	M-L	M	M-L	M	M	M-L	L	M-L
Wildland Fire	M-L	L	M-L	L	M-L	M-L	L	M-L	M-L
Earthquake	M	M-L	L	M-L	M-L	L	L	L	M-L

4.13.1 Vulnerable State Assets

Hazards can affect the ability of state assets to perform critical functions. These functions can be characterized by the FEMA Community Lifelines framework. As shown in Table 192, potential flooding and wildland fire impacts to asset types and community lifelines are

provided as examples. Flooding and wildland fire are hazards that can be geographically represented by distinct boundaries, which can help identify assets that are particularly vulnerable to these hazards.

Table 192. Hazard impacts to state assets and community lifelines

Asset Type and Community Lifeline	Flood Impacts	Wildland FIre Impacts
Law Enforcement (Safety and Security)	Flooding can cause direct structural or vehicle damage to law enforcement assets. Severe flooding increases demands on first responders to support evacuations and road closures.	Wildland fires can cause direct damage to buildings and infrastructure through exposure to heat and flames. Wildland fire can further threaten the health and safety of communities and first responders, creating increased demands on law enforcement operations.
EMS (Health and Medical)	Flooding can cause water damage, which can lead to mold or wood rot and impact structural stability. Loss of power during flood events can affect facility operations.	In addition to direct fire building damage, increased demands on EMS operations can also occur due to health and safety impacts to the community.
Fire Station (Safety and Security)	In addition to direct structural damage, flooding can wash out sections of roadways and bridges, affecting access routes for fire station vehicles responding to emergencies.	In addition to direct structural damage, response to fire events can cost thousands of taxpayer dollars and involve thousands of man hours from volunteer firefighters.
Gas Station with Generator (Energy)	Power outages resulting from flooding and high winds associated with storms increase the dependence on gas stations with generators that are able to maintain operations.	Power lines are particularly susceptible to wildland fire risk because most poles are made of wood that is at risk of burning. Power outages will increase demand on gas stations with generators. Pipelines that provide fuel are also at risk of being ignited, which can result in explosions and fuel supply shortages.
Municipal Solid Waste (Hazardous Materials)	Flooded roadways can disrupt municipal solid waste collection and operations, posing health risks to the community.	Wildland fires can cause direct damage to plants and power outages can affect the operations of municipal solid waste facilities.
Power Plant (Energy)	In addition to direct flood damage, flooded transportation routes can affect personnel access to power plants and reduce operational capacity.	Wildland fires can cause direct damage to plants and reduced operations can lead to power outages for communities.

Asset Type and Community Lifeline	Flood Impacts	Wildland Fire Impacts
Urgent Care Facilities (Health and Medical)	Flooding can cause injuries and contact with floodwaters can result in contracting diseases and infections, leading to increased demand on urgent care facilities.	Smoke and air pollution from wildland fire can be a health hazard, especially for vulnerable populations, causing increased demands on urgent care facilities.
Wastewater Treatment Plant (Hazardous Materials)	Water treatment and sewage collection systems damaged by flooding or loss of power can affect residents and communities.	Wildland fires can increase the probability of other natural disasters, specifically floods and mudflows, that can further affect wastewater treatment plant operations.

The state asset inventory used for this planning effort consists of 3,833 state-owned building records. There are several existing data gaps in this inventory. Approximately 48% of the records were not accurately addressed, and approximately 27% and 21% of records have inconsistent or no data for construction type or year of construction. Additional attributes that are necessary for detailed risk analysis, including the foundation type and first floor elevation, are currently lacking.

Early in 2024, OPM, DAS, and DEEP will embark on a robust analysis of all state facilities and assets as required by Governor Lamont's Executive Order 21-3. The EO requires the agencies to "assess the vulnerability of state government assets and operations to the impacts of climate change" and create "a list of priority assets and infrastructure for climate resilience projects". The three agencies will be conducting this study on behalf of all state agencies except DOT. DOT, due to its large number of assets, will conduct its own analysis. The results of both analyses will be incorporated into an out-of-cycle update to the plan in 2024 and resubmitted to FEMA for review and approval. Funding is in place for the studies.

While the current data limitations for state-owned assets hinder more robust risk analysis, the critical facilities inventory provides more detailed information on asset location and primary use that support use of the FEMA Community Lifelines framework. These facilities have been determined to be of critical importance at both the local and state levels. Therefore, the state has ranked them highest in priority for analysis and action. Regardless of private or public ownership, if critical facility functions are diminished by natural hazard impacts at the local scale, this can affect essential state operations. To support prioritization of the most vulnerable critical facilities that support state operations, the following steps were implemented:

- Critical facility locations were intersected with hazard areas that are geographically defined by standard boundaries. These include the SFHA, the projected future 1% annual chance floodplain with 1.8ft of sea level rise, and WUI High Severity areas.

- The total number of critical facilities by asset type and corresponding FEMA lifeline that intersected each of these hazard areas were summarized by town.
- Priority facilities were selected based on abundance in hazard areas and importance to state operations.
- For roadways assets that are not clearly defined by point locations, roadway segments were intersected with the state SFHA to provide an estimate of current flood exposure.
- To assess statewide infrastructure and utilities not directly accounted for in the state-owned buildings and critical facilities datasets, the results of the Hazus earthquake analysis were used to identify the most vulnerable infrastructure and utility types.

As shown in Table 193, Fire Station and EMS facilities, supporting the safety and security and health and medical lifelines, represent the greatest abundance of asset types in the SFHA and WUI High Severity areas. EMS, fire station, and wastewater treatment plants are also the most abundant asset categories exposed to future sea level rise. The towns in coastal counties where these assets are located are summarized in Table 194. A complete summary of critical facilities exposed to flooding and wildfires by town and by asset type is presented in Table 195.

Table 193. Total number of critical facilities exposed in each hazard area

Asset Type and FEMA Lifeline	SFHA	1.8ft SLR	WUI High Severity
Law Enforcement (Safety and Security)	21	3	10
EMS (Health and Medical)	30	14	13
Fire Station (Safety and Security)	34	11	21
Gas Station with Generator (Energy)	8	1	10
Municipal Solid Waste (Hazardous Materials)	9	0	0
Power Plant (Energy)	27	6	5
Urgent Care Facilities (Health and Medical)	6	1	0
Wastewater Treatment Plants (Hazardous Materials)	25	11	6

Table 194. Towns with priority critical facilities exposed to current and future flooding and wildland fire

County	EMS (Health and Medical)	Fire Station (Safety and Security)	Wastewater Treatment Plant (Hazardous Materials)
Fairfield	Bridgeport, Danbury, Fairfield, Greenwich, Norwalk, Shelton, Stamford, Westport	Bridgeport, Danbury, Fairfield, Greenwich, Norwalk, Shelton, Stamford	Bridgeport, Fairfield, Norwalk, Shelton, Stamford, Stratford, Westport
New Haven	Ansonia, Branford, Derby, Hamden, Meriden, Middlebury, Naugatuck, New Haven, North Haven, Oxford, West Haven	Ansonia, Beacon Falls, Branford, Derby, Hamden, Meriden, Middlebury, Naugatuck, New Haven, North Haven, Oxford, West Haven	Beacon Falls, Derby, Milford, Naugatuck, New Haven, Seymour, West Haven
Middlesex	Clinton, Deep River, Old Saybrook	Clinton, Deep River	Middletown, Portland
New London	Groton, New London, Norwich, Stonington	Groton, New London, Norwich, Stonington	Griswold, Groton, New London, Norwich, Stonington

All of the major and intermediate state highways and routes can be considered community lifelines as they provide critical egress and access to the communities they traverse. While not all segments of the road infrastructure may experience inundation or damage, some major commuter throughways that intersect high flood hazard areas (SFHA) include State Routes 1, 5, 6, and 7, as well as Interstates 84, 91, 95, 291, 384, and 395. Additionally, commuter rail lines, including MTA Metro-North, Shoreline East, and the Amtrak regional rails, are located within these potentially flood vulnerable areas.

The results of the Hazus earthquake analysis provide additional insights on potential statewide infrastructure hazard vulnerabilities. Highway bridges are particularly susceptible to damage, with an estimated 288 projected to experience damage under a 6.4 magnitude earthquake scenario, as shown in Table 196. Results of Hazus earthquake analysis for infrastructure system damage. Ferry and port facilities are also infrastructure types more likely to experience moderate damage from an earthquake of magnitude 5.7 or greater. Electrical power, wastewater and communication systems are utility types that are

more likely to be impacted by an earthquake of magnitude 5.7 or greater, as shown in Table 197. Results of Hazus earthquake analysis for utility system damage.

For other natural hazards considered in this plan that are less clearly defined by geography, all state-owned assets and critical facilities in Connecticut are exposed to these hazards. Potential impacts to each sector are outlined for each hazard in the Hazard Summaries.

Table 195. Critical facilities located within the SFHA, sea level rise floodplain (1.8ft) and WUI High Severity area by town

		Law Enforcement (Safety and Security)			EMS (Health and Medical)			Fire Station (Safety and Security)			Gas Station with Generator (Energy)			Municipal Solid Waste (Hazardous Materials)			Power Plant (Energy)			Urgent Care Facilities (Health and Medical)			Wastewater Treatment (Hazardous Materials)		
County	Town	SFHA	SLR	WUI	SFHA	SLR	WUI	SFHA	SLR	WUI	SFHA	SLR	WUI	SFHA	SLR	WUI	SFHA	SLR	WUI	SFHA	SLR	WUI	SFHA	SLR	WUI
Fairfield	Bethel	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Bridgeport	1	1	-	1	-	-	2	-	-	1	1	-	-	-	-	4	4	-	-	-	-	1	1	-
	Brookfield	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Danbury	-	-	-	2	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Darien	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Easton	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Fairfield	-	-	-	2	1	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-
	Greenwich	-	-	-	1	1	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Monroe	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1		-	-	-	-	-	-	-
	New Canaan	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	New Fairfield	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Newtown	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Norwalk	-	-	-	-	1	-	1	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-
	Redding	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Ridgefield	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Shelton	-	-	-	-	-	2	-	-	1	-	-	-	-	-	-	1		1	-	-	-	1	-	1
	Sherman	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Stamford	-	-	-	1	2	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-
	Stratford	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	1	-	1	-	-
	Trumbull	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Weston	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

		Law Enforcement (Safety and Security)			EMS (Health and Medical)			Fire Station (Safety and Security)			Gas Station with Generator (Energy)			Municipal Solid Waste (Hazardous Materials)			Power Plant (Energy)			Urgent Care Facilities (Health and Medical)			Wastewater Treatment (Hazardous Materials)		
	Westport	-	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	1	1	-
	Wilton	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hartford	Avon	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Berlin	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-
	Bloomfield	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Bristol	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Burlington	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Canton	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-
	East Granby	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	East Hartford	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	East Windsor	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Enfield	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-
	Farmington	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-
	Glastonbury	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-
	Granby	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Hartford	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Hartland	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1		-	-	-	-	-	-	-
	Manchester	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Marlborough	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	New Britain	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Newington	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Plainville	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Rocky Hill	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-
	Simsbury	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

		Law Enforcement (Safety and Security)			EMS (Health and Medical)			Fire Station (Safety and Security)			Gas Station with Generator (Energy)			Municipal Solid Waste (Hazardous Materials)			Power Plant (Energy)			Urgent Care Facilities (Health and Medical)			Wastewater Treatment (Hazardous Materials)		
	South Windsor	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Southington	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Suffield	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	West Hartford	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Wethersfield	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	1	-	-	-	-	-
	Windsor	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1		-	-	-	-	-	-	-
	Windsor Locks	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Litchfield	Barkhamsted	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Bethlehem	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Bridgewater	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Canaan	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Colebrook	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Cornwall	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Goshen	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Harwinton	-	-	-	-	-	-	-	-	1	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	1
	Kent	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Litchfield	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	1		1	-	-	-	-	-	-	-
	Morris	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	New Hartford	2	-	-	-	-	-	2	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-
	New Milford	-	-	-	1	-	-	-	-	-	1	-	-	1	-	-	2	-	-	-	-	-	1	-	-	-
	Norfolk	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	North Canaan	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-
	Plymouth	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Roxbury	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

		Law Enforcement (Safety and Security)			EMS (Health and Medical)			Fire Station (Safety and Security)			Gas Station with Generator (Energy)			Municipal Solid Waste (Hazardous Materials)			Power Plant (Energy)			Urgent Care Facilities (Health and Medical)			Wastewater Treatment (Hazardous Materials)		
	Salisbury	2	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Sharon	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Thomaston	-	-	-	1	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-
	Torrington	-	-	1	-	-	1	2	-	3	-	-	3	-	-	-	1		2	-	-	-	-	-	-
	Warren	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Washington	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Watertown	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-
	Winchester	2	-	-	1	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-
	Woodbury	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Middlesex	Chester	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Clinton		-																						
	Cromwell	-	-	-	1	1	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Deep River	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Durham	-	-	-	1	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	East Haddam	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	East Hampton	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Essex	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Haddam	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Killingworth	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-
	Middlefield	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Middletown	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
	Old Saybrook	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	1		
	Portland	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
	Westbrook	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1		
	Ansonia	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		

		Law Enforcement (Safety and Security)			EMS (Health and Medical)			Fire Station (Safety and Security)			Gas Station with Generator (Energy)			Municipal Solid Waste (Hazardous Materials)			Power Plant (Energy)			Urgent Care Facilities (Health and Medical)			Wastewater Treatment (Hazardous Materials)		
New Haven	Beacon Falls	-	-	1	-	-	1	-	-	4	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-
	Bethany	-	-	1	-	-	1	-	-	1	-	-	1	-	-	-	-	-	-	-	-	-	-	-	1
	Branford	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Cheshire	-	-	-	1	1	-	1	1	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-	-
	Derby	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	East Haven	-	-	1	-	-	1	-	-	3	-	-	-	-	-	-	1		1	-	-	-	1	-	2
	Guilford	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Hamden	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Madison	-	-	1	-	-	3	-	-	3	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-
	Meriden	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Middlebury	-	-	-	1	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Milford	1	-	-	1	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Naugatuck	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-
	New Haven	-	-	1	-	-	2	-	-	2	-	-	1	-	-	-	-	-	-	-	-	-	-	-	1
	North Branford	2	1	-	-	1	-	1	-	-	-	-	-	-	-	-	3	-	-	-	-	-	-	1	-
	North Haven	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Orange	-	-	1	-	-	1	-	-	2	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-
	Oxford	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Prospect	-	-	1	-	-	1	-	-	1	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-
	Seymour	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Southbury	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	1	-	-
	Wallingford	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
	Waterbury	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	West Haven	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-

		Law Enforcement (Safety and Security)			EMS (Health and Medical)			Fire Station (Safety and Security)			Gas Station with Generator (Energy)			Municipal Solid Waste (Hazardous Materials)			Power Plant (Energy)			Urgent Care Facilities (Health and Medical)			Wastewater Treatment (Hazardous Materials)		
	Wolcott	-	-	-	1	1	-	1	1	-	-	-	-	-	-	-	-	-	-	1	-	-	1	1	-
	Woodbridge	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
New London	Bozrah	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Colchester	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	East Lyme	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Franklin	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Griswold	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Groton	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-
	Lebanon	1	1	-	2	2	-	2	2	-	-	-	-	-	-	-	1	-	-	-	-	-	1	-	-
	Ledyard	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Lisbon	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Lyme	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Montville	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	New London	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	2	1	-	-	-	-	-	-	-
	North Stonington	-	-	-	-	1	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-
	Norwich	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Old Lyme	-	-	-	1	-	-	1	-	-	-	-	-	-	-	-	2	-	-	1	-	-	1	-	-
	Preston	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Salem	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Sprague	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Stonington	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Voluntown	-	-	-	3	1	-	3	1	-	-	-	-	-	-	-	-	-	-	-	-	-	3	2	-
	Waterford	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Tolland	Andover	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

		Law Enforcement (Safety and Security)			EMS (Health and Medical)			Fire Station (Safety and Security)			Gas Station with Generator (Energy)			Municipal Solid Waste (Hazardous Materials)			Power Plant (Energy)			Urgent Care Facilities (Health and Medical)			Wastewater Treatment (Hazardous Materials)		
	Bolton	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Columbia	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Coventry	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Ellington	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Hebron	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Mansfield	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Somers	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Stafford	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Tolland	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Union	-	-	-	1	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Vernon	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Wilington	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Windham	Ashford	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Brooklyn	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Canterbury	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
	Chaplin	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Eastford	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Hampton	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Killingly	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Plainfield	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Pomfret	-	-	-	1	-	-	1	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
	Putnam	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Scotland	3	-	-	3	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-
	Sterling	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Thompson	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

		Law Enforcement (Safety and Security)			EMS (Health and Medical)			Fire Station (Safety and Security)			Gas Station with Generator (Energy)			Municipal Solid Waste (Hazardous Materials)			Power Plant (Energy)			Urgent Care Facilities (Health and Medical)			Wastewater Treatment (Hazardous Materials)		
	Windham	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Woodstock	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-

Table 196. Results of Hazus earthquake analysis for infrastructure system damage

			East Haddam (magnitude 6.40)		Haddam (magnitude 5.70)		Portland (magnitude 5.70)		Stamford (magnitude 5.70	
System	Component	Locations/ Segments	With at least Mod. Damage	With Complete Damage	With at least Mod. Damage	With Complete Damage	With at least Mod. Damage	With Complete Damage	With at least Mod. Damage	With Complete Damage
Highway	Segments	2,070	0	0	0	0	0	0	0	0
	Bridges	4,361	288	39	48	5	87	11	27	2
	Tunnels	7	0	0	0	0	0	0	0	0
Railway	Segments	427	0	0	0	0	0	0	0	0
	Bridges	463	1	0	0	0	0	0	0	0
	Tunnels	0	0	0	0	0	0	0	0	0
	Facilities	20	0	0	0	0	1	0	2	0
Bus	Facilities	5	0	0	0	0	0	0	0	0
Ferry	Facilities	10	2	0	2	0	2	0	2	0
Port	Facilities	283	9	0	7	0	7	0	76	0
Airport	Facilities	12	0	0	0	0	0	0	0	0
	Runways	26	0	0	0	0	0	0	0	0

Table 197. Results of Hazus earthquake analysis for utility system damage

		East Haddam (magnitude 6.40)		Haddam (magnitude 5.70)		Portland (magnitude 5.70)		Stamford (magnitude 5.70)	
System	Total #	With at least Mod. Damage	With Complete Damage	With at least Mod. Damage	With Complete Damage	With at least Mod. Damage	With Complete Damage	With at least Mod. Damage	With Complete Damage
Potable Water	11	0	0	0	0	1	0	0	0
Wastewater	89	8	0	6	0	7	0	5	0
Natural Gas	5	0	0	0	0	1	0	0	0
Oil Systems	1	1	0	1	0	1	0	0	0
Electrical Power	84	40	0	9	0	16	1	5	1
Communication	113	12	0	3	0	9	0	8	0
Potable Water	11	0	0	0	0	1	0	0	0

4.13.2 Projected Changes in Population & Development

Changes in growth and development can affect vulnerability to natural hazards. Recent growth and projected growth across the state has been, and is projected to continue being, minimal. Generally, stormwater standards and best practices, low impact development (LID), increased planning around climate change and green infrastructure efforts have increased dramatically in the last decade. The NFIP State Coordinator's office within DEEP and the Office of the State Building Inspector, within DAS, continue to have well run and respected programs to help local regulators ensure code and NFIP compliance. The small level of growth combined with increased awareness of hazards related to climate change, combined with mature regulatory programs and a progressive focus on climate resilience position Connecticut well toward ensuring new development does not increase vulnerability.

4.13.3 Changes in Population and Risk

Connecticut has experienced relatively low population growth over the last decade, with projections indicating approximately 2% population growth statewide by 2040. These projections also show that 108 of Connecticut's 169 municipalities will experience negative population growth by 2040. There are several cities and towns with high building permit counts that are experiencing negative or low population growth and projected development (e.g. Stamford, Westport, and Southington). The communities with the highest projected increases in population, by COG, are included in Table 198. Hartford, New Haven, and Windham counties are projected to have the greatest growth in population, with population increases for specific towns reaching up to 47% growth.

Table 198. Municipalities with >15% population growth by COG

COG	Municipalities with > 15% Population Growth
CRCOG	Avon – 34% East Windsor – 36% Rocky Hill – 22% Manchester – 21%
RiverCOG	Middletown – 19%
WestCOG	None
MetroCOG	None
SCRCOG	West Haven – 31% Hamden – 15%
NVCOG	Oxford – 29%

COG	Municipalities with > 15% Population Growth
Northwest Hills COG	Canaan – 19%
SECCOG	Windham – 47% Norwich – 28%
Northeast COG	Brooklyn – 17% Sterling – 25%

4.13.4 Changes in Building (Re)Development

As a strong home rule state, Connecticut does not exert control over land use regulation. The Department of Economic and Community Development, the Connecticut Institute for Resilient and Climate Adaptation (CIRCA) and others are focused on encouraging Transit Oriented Development.

Connecticut General Status (CGS 13b-79) Definition of TOD

"*The development of residential, commercial, and employment centers within one-half mile of walking distance of public transportation facilities, including rail and bus rapid transit and services, that meet transit supportive standards for land uses, built environment densities, and walkable environments, in order to facilitate and encourage the use of those services.*"

The result will likely be a mixture of new development, redevelopment, or small-scale infill development. CIRCA's role, as evidenced in its Resilient Connecticut Initiative, is to encourage high density development, near transit and away from hazards to create resilience hub areas. Ensuring that TOD and resilience initiatives are complementary have been and will continue to be a focus for the State.

4.13.5 Changes in Development Analysis Results

As Plans of Conservation and Development and Regional Hazard Mitigation and Climate Adaptation Plans are updated, the intersection between new development to accommodate increased populations and hazards should be evaluated closely in these cities and towns. Changes in development, as indicated by building permits issued over the last five years, show corresponding growth in development in Hartford and New Haven Counties. Fairfield County has the greatest number of building permits issued over the past five years as shown in Table 199. It should be noted that building permits do not directly translate to new construction of housing or buildings, as they include improvements and repairs. While not a singular indicator of growth they do provide a glance at potential trends.

The counties and associated towns are all vulnerable to the highly ranked statewide hazards of tropical cyclone, flood, and extreme heat. Climate projections indicate that

tropical cyclones, flood, and extreme heat hazards will pose increasing risks in the future. Tropical cyclones are projected increase in intensity and have greater amounts of rainfall. Flooding intensity and frequency of events is projected to increase, with sea level rise contributing to more substantial changes in flooding extent for coastal communities. Extreme heat will likely increase in intensity and frequency, with urban areas being particularly vulnerable to these changes due to the heat island effect. As development increases with associated population growth, exposure to hazards will increase.

Coastal Areas

New development, including state-owned buildings, critical facilities, and infrastructure, in the Special Flood Hazard Area and coastal areas projected to be inundated by sea level rise will be most susceptible to flooding impacts.

Metropolitan Areas

There is a trend in the largest cities, particularly New Haven, of higher density taller downtown residential building. These and other infill and new developments will comply with modern building codes, floodplain management standards (where applicable) and stormwater management standards. This should help with minimizing any increases in vulnerability related to development.

Western Connecticut

While Litchfield County has had relatively low development over the past five years, the towns of Kent and Woodbury have shown the greatest areas of development in the County according to building permit data. Given that most towns in Litchfield County are projected to have a decrease in population by 2040, the impacts of increasing hazard risks resulting from climate change in these areas will likely not be further exacerbated by significant development or population growth.

Table 199. Changes in development, represented by total building permits between 2018 and 2022, and projected changes in population growth by town. represented

County	Town	Total Building Permits (2018-2022)	Population Percent Change (2015-2040)
Fairfield	Bethel	345	-17%
Fairfield	Bridgeport	673	6%
Fairfield	Brookfield	80	-11%
Fairfield	Danbury	522	14%
Fairfield	Darien	361	6%
Fairfield	Easton	36	-24%
Fairfield	Fairfield	736	13%
Fairfield	Greenwich	737	-21%

County	Town	Total Building Permits (2018-2022)	Population Percent Change (2015-2040)
Fairfield	Monroe	44	-35%
Fairfield	New Canaan	194	-6%
Fairfield	New Fairfield	34	-44%
Fairfield	Newtown	451	1%
Fairfield	Norwalk	557	5%
Fairfield	Redding	19	-3%
Fairfield	Ridgefield	99	-10%
Fairfield	Shelton	648	-12%
Fairfield	Sherman	31	-45%
Fairfield	Stamford	1713	4%
Fairfield	Stratford	255	7%
Fairfield	Trumbull	200	-8%
Fairfield	Weston	55	-27%
Fairfield	Westport	489	-17%
Fairfield	Wilton	36	-17%
Hartford	Avon	73	34%
Hartford	Berlin	114	1%
Hartford	Bloomfield	276	-2%
Hartford	Bristol	303	-5%
Hartford	Burlington	132	-9%
Hartford	Canton	69	7%
Hartford	East Granby	31	1%
Hartford	East Hartford	18	12%
Hartford	East Windsor	216	36%
Hartford	Enfield	204	-9%
Hartford	Farmington	207	3%
Hartford	Glastonbury	194	3%
Hartford	Granby	206	-11%
Hartford	Hartford	40	2%
Hartford	Hartland	8	-24%
Hartford	Manchester	149	21%
Hartford	Marlborough	5	-18%

County	Town	Total Building Permits (2018-2022)	Population Percent Change (2015-2040)
Hartford	New Britain	253	10%
Hartford	Newington	20	11%
Hartford	Plainville	63	0%
Hartford	Rocky Hill	40	22%
Hartford	Simsbury	524	1%
Hartford	South Windsor	304	-8%
Hartford	Southington	414	-2%
Hartford	Suffield	206	8%
Hartford	West Hartford	446	13%
Hartford	Wethersfield	17	9%
Hartford	Windsor	106	-4%
Hartford	Windsor Locks	48	1%
Litchfield	Barkhamsted	N/A	-18%
Litchfield	Bethlehem	N/A	-7%
Litchfield	Bridgewater	5	-44%
Litchfield	Canaan	N/A	19%
Litchfield	Colebrook	N/A	-24%
Litchfield	Cornwall	N/A	-34%
Litchfield	Goshen	N/A	1%
Litchfield	Harwinton	N/A	-15%
Litchfield	Kent	34	-23%
Litchfield	Litchfield	N/A	-14%
Litchfield	Morris	N/A	-7%
Litchfield	New Hartford	N/A	-2%
Litchfield	New Milford	N/A	-18%
Litchfield	Norfolk	N/A	-20%
Litchfield	North Canaan	N/A	-13%
Litchfield	Plymouth	N/A	-7%
Litchfield	Roxbury	N/A	-11%
Litchfield	Salisbury	N/A	-34%
Litchfield	Sharon	N/A	-42%
Litchfield	Thomaston	N/A	-7%

County	Town	Total Building Permits (2018-2022)	Population Percent Change (2015-2040)
Litchfield	Torrington	N/A	2%
Litchfield	Warren	N/A	-3%
Litchfield	Washington	N/A	-30%
Litchfield	Watertown	N/A	-11%
Litchfield	Winchester	N/A	-3%
Litchfield	Woodbury	55	-9%
Middlesex	Chester	2	-17%
Middlesex	Clinton	131	-26%
Middlesex	Cromwell	54	12%
Middlesex	Deep River	17	-28%
Middlesex	Durham	23	-10%
Middlesex	East Haddam	80	-12%
Middlesex	East Hampton	122	-14%
Middlesex	Essex	75	-22%
Middlesex	Haddam	142	-1%
Middlesex	Killingworth	36	-24%
Middlesex	Middlefield	22	-3%
Middlesex	Middletown	94	19%
Middlesex	Old Saybrook	95	-29%
Middlesex	Portland	24	5%
Middlesex	Westbrook	73	-2%
New Haven	Ansonia	N/A	8%
New Haven	Beacon Falls	N/A	5%
New Haven	Bethany	N/A	-5%
New Haven	Branford	163	-17%
New Haven	Cheshire	147	-14%
New Haven	Derby	N/A	8%
New Haven	East Haven	N/A	-1%
New Haven	Guilford	N/A	-3%
New Haven	Hamden	N/A	15%
New Haven	Madison	N/A	-11%
New Haven	Meriden	N/A	7%

County	Town	Total Building Permits (2018-2022)	Population Percent Change (2015-2040)
New Haven	Middlebury	N/A	11%
New Haven	Milford	889	-10%
New Haven	Naugatuck	N/A	0%
New Haven	New Haven	2877	9%
New Haven	North Branford	N/A	-16%
New Haven	North Haven	N/A	-3%
New Haven	Orange	N/A	2%
New Haven	Oxford	196	29%
New Haven	Prospect	126	-12%
New Haven	Seymour	N/A	0%
New Haven	Southbury	N/A	-5%
New Haven	Wallingford	123	-2%
New Haven	Waterbury	110	7%
New Haven	West Haven	N/A	31%
New Haven	Wolcott	130	-2%
New Haven	Woodbridge	N/A	-24%
New London	Bozrah	N/A	14%
New London	Colchester	111	-2%
New London	East Lyme	350	-5%
New London	Franklin	N/A	-14%
New London	Griswold	197	12%
New London	Groton	N/A	-3%
New London	Lebanon	29	-13%
New London	Ledyard	N/A	-11%
New London	Lisbon	N/A	-13%
New London	Lyme	31	10%
New London	Montville	N/A	-6%
New London	New London	198	14%
New London	North Stonington	N/A	-20%
New London	Norwich	113	28%
New London	Old Lyme	N/A	-19%
New London	Preston	64	-16%

County	Town	Total Building Permits (2018-2022)	Population Percent Change (2015-2040)
New London	Salem	N/A	-17%
New London	Sprague	6	-2%
New London	Stonington	N/A	-17%
New London	Voluntown	16	-27%
New London	Waterford	N/A	-17%
Tolland	Andover	18	-22%
Tolland	Bolton	13	-23%
Tolland	Columbia	11	-9%
Tolland	Coventry	103	-15%
Tolland	Ellington	623	31%
Tolland	Hebron	80	-18%
Tolland	Mansfield	38	10%
Tolland	Somers	75	-3%
Tolland	Stafford	126	-5%
Tolland	Tolland	73	-19%
Tolland	Union	12	6%
Tolland	Vernon	564	6%
Tolland	Willington	15	-7%
Windham	Ashford	N/A	-5%
Windham	Brooklyn	91	17%
Windham	Canterbury	N/A	-7%
Windham	Chaplin	N/A	-22%
Windham	Eastford	N/A	-4%
Windham	Hampton	N/A	-20%
Windham	Killingly	N/A	1%
Windham	Plainfield	N/A	-5%
Windham	Pomfret	N/A	12%
Windham	Putnam	N/A	11%
Windham	Scotland	N/A	-7%
Windham	Sterling	N/A	25%
Windham	Thompson	N/A	-2%
Windham	Windham	14	47%

County	Town	Total Building Permits (2018-2022)	Population Percent Change (2015-2040)
Windham	Woodstock	N/A	-3%
TOTAL*		**22,605**	**2%**

* Total building permits is greater than the sum of the column because counts of permits were available for 2022 for Towns marked as N/A for the full 5-year range.

4.13.6 Vulnerablity & Impact Distribution

For each hazard considered as part of the planning effort, the impacts on socially vulnerable populations and underserved communities, which can be further exacerbated by climate change, are an important consideration.

Socially Vulnerable & Underserved Communities

Social Vulnerability: the potential for loss within an individual or social group, recognizing that there are characteristics that influence an individual or group's ability to prepare, respond, cope, or recover from an event. These characteristics can overlap within populations to create heightened vulnerability, which may be compounded by deficiencies in infrastructure within communities and historic or existing discriminatory government policies.

Underserved Communities: populations sharing a particular characteristic, as well as geographic communities, that have been systematically denied a full opportunity to participate in aspects of economic, social, and civic life. The barriers to opportunity and participation these communities face have occurred throughout history and continue today.

Socially vulnerable populations living in frequently flooded areas and urban areas with minimal tree canopy will be disproportionately impacted by increasing flood and extreme heat risk. Vulnerable populations can include, but are not limited to, individuals over age 65, individuals with functional needs, individuals with low English language fluency, and individuals with low socioeconomic status. As shown in Figure 157, areas with high social sensitivity, as defined by CIRCA CCVI Social Sensitivity score, also align with counties projected to have the greatest development, including Fairfield, New Haven, and Hartford. Nearly a third of local municipalities in New Haven (33%) and Hartford (28%) counties have moderate to high average social sensitivity (average CCVI greater than or equal to 2), as shown in Table 200.

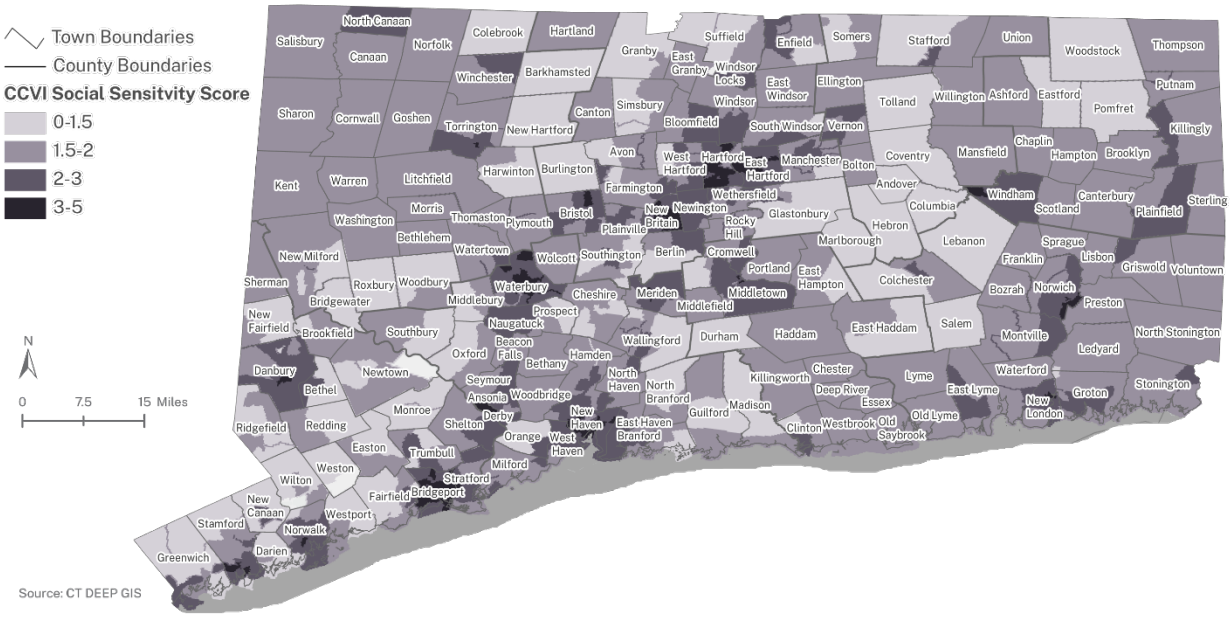


Figure 157. CIRCA Climate Change Vulnerability Index (CCVI) Social Sensitivity Scores

Table 200. Social Sensitivity Score Summary, derived from CIRCA Climate Change Vulnerability Index (CCVI)

County	Sub-County Local Municipalities	Total Municipalities	Municipalities Med-High Social Sensitivity	# Med-High Social Sensitivity	% Med-High Social Sensitivity
Fairfield	Bethel, Bridgeport, Brookfield, Danbury, Darien, Easton, Fairfield, Greenwich, Monroe, New Canaan, New Fairfield, Newtown, Norwalk, Redding, Ridgefield, Shelton, Sherman, Stamford, Stratford, Trumbull, Weston, Westport, Wilton	23	Bridgeport, Danbury, Norwalk, Stratford	4	17%
Hartford	Avon, Berlin, Bloomfield, Bristol, Burlington, Canton, East Granby, East, East Windsor, Enfield, Farmington, Glastonbury, Granby, Hartford, Hartland, Manchester, Marlborough, New Britain, Newington, Plainville, Rocky Hill, Simsbury, South Windsor, Southington, Suffield, West Hartford, Wethersfield, Windsor, Windsor Locks	29	Bloomfield, Bristol, East Hartford, New Britain, Newington, Plainville, Windsor Locks	8	28%
Litchfield	Barkhamsted, Bethlehem, Bridgewater, Canaan, Colebrook, Cornwall, Goshen, Harwinton, Kent, Litchfield, Morris, New Hartford, New Milford, Norfolk, North Canaan, Plymouth, Roxbury, Salisbury, Sharon, Thomaston, Torrington, Warren, Washington, Watertown, Winchester, Woodbury	26	North Canaan	1	4%

County	Sub-County Local Municipalities	Total Municipalities	Municipalities Med-High Social Sensitivity	# Med-High Social Sensitivity	% Med-High Social Sensitivity
Middlesex	Chester, Clinton, Cromwell, Deep River, Durham, East Haddam, East Hampton, Essex, Haddam, Killingworth, Middlefield, Middletown, Old Saybrook, Portland, Westbrook	15	Middletown	1	7%
New Haven	Ansonia, Beacon Falls, Bethany, Branford, Cheshire, Derby, East Haven, Guilford, Hamden, Madison, Meriden, Middlebury, Milford, Naugatuck, New Haven, North Branford, North Haven, Orange, Oxford, Prospect, Seymour, Southbury, Wallingford, Waterbury, West Haven, Wolcott, Woodbridge	27	Ansonia, Derby, East Haven, Meriden, Naugatuck, New Haven, Seymour, Waterbury, West Haven	9	33%
New London	Bozrah, Colchester, East Lyme, Franklin, Griswold, Groton, Lebanon, Ledyard, Lisbon, Lyme, Montville, New London, North Stonington, Norwich, Old Lyme, Preston, Salem, Sprague, Stonington, Voluntown	21	New London, Norwich	2	10%
Tolland	Andover, Bolton, Columbia, Coventry, Ellington, Hebron, Mansfield, Somers, Stafford, Tolland, Union, Vernon, Willington	13	N/A	0	0%
Windham	Ashford, Brooklyn, Canterbury, Chaplin, Eastford, Hampton, Killingly, Plainfield, Pomfret, Putnam, Scotland, Sterling, Thompson, Windham, Woodstock	15	Plainfield, Windham	2	13%
Totals		**169**		**27**	**16%**

The towns of Bridgeport, Danbury, Hartford, East Hartford, Stamford, Norwalk, Torrington, Meriden, New Haven, Waterbury, and Norwich are projected to have population growth by 2040 and have also been identified as climate-disadvantaged communities by the federal Climate and Economic Justice Screening Tool. Communities identified as climate change disadvantaged are at or above the 65th percentile for low-income and are at or above the 90th percentile for measures of expected loss from climate impacts, including expected agriculture loss rate, expected building loss rate, expected population loss rate, projected flood risk, or projected wildfire risk. These parameters are used as indicators of climate and socioeconomic burdens that characterize underserved communities. The previously noted eleven towns that are climate change disadvantaged also have average CCVI social sensitivity scores that range from moderate to high (1.7 to 3.1), as shown in Table 201. As ongoing climate change increases flooding and extreme heat risks, underserved communities may face adaptation disadvantages due to capacity and resource limitations.



Figure 158. Climate disadvantaged census tracts, provided by the Climate and Economic Justice Screening Tool

Table 201. Social Sensitivity Score by jurisdiction, derived from CIRCA Climate Change Vulnerability Index (CCVI). Climate disadvantaged, derived from Climate and Economic Justice Screening Tool

County	Town	Mean Social Sensitivity Score (CCVI)	Median Social Score	Climate Disadvantaged
Fairfield	Bethel	1.594	1.381	
Fairfield	Bridgeport*	3.081	3.141	Yes
Fairfield	Brookfield	1.657	1.619	
Fairfield	Danbury*	2.167	2.040	Yes
Fairfield	Darien	1.338	1.335	
Fairfield	Easton	1.473	1.381	
Fairfield	Fairfield	1.492	1.394	
Fairfield	Greenwich	1.478	1.414	
Fairfield	Monroe	1.445	1.477	
Fairfield	New Canaan	1.348	1.260	
Fairfield	New Fairfield	1.507	1.428	
Fairfield	Newtown	1.477	1.513	
Fairfield	Norwalk*	2.138	2.110	Yes

County	Town	Mean Social Sensitivity Score (CCVI)	Median Social Score	Climate Disadvantaged
Fairfield	Redding	1.412	1.303	
Fairfield	Ridgefield	1.446	1.414	
Fairfield	Shelton	1.779	1.603	
Fairfield	Sherman	1.513	1.513	
Fairfield	Stamford*	1.736	1.603	Yes
Fairfield	Stratford	2.189	2.168	
Fairfield	Trumbull	1.803	1.757	
Fairfield	Weston	1.280	1.335	
Fairfield	Westport	1.430	1.414	
Fairfield	Wilton	1.365	1.463	
Hartford	Avon	1.670	1.603	
Hartford	Berlin	1.631	1.603	
Hartford	Bloomfield	2.110	2.108	
Hartford	Bristol	2.209	2.089	
Hartford	Burlington	1.325	1.348	
Hartford	Canton	1.601	1.565	
Hartford	East Granby	1.644	1.658	
Hartford	East Hartford*	2.654	2.595	Yes
Hartford	East Windsor	1.905	1.953	
Hartford	Enfield	1.773	1.799	
Hartford	Farmington	1.824	1.757	
Hartford	Glastonbury	1.437	1.381	
Hartford	Granby	1.337	1.272	
Hartford	Hartford*	2.857	2.994	Yes
Hartford	Hartland	1.711	1.715	
Hartford	Manchester	1.951	1.906	
Hartford	Marlborough	1.403	1.394	
Hartford	New Britain	2.774	2.816	
Hartford	Newington	2.262	2.235	
Hartford	Plainville	2.107	1.925	
Hartford	Rocky Hill	1.902	1.861	
Hartford	Simsbury	1.536	1.477	

County	Town	Mean Social Sensitivity Score (CCVI)	Median Social Score	Climate Disadvantaged
Hartford	South Windsor	1.807	1.861	
Hartford	Southington	1.662	1.642	
Hartford	Suffield	1.534	1.428	
Hartford	West Hartford	1.775	1.740	
Hartford	Wethersfield	1.900	1.730	
Hartford	Windsor	1.887	1.774	
Hartford	Windsor Locks	2.083	2.213	
Litchfield	Barkhamsted	1.435	1.428	
Litchfield	Bethlehem	1.518	1.513	
Litchfield	Bridgewater	1.499	1.490	
Litchfield	Canaan	1.644	1.642	
Litchfield	Colebrook	1.360	1.348	
Litchfield	Cornwall	1.676	1.673	
Litchfield	Goshen	1.522	1.513	
Litchfield	Harwinton	1.468	1.381	
Litchfield	Kent	1.776	1.782	
Litchfield	Litchfield	1.844	1.730	
Litchfield	Morris	1.703	1.698	
Litchfield	New Hartford	1.483	1.477	
Litchfield	New Milford	1.564	1.603	
Litchfield	Norfolk	1.644	1.642	
Litchfield	North Canaan	2.349	2.368	
Litchfield	Plymouth	1.868	1.799	
Litchfield	Roxbury	1.469	1.463	
Litchfield	Salisbury	1.751	1.746	
Litchfield	Sharon	1.675	1.673	
Litchfield	Thomaston	1.698	1.603	
Litchfield	Torrington*	1.982	1.888	Yes
Litchfield	Warren	1.516	1.513	
Litchfield	Washington	1.604	1.603	
Litchfield	Watertown	1.923	1.906	
Litchfield	Winchester	1.949	1.906	

County	Town	Mean Social Sensitivity Score (CCVI)	Median Social Score	Climate Disadvantaged
Litchfield	Woodbury	1.593	1.463	
Middlesex	Chester	1.620	1.603	
Middlesex	Clinton	1.640	1.698	
Middlesex	Cromwell	1.890	2.069	
Middlesex	Deep River	1.620	1.603	
Middlesex	Durham	1.482	1.477	
Middlesex	East Haddam	1.561	1.428	
Middlesex	East Hampton	1.609	1.658	
Middlesex	Essex	1.585	1.579	
Middlesex	Haddam	1.700	1.698	
Middlesex	Killingworth	1.532	1.528	
Middlesex	Middlefield	1.659	1.658	
Middlesex	Middletown	2.027	2.069	
Middlesex	Old Saybrook	1.646	1.513	
Middlesex	Portland	1.727	1.675	
Middlesex	Westbrook	1.706	1.698	
New Haven	Ansonia	2.514	2.774	
New Haven	Beacon Falls	1.859	1.843	
New Haven	Bethany	1.707	1.698	
New Haven	Branford	1.758	1.698	
New Haven	Cheshire	1.582	1.550	
New Haven	Derby	2.669	2.426	
New Haven	East Haven	2.162	2.267	
New Haven	Guilford	1.586	1.550	
New Haven	Hamden	1.814	1.642	
New Haven	Madison	1.514	1.477	
New Haven	Meriden*	2.202	2.089	Yes
New Haven	Middlebury	1.526	1.348	
New Haven	Milford	1.816	1.799	
New Haven	Naugatuck	2.225	2.267	
New Haven	New Haven*	2.621	2.747	Yes
New Haven	North Branford	1.502	1.348	

County	Town	Mean Social Sensitivity Score (CCVI)	Median Social Score	Climate Disadvantaged
New Haven	North Haven	1.745	1.757	
New Haven	Orange	1.618	1.463	
New Haven	Oxford	1.600	1.428	
New Haven	Prospect	1.575	1.642	
New Haven	Seymour	2.004	1.906	
New Haven	Southbury	1.619	1.704	
New Haven	Wallingford	1.632	1.428	
New Haven	Waterbury*	2.754	2.747	Yes
New Haven	West Haven	2.490	2.658	
New Haven	Wolcott	1.730	1.757	
New Haven	Woodbridge	1.706	1.740	
New London	Bozrah	1.574	1.565	
New London	Colchester	1.592	1.463	
New London	East Lyme	1.811	1.673	
New London	Franklin	1.727	1.715	
New London	Griswold	1.765	1.682	
New London	Groton	1.991	1.861	
New London	Lebanon	1.488	1.477	
New London	Ledyard	1.660	1.642	
New London	Lisbon	1.561	1.513	
New London	Lyme	1.608	1.603	
New London	Montville	1.967	1.972	
New London	New London	2.668	2.826	
New London	North Stonington	1.756	1.757	
New London	Norwich*	2.246	2.058	Yes
New London	Old Lyme	1.631	1.698	
New London	Preston	1.867	1.861	
New London	Salem	1.367	1.348	
New London	Sprague	1.968	1.972	
New London	Stonington	1.732	1.658	
New London	Voluntown	1.804	1.799	

County	Town	Mean Social Sensitivity Score (CCVI)	Median Social Score	Climate Disadvantaged
New London	Waterford	1.808	1.698	
Tolland	Andover	1.464	1.463	
Tolland	Bolton	1.546	1.550	
Tolland	Columbia	1.474	1.463	
Tolland	Coventry	1.444	1.463	
Tolland	Ellington	1.755	1.642	
Tolland	Hebron	1.364	1.381	
Tolland	Mansfield	1.735	1.730	
Tolland	Somers	1.526	1.550	
Tolland	Stafford	1.520	1.428	
Tolland	Tolland	1.356	1.348	
Tolland	Union	1.567	1.565	
Tolland	Vernon	1.997	1.843	
Tolland	Willington	1.555	1.550	
Windham	Ashford	1.738	1.740	
Windham	Brooklyn	1.952	1.953	
Windham	Canterbury	1.757	1.757	
Windham	Chaplin	1.615	1.603	
Windham	Eastford	1.449	1.428	
Windham	Hampton	1.703	1.698	
Windham	Killingly	1.976	1.906	
Windham	Plainfield	2.028	2.040	
Windham	Pomfret	1.443	1.428	
Windham	Putnam	1.861	1.833	
Windham	Scotland	1.558	1.550	
Windham	Sterling	1.772	1.757	
Windham	Thompson	1.869	1.799	
Windham	Windham	2.505	2.474	
Windham	Woodstock	1.473	1.463	

4.13.7 Key Issues for Mitigation

Table 202 identifies the key issues and problem statements identified in the Risk Assessment by hazard. Problem statements summarize the greatest vulnerabilities and compare losses across the state, allowing the state to determine mitigation priorities. These problem statements were provided to the SHMPT and participating stakeholders during the Mitigation Strategy Workshop. For additional context and comparisons across Connecticut's hazard mitigation planning jurisdictions (COGs), refer to the hazard risk summary table (Table 191).

The risk assessment highlighted the most vulnerable state-owned and -operated assets in Connecticut. The hazard history (especially repetitive, high-impact events), exposure analysis, and state agency input were the primary identifiers used to find the most vulnerable assets. Overall, municipal-level critical facilities and assets were identified as the primary mitigation concern in the state, and their mitigation is supported by the mitigation actions on capability- and capacity-building. Table 28 in **Appendix 3** contains the specific assets, their associated sector, the reason they were identified as "most vulnerable," and the mitigation actions in the Mitigation Strategy that support their mitigation.

An expected loss vulnerability assessment was not able to be used in this case due to data limitations. Primarily, the state-owned and -operated facilities data did not have the necessary asset identification attributes required to conduct a detailed and comprehensive facility-level assessment to the scale desired. However, the forthcoming state agency vulnerability assessment project (refer to action #21 and #48 in the Mitigation Strategy) will address the data gaps and allow the state to conduct the desired assessment.

Table 202. Problem statements from the risk assessment by hazard

Hazard	Problem Statement(s)
Flood	• Flood events have impacted state roads, and increasing precipitation intensities due to climate change will continue to affect critical roadways. The State will need to coordinate with COGs to reduce flood impacts on major roadways. • Aging and under designed stormwater infrastructure may be increasingly inadequate during high-intensity, short-duration (flash flooding) rainfall events. • Changing weather patterns can increase the frequency and severity of flooding events and communities may not be educated on the consequences and appropriate preparation and response methods. • In some cases, flood control actions taken by one COG/ municipality/ community can negatively impact downstream or neighboring communities. • Storm surge is expected to increase in severity and impact more areas that have not been impacted by storm surge previously. • State-owned buildings and critical infrastructure (including hazardous materials sites) within each COG are vulnerable to flood damage. Southeastern Connecticut COG has the most critical facilities in flood hazard areas (followed by Naugatuck Valley COG). New London County has the most state-owned buildings in flood hazard areas (followed by Litchfield). • The COG regions most exposed to SLR conditions include Connecticut Metropolitan (MetroCOG), Lower Connecticut River Valley (RiverCOG), Southeastern Connecticut (SCCOG), South Central Regional (SCROG), and Western Connecticut (WestCOG). The COGs with the greatest number of critical facilities exposed to RSLR are the SCCOG and WestCOG, • Increased awareness regarding sea level rise risk when purchasing or renting property will be needed to protect investments in the future. • Most Vulnerable State Asset(s): Fairfield, New Haven, and New London counties have the most state-owned or -operated buildings in the floodplain as well as the highest overall building value in the floodplain. Fairfield and New Haven counties have the highest numbers of state facilities vulnerable to sea level rise, with notable risk starting with 1.8 ft of sea level rise during a 100-year storm.

Hazard	Problem Statement(s)
Dam Failure	• Residents and business owners may not realize they are located in a dam inundation area which are often different than the 100-year floodplain. They may be impacted during a dam breach causing property and social impacts. High hazard dam inundation areas are found in the Dam's Emergency Action Plan but are not always available to the public. • Not all dam inundation areas have been mapped for high-hazard dams within the state. There are 189 high-hazard dams in Connecticut, and 22 do not have their inundation areas mapped. • There are 24 high-hazard potential dams without Emergency Action Plans. One (1) is owned by DEEP. Metropolitan District Commission owns many of the HHPDs without EAPs (7). • There are high-hazard dams that have concerning condition assessment ratings. 20 HHPDs have "poor" or "unsatisfactory" condition assessments. • Litchfield County has the most state-owned buildings in dam inundation areas, followed by Fairfield County. Capital Region COG and Naugatuck Valley COG have the most critical facilities in dam inundation areas. • Most Vulnerable State Asset(s): Fairfield, New Haven, and Litchfield counties have the highest number of state-owned buildings in a mapped high hazard potential dam inundation zone. Fairfield County has over $220 million worth of state-owned building value in the zone.

Hazard	Problem Statement(s)
Extreme Heat	• Extreme heat events are expected to rise in Connecticut, especially impacting vulnerable groups such as unhoused populations and low-income households who may not have access to a cooling center. Annual days with a maximum temperature of more than 90 degrees F are projected to increase by 8 days in the near-term, 18 days by mid-century, and 44 days by late-century. • Extreme temperatures pose a threat to public health, especially to the elderly or those with medical conditions. Groups that are more likely to live alone, move away from their families/communities, and not integrating into their neighborhoods may not have others to check in on them during a heatwave, which can be a gradual and harder-to-notice hazard. • Electrical utility infrastructure may not be prepared to handle the increased power demands during heatwave events. Hartford and New Haven are projected to have increased population growth and have the highest heat severity. Socially vulnerable populations are expected to be impacted the worst. • Cooling centers should be strategically located, especially in urban areas, to maximize coverage for those residents most vulnerable to heat waves. Low-income families may not have the ability to acquire or run air conditioning and may need alternative solutions to mitigate the dangers from heat waves. • Those most vulnerable to heat waves are often the most difficult to reach with information or warnings about heat waves. • Heat mitigation measures are not as widely known as more common projects (e.g., for flooding), and they can be harder to secure grant funding for using traditional cost-benefit approaches. Innovative approaches will need to be prioritized and socialized throughout the COGs/municipalities. • Most Vulnerable State Asset(s): Hartford County has the greatest number and value of state-owned buildings within its jurisdiction. Additionally, with the City of Hartford being located within it, state operations that require outdoor workers will have the heat island effect to contend with that can exacerbate extreme heat events. Department of Transportation and recreational-related operations throughout the state are the most vulnerable.

Hazard	Problem Statement(s)
Extreme Cold	• Vulnerable populations may need support seeking shelter during extreme cold events. • COGs located along the Long Island Sound may have coastal freezing, which can interfere with the transportation of goods. It can also inhibit fishing and other maritime industries. • DoT projects/employees may face increased risk and/or delays, along with increasing workload demands due to road damage from freezing conditions. • Most Vulnerable State Asset(s): New Haven County has the highest number of CTDOT projects, followed by Hartford and Fairfield counties. CTDOT assets and employees in these counties have higher vulnerability to extreme cold than counties with fewer CTDOT projects, such as Windham and Tolland counties.
Winter Weather	• Critical facilities may not have emergency backup power or rely on generators that will need to be refueled in 24-72 hours. Increasing demand on utility infrastructure may necessitate reliance on alternative energy sources (e.g., solar, backup batteries) or microgrids. • Debris management/snow removal will likely be a tremendous challenge with the increased potential for high-intensity, short-duration snowfall events. • Economic impacts from extreme, long-duration winter storms will stress local government resources. Expected annual loss (buildings, agriculture, and population) is expected to be highest in Western Connecticut COG, by far. • Vulnerable population may need assistance with transportation for essential trips or to move to shelter with adequate heating. • Most Vulnerable State Asset(s): New London County has the greatest number of state-owned buildings regularly exposed to less than 2.5 ft of snowfall, but Hartford and Litchfied counties (northwest portion of the state) are likely to experience higher snow accumulation. With Hartford being the capitol, state operations there are of particularly high vulnerability.

Hazard	Problem Statement(s)
Thunderstorm	• Severe thunderstorms may endanger people and cause power outages and property damage due to lightning, flooding, and strong winds. The intensity of individual thunderstorms is projected to increase due to climate change, which may increase the severity of thunderstorm impacts. State-owned buildings and critical facilities should be built to withstand increasingly severe thunderstorm-related impacts. • Severe thunderstorms with damaging winds and hail are frequent events in each county in Connecticut, most commonly occurring in Litchfield County. • Cascading impacts of severe thunderstorms can have lasting, cross-jurisdictional impacts. Normal mutual-aid partners or regional resources may be unavailable or unable to support response. Utility outages will likely become a more common occurrence. • Most Vulnerable State Asset(s): state-owned buildings located in Fairfield and Middlesex counties have the highest vulnerability to thunderstorms, followed by Tolland county. New Haven County has the highest state-owned building value exposed to thunderstorm hazards, followed by Fairfield County. The most common types of state-owned building exposed to thunderstorms are education and transportation.
Drought	• Drought may impact the quantity and quality of the water supply. Vulnerable communities, including populations relying on well water, may have difficulty accessing potable water. • Capitol Region COG has the highest expected annual loss & highest agricultural value exposed to drought. Residents in this region may experience worse impacts due to drought conditions and may require state assistance. Increasing drought-resistant crops should be considered. • For agricultural communities, inefficient/aging irrigation systems can waste excessive amounts of water and increase the severity of drought impacts. Older infrastructure could also be impacted by drought conditions (such as soil or substructure constriction). • Public information campaigns should include water conservation measures. • Most Vulnerable State Asset(s): State-owned facilities and critical facilities that are related to agriculture are more vulnerable drought than other state-owned facilities. There are 86 agriculture-related state-owned facilities located in Connecticut. These state-owned facilities are farm storage facilities, livestock facilities, or utilities that make use of water. All of 86 of these state-owned facilities are in Tolland County.

Hazard	Problem Statement(s)
Tropical Cyclone	• Socially vulnerable populations, including those with functional needs or over the age of 65, may be more vulnerable to the effects of tropical cyclones given the financial burden and feasibility of evacuation without assistance in the case of a major storm event. Populations located in communities where access to advanced warnings and evacuation orders may not be available in their spoken language are also at a higher risk due to lack of warning time and advance preparations. Increased event frequency may lead to the public being less likely to take appropriate safety measures (e.g., evacuate) every time it's recommended. • Flooding may impact state roads that serve as evacuation routes, prohibiting populations from evacuating during a tropical cyclone. Alternative evacuation routes should be identified and publicized. • Strong winds may bring down trees and debris, causing damage to critical facilities and state-owned buildings. Nearly all state-owned buildings are exposed to hurricane-force winds in Connecticut. Capitol Region COG has the highest number of critical facilities exposed to hurricane-force winds. • Areas with high population density in tropical cyclone damage areas are at a higher risk for widespread impacts. The South Central Regional COG has the greatest percentage of the population located in high tropical cyclone damage areas. • Most Vulnerable State Asset(s): Based on the number and value of state-owned buildings and the likely location and severity of a tropical cyclone event, the state assets in New Haven County (especially near the coast) are the most vulnerable. Hartford, due to its importance to state operation continuity, also has high vulnerability.

Hazard	Problem Statement(s)
Earthquake	• Earthquakes can cause severe damage to buildings and building foundations. The most important critical facilities in each region should be reviewed for their ability to withstand potential impacts to help avoid increased negative consequences and delayed recoveries. 513 critical facilities are located in areas with a history of the highest ground acceleration during shaking from an earthquake in Connecticut. 44 of the facilities are designated for hazardous materials and 74 are designated as Energy lifelines. • People requiring short-term shelter due to an earthquake in Connecticut is estimated to be between 5,800 to over 19,300 people, depending on the specific scenario. In addition, the estimated number of displaced households ranged from roughly 11,900 to 38,400 in total. These estimates indicate that the potential does exist for individual assistance needs such as sufficient temporary shelter accommodations, and household relocation assistance (temporary or possibly permanent relocation). • Most Vulnerable State Asset(s): Earthquake is not as significant of a concern compared to many of the other hazards, but state assets located in more densely populated areas are the most vulnerable due to the risk to state operations.

Hazard	Problem Statement(s)
Wildland Fire	• Vulnerable populations may experience higher risk due to wildland fires. Smoke can worsen health problems for people with asthma and other breathing issues. Additionally, lower income residents are less likely to be able to afford the expense of clearing vegetative fuels, evacuating, fire-proofing their homes, or rebuilding after a fire. • Homes, businesses, and infrastructure without defensible space are most susceptible to wildland fires; this includes pumping stations and water storage tanks in wooded areas. • Wildland fires may grow in intensity during extreme heat events and become harder to control. • Northeastern Connecticut COG has the highest number of critical facilities located in the Wildland Urban Interface (WUI), with 91% of all critical facilities in the WUI. Northwest Hills COG has a similarly high percentage of critical facilities in the WUI, at 88%. The critical facilities in these COGs are highly vulnerable to wildland fires and should be fireproofed, relocated, or otherwise helped with a mitigation activity to reduce vulnerability. • Residents who live in wildland fire hazard areas, or who choose to purchase property in or around the wildland-urban interface, should be informed and educated on the risks of wildland fires and methods to fireproof their properties. • Most Vulnerable State Asset(s): Middlesex County had the highest percentage of total buildings at risk with 81% of buildings being in the Intermix or Interface WUI class. Windham County measured at the second highest exposed county in Connecticut with 73% of total buildings at risk. New London had the highest number of total buildings at risk, accounting for 53% of its total state-owned buildings.

Hazard	Problem Statement(s)
Tornado	• Populations located in communities without early warning systems or access to warning systems in their spoken language may be at a higher risk of tornadoes due to lack of warning time. Additionally, populations with functional needs or over the age of 65 may be at higher risk due to inability to evacuate without assistance. • Roads and bridges can be damaged due to strong wind or debris carried by tornado wind, resulting in road closures. Road closures may impact the movement of essential goods, and impact public transportation routes. Power outages may also occur, which can cause food spoilage at grocery stores and shelters or loss of function for essential equipment at hospitals and other critical facilities. • Naugatuck Valley COG & Capitol Region COG have the most critical facilities and populations with increased vulnerability to tornadoes. Tornado response and protection measures should be promoted among the public to protect the population in high vulnerability COGs. • Most Vulnerable State Asset(s): Hartford, Litchfield, and New Haven Counties are the only counties with state-owned buildings located in the high-density tornado area. New Haven County has the highest number of state-owned buildings exposed to tornado hazard, with 152. Hartford has the second highest number with 83.

Tropical Cyclone

Hazard Ranking: HIGH

Connecticut
Hazard Summary

Locations at Risk

Connecticut is located on the Atlantic coastline and has experienced all three types of tropical cyclone systems, including some of the worst hurricanes to make landfall in the United States.

Historic Frequency

It is challenging to predict when and where a hurricane will occur, but the greatest risk of a hurricane impacting the New England region is from late August to mid-October.

Climate Effects

- Climate model simulations indicate an increase in global tropical cyclone intensity in a warmer world, as well an increase in the number of very intense tropical cyclones. The amount of rainfall associated with a given storm is projected to increase.

Community Impacts

People

Residents may be displaced or require temporary or long-term shelter because of a hurricane or tropical storm. In addition, downed trees, damaged buildings, and debris carried by high winds can lead to injury or loss of life. Socially vulnerable populations are most susceptible, based on several factors including their physical and financial ability to react during a hazard and the location and construction quality of their housing.

State Government

Hurricanes can be costly to the state government when repairing and rebuilding infrastructure. Governmental approval and public opinion may also shift during post-hurricane recovery as the government works to address damage. All state-owned facilities and critical facilities are exposed to tropical and cyclone events of varying severity. The total number of state-owned buildings is 3,697, with an estimated value of $8.35 billion.

Built Environment

Strong windows, intense rainfall and storm surge associated with tropical cyclones can cause trees to fall, utility lines to collapse, roadway inundation and damage structural integrity of buildings.

Environment

Tropical cyclones can cause beach and dune erosion, destroying fragile coastal ecosystems. Saltwater intrusion may also occur with storm surge, contaminating freshwater ecological habitats and sources of public drinking water.

Economy

The damage to infrastructure, buildings, private property, as well as the impact to human health and wellbeing can be costly to address post-disaster. Business may experience decreased revenue and jurisdictions could see reduced economic growth after a particularly severe hurricane event.

Extreme Heat

Hazard Ranking: MEDIUM-HIGH

Connecticut
Hazard Summary

Locations at Risk

Extreme heat can occur anywhere in Connecticut. Fairfield County has the greatest average annual number of days with temperatures greater than 90°F.

Historic Frequency

Based on historical data, the state should experience 1-2 extreme heat events per year.

Climate Effects

- Average annual temperature in the state has increased by 3.5°F since 1900 and is expected to continue to increase.
- Extreme heat is projected to continue to increase in intensity with the hottest end of century projections in average temperature as 10°F warmer than the hottest year on record.
- Extreme heat will likely increase significantly in frequency. By the century's end, annual days with a maximum temperature greater than 90°F are projected to increase by 17.5 and 44.2 days under low and high emission scenarios respectively.

Community Impacts

People

Extremely hot and humid weather can lead to heat-related illness such as heat cramps, heat exhaustion, and heat stroke. Groups at greater risk of heat-related illness include but are not limited to outdoor workers, athletes, emergency responders, and socially vulnerable populations. Children, older adults, people experiencing homelessness, and low-income communities face a greater risk of heat-related illness and may lack resources to adapt or recover.

State Government

Critical facilities, utilities, and emergency operations are susceptible as heat degrades infrastructure. All state-owned facilities are exposed to extreme heat. A total of 2,133 state-owned buildings, or 58%, are in counties with greater than 5 historic extreme heat events recorded. This represents $3.87 billion ($3,874,586,123), making up 46% of total state-owned building value. Emergency personnel may also be impacted when working under extreme heat conditions.

Built Environment

Temperatures over 100 degrees can cause strain or degrade infrastructure. Higher temperatures result in more frequent use of air conditioning to cool buildings, which places increased demand on electricity-related critical infrastructure. The electrical grid can further be strained because of higher temperatures reducing transmission capacity.

Water-related critical infrastructure can be impacted by increased demand for drinking water consumption. Extreme heat can lead to pavement buckling and deterioration, as well as warping or buckling of railway tracks. High temperatures can cause bridges to expand and accelerate material degradation, reducing the stability and durability of bridges.

Environment

Agricultural crops can be damaged by extreme heat and livestock can be injured or killed by heat-related illness. Extreme heat can contribute to increased risk of wildfires.

Economy

Reduced agricultural crop production can lead to supply shortages and increased costs to farmers and consumers' Increased dependence on air-conditioning can lead to increased utility bills.

Flood

Hazard Ranking: MEDIUM-HIGH

Connecticut
Hazard Summary

Locations at Risk

All of Connecticut is susceptible to flooding, but communities located in the floodplain are more vulnerable to flood impacts. New Haven, Hartford, and Fairfield counties have the greatest geographic floodplain extents in the state.

Historic Frequency

It is estimated that the state will experience multiple flood events per year based on past flood events. New Haven, Hartford, Litchfield and Fairfield counties have the highest probabilities of flooding in the state.

Climate Effects

- Flood intensity and frequency of events is projected to increase in Connecticut due to climate change.
- Riverine flooding location is not projected to change, but coastal flooding may impact areas further inland due to stronger storms increasing the extent of coastal flooding.

Community Impacts

People

Populations living in or near the floodplain areas have the highest risk. People traveling in flooded areas or living in urban areas with poor stormwater management are also at risk.

Vulnerable populations include populations without access to early warning systems to evacuate from flooding; individuals over age 65, and individuals with functional needs; individuals with low English language fluency; populations with low socioeconomic status who may consider the economic impacts of evacuating.

State Government

A total of 284 state-owned buildings are located within the floodplain. The highest number of exposed facilities is in New London and Litchfield Counties. The 284 state owned buildings that fall within the 100-year and 500-year floodplain have a combined total of approximately $332 million dollars in building value.

Built Environment

A total of 227 critical facilities were determined to be located within the floodplain, with the highest amount of critical facilities exposed in Fairfield, New Haven, and New London counties. Floods can cause damage to the built environment through water damage and loss of power, which can render critical facilities inoperable.

Environment

The environmental impact of floods includes loss of crops, fluvial erosion, and potential for landslides. Landslides can occur following flood events when high flows oversaturate soils on steep slopes, causing them to fail.

Economy

In areas impacted by flood damage, economic impacts can be significant. Economic impacts may include loss of inventory, relocation costs, wage losses, and rental losses due to the repair or replacement of buildings.

Drought

Hazard Ranking: MEDIUM

Connecticut
Hazard Summary

Locations at Risk

All of Connecticut is vulnerable to drought conditions. Litchfield, Hartford, Tolland, and Windham counties may experience worse impacts of drought as they hold most of the state's agricultural lands.

Historic Frequency

Connecticut is expected to have a drought every two to three years based on historical data.

Climate Effects

- Climate projections indicate an increase in the number of dry days and days with extreme heat. This may cause an increase in the severity and length of drought conditions in the state.
- Projected longer dry periods in the summer months may result in more frequent and/or intense droughts.
- Connecticut's small reservoir systems could be sensitive to changes in water availability, possibly drying out.

Community Impacts

People

Low water flow due to drought can result in decreased sewage flows and subsequent increases in contaminants in the water supply. Drought may also reduce the quantity and quality of available drinking water.

State Government

All state-owned facilities are exposed to drought. This represents 3,697 structures with an estimated total value of $8.35 billion. State-owned facilities that are related to agriculture are more vulnerable to drought because they rely on potable water supply, which can be depleted during droughts. There are 86 agriculture-related state-owned facilities in Connecticut, all located in Tolland County. These include farm storage facilities, livestock facilities, and utilities that make sue of water.

Built Environment

Drought may cause minor structural damage if building foundations or footings are impacted by drier soil conditions. Decreased amounts and quality of water during drought events have the potential to reduce the availability of electricity to power buildings.

Environment

Drier summers and intermittent conditions may strain water irrigation water supplies, stress crops, and delay harvest. Dry conditions may also cause the ground to lose moisture, become unstable, lose topsoil, and erode. Ecological and wildlife health is negatively impacted by reduced water availability. Wildfire conditions can be exacerbated by drought conditions, increasing the risk of wildfire damage throughout the state.

Economy

Drought conditions may lead to increased flood prices throughout the state, due to reduced agricultural yield and death of livestock. Wildfire caused by drought could damage infrastructure and the built environment, costing the state in repairs and emergency labor.

Thunderstorm

Hazard Ranking: MEDIUM

Connecticut
Hazard Summary

Locations at Risk

Thunderstorms can occur anywhere in Connecticut and produce damage over a wide area, with severe localized effects.

Historic Frequency

Litchfield has the highest probable number of thunderstorm events per year, followed by Fairfield and Hartford counties.

Climate Effects

- Thunderstorm intensity has increased in recent decades, with scientific studies showing this trend will increase. Major clusters of summer thunderstorms will grow larger, occurring at higher frequencies and more intensity.
- By the end of the century, the number of summertime storms that produce extreme downpours could increase by more than 400% across parts of the United States. In addition, the intensity of individual extreme rainfall events could increase by as much as 70% in some areas.
- Maximum rainfall rates became 15% to 40% heavier, and intense rainfall reached farther from the storm's center.

Community Impacts

People

Lightning produced by thunderstorms can cause injury or fatality due to electrocution or fires.

Hail poses the threat of personal injury, particularly for hail stones of larger sizes. Residents in remote areas may be temporarily isolated and cut off from critical services and facilities if roads become impassable due to debris, fallen trees, and utility lines.

State Government

Government emergency services may face challenges reaching remote residents if roadways are blocked. Critical services may also be impacted due to power and communication outages. A total of 2,536, or 69%, of state-owned buildings are exposed to high or moderate thunderstorm hazard areas. This represents a value of $2.61 billion ($2,609, 257, 032), making up 31% ff the value of all state-owned buildings.

Built Environment

Lightning from thunderstorms can cause structural damage to state-owned buildings and critical facilities. Lightning can also create fires, which can further damage structural integrity.

Environment

Lightening may cause fires in farms and forests, killing livestock and harming biodiversity.

Economy

A major storm event can cause damages associated with property, debris, water infrastructure and loss of power. Delivery of services may also be slowed or halted in affected areas because of momentary losses in power and communications.

Extreme Cold

Hazard Ranking: MEDIUM

Connecticut
Hazard Summary

Locations at Risk

Inland, northern portions of the state, such as Litchfield, have more extreme cold temperatures than coastal areas.

Historic Frequency

Based on historical data, there is a chance of cold or extreme cold weather occurring one to two times per year.

Climate Effects

- Winters are projected to become milder, with fewer cold extremes, particularly across inland and northern portions of the Northeast.
- Winter warming is expected to reduce the number of direct cold-related deaths, but the decrease is projected to be smaller than increases in heat-related deaths in most regions.
- The impact of extreme cold events that do occur will become more severe although perceived threat is lower, as the state may not be prepared or have the proper response steps to keep the population safe.

Community Impacts

People

People, especially the elderly, outdoor laborers, children, and individuals that are homeless or in poor physical health, are vulnerable to cold-related illnesses (e.g., frostbite) and death (extreme hypothermia). Prolonged extreme cold can also lead to a drastic increase in cost to heat a home, which can impact people who are financially unstable and unable to afford to pay utility bills.

State Government

All state-owned buildings are exposed to extreme cold. This includes 3,697 state-owned buildings with an estimated total value of $8.35 billion.

Built Environment

Freezing temperatures in extreme cold events may cause pipes to burst and freeze in critical facilities and state-owned buildings. Cold weather can also weaken concrete and create cracks in drywall joint compounds and paint. Poorly insulated buildings or buildings without heat may be more vulnerable to freezing. Extreme cold events can cause roads and bridges to freeze. Ice, freezing rain, and snowstorms on roadways and bridges can cause traffic accidents and may lead to injury or loss of life.

Environment

Cold temperatures can cause trees and winter crops to die. Prolonged cold snaps can impact livestock not protected from the frigid temperatures. Cold weather can cause wastewater systems to fail, potentially leading to pollution in waterways.

Economy

Extreme cold events may impact agricultural productivity. Indirect impacts due to loss of agricultural productivity may include higher food prices across the state.

Tornado

Hazard Ranking: MEDIUM

Connecticut
Hazard Summary

Locations at Risk

All of Connecticut is susceptible to tornadoes, and historically, tornados have occurred in each county. The majority of tornados have occurred in the western counties in the state.

Historic Frequency

Based on past tornado events, it is estimated that the state will experience one to two tornado events per year.

Climate Effects

- Climate change may affect the frequency and intensity of future tornado events, but a lack of reliable historical data makes it difficult to determine whether there are any long-term trends in their frequency or intensity.

Community Impacts

People

The entire population of Connecticut is exposed to tornado impacts. The population in areas with greater tornado frequency are at a higher risk. Populations living in mobile homes, in vehicles, or outside at the time of a tornado event may also be at a higher risk and should seek shelter in a building. Following a tornado event, residents may be displaced or require temporary to long-term shelter.

Building materials or hazardous waste may be carried by strong winds of the tornado into water bodies, which could then become contaminated. This may impact drinking water quality or lead to the spread of water-borne diseases.

State Government

Roads and bridges can be damaged due to strong wind or debris carried by tornado wind, resulting in road closures. Road closures may impact the movement of essential goods, and impact public transportation routes. Power outages may also occur, which can cause food spoilage at grocery stores and shelters or loss of function for essential equipment at hospitals and other critical facilities. Using a tornado density approximation, 167 state-owned buildings are in tornado high hazard areas. The highest number of exposed facilities is in Hartford County and New Haven County, with 78 and 70 exposed buildings, respectively. The value of state-owned buildings in tornado hazard areas is approximately $1,215,000,000, making up 20% of the total value of state-owned buildings in the State.

Built Environment

The majority of deaths due to tornadoes occur in residential structures as they are generally more susceptible to tornado damage than commercial or industrial structures due to differences in building construction. Wood and masonry buildings, in general and regardless of their occupancy class, tend to experience more damage than concrete or steel buildings. High-rise buildings are also very vulnerable structures. Mobile homes are the most vulnerable to tornado damage and offer little protection to people inside.

Environment

Strong winds may uproot trees and other large plants, causing significant damage to the surrounding environment. Additionally, the loss of root systems can increase the potential for soil erosion in damaged areas.

Economy

Types of impacts may include loss of business functions, water supply system damage, damage to inventories, relocation costs, wage losses, and rental losses due to the repair or replacement of buildings. Recovery and clean-up costs can also be expensive.

Winter Weather

Hazard Ranking: MEDIUM-LOW

Connecticut
Hazard Summary

Locations at Risk

Winter weather affects the entire state due to its northern climate.

Historic Frequency

Based on historical events of winter weather, each county in Connecticut will likely experience at least four major winter weather events each year.

Climate Effects

- Annual mean temperature in Connecticut has increased by about 3°F (1.7°C) since 1895, faster than rising global mean temperatures. Due to rising temperatures, increased rain could create more ice storms.
- Climate models show that the frequency of winter weather is projected to decrease, while the intensity of winter weather is projected to increase with heavier (denser) snow.

Community Impacts

People

Power outages and road closures due to winter weather can result in limited access to food, basic supplies, and an adequate heat source. Health threats can become severe when frozen precipitation makes roadways and walkways very slippery, prolonged power outages occur, and fuel supplies are jeopardized. Winter weather will have a greater impact on those who are considered socially vulnerable, including homeless individuals or low-income individuals who cannot afford to heat their homes.

State Government

If critical facilities and state-owned buildings lose power, they may become inoperable. A total of 2,710, or 81%, of state-owned buildings are located in an area of the state with an average annual snow-depth of 2.5 feet or greater. This represents approximately $5.7 billion in estimated building value exposed to severe snow accumulation, making up 62% of the total known value of all state-owned buildings in the state.

Built Environment

Buildings may be damaged when snow loads exceed the design capacity of their roofs or trees fall due to excessive ice accumulation on branches. Ice and heavy snow have the potential to disrupt power and utilities, downing powerlines and uprooting trees onto vital infrastructure and components of the electrical grid. Winter weather events can cause transportation and utility infrastructure disruption. Roads and bridges may experience structural damage due to rapid temperature variation during winter weather, chemicals used to treat roads, and ice loads.

Environment

Runoff from plowed snow which contains sand, debris, salt, heavy metals, and petroleum has the potential to affect local water sources, streams, rivers, and drinking water.

Economy

Winter weather has the potential to disrupt traffic, close offices, and schools, and impact productivity and revenue statewide. A large concentration of Connecticut commuters are greatly impacted if winter weather disrupts train service to New York City.

Dam Failure

Hazard Ranking: MEDIUM-LOW

Connecticut
Hazard Summary

Locations at Risk

Out of 834 dams analyzed by the National Inventory of Dams, 287 are classified as high hazard potential. Fairfield and New Haven counties have the highest number of high hazard potential dams.

Historic Frequency

Dam failures are infrequent and usually coincide with major events such as earthquakes or excessive rainfall. The state is working to repair dams that pose the greatest risk.

Climate Effects

- Dams are designed partly based on the assumption of river's flow behavior and expected rainfall. As changes in weather patterns affect river flow, a dam may lose some of its designed margin of safety.
- Loss of designed safety margin can cause floodwater to overtop, creating unintended loads and possibly leading to dam failure.
- Climate science does not currently have conclusive changes in dam failure event locations, duration, or trend in event frequency.

Community Impacts

People

Dam failures pose a significant risk to human life as the magnitude of inundation flooding can cause severe injuries and fatalities. Vulnerable populations face greater risk as they may be unable to evacuate and relocate quickly. Communities may also experience the spread of illnesses after dam failure, as inundation flooding carries pollutants and pathogens.

State Government

Damage to utilities and major arterial roadways may impact emergency services, critical facility operations, and communications. A total of 182 state-owned buildings, or 4.9%, are located within a high or significant hazard inundation area. This amounts to over $433.8 million in building values exposed to the hazard area, roughly 9.4% of the total value of all state-owned buildings in Connecticut.

Built Environment

Dam failure can result in damage to habitable structures, local utility facilities and infrastructure, roadways, railroads, and critical facilities depending on the severity of the breakage.

Environment

Floodwater from dams can carry debris, sediment, and contaminants, causing long-term and short-term ecological damage. The sudden release of large volumes of water can cause habitat destruction, loss of wildlife, and contamination.

Economy

Dam failure can have a significant economic impact from the destruction of buildings and transportation infrastructure, leading to loss of business and reduced economic activity. Repairing damaged infrastructure is costly and time-consuming.

Wildland Fire

Hazard Ranking: MEDIUM-LOW

Connecticut
Hazard Summary

Locations at Risk

About 60% of Connecticut is forested and the state is also densely populated. In turn, it ranks among the highest in the nation in terms of the percentage of land considered in wildland urban interface areas.

Historic Frequency

Wildland fires will continue to be a highly probable occurrence (greater than 5 events per year) in the state, though the size and severity of these events are deemed minimal due to the rapid detection, containment, and suppression of fire incidents.

Climate Effects

- Climate model simulations indicate an increase in wildland fire intensity with warmer and longer dry seasons, as well as an increase in the number of very intense wildland fires. With the changing conditions, the severity of wildland fires is projected to increase.
- Climate changes also may increase winds that spread fires. Faster fires are harder to contain, and thus are more likely to expand into residential neighborhoods.
- Climate change may also cause an increase in invasive insect species in Connecticut forests. These species can kill mature tree species, creating an increase in vegetative fuel loads in wildland areas, and increasing the chance of wildland fire.

Community Impacts

People

Smoke and air pollution from wildland fires can be a health hazard, especially for sensitive populations including children, the elderly, and those with respiratory and cardiovascular diseases. Wildland fire may also threaten the health and safety of those fighting the fires. First responders are exposed to the dangers from the initial incident and after-effects from smoke inhalation and heat stroke.

State Government

A total of 1,529 state-owned buildings, 48.3% of state-owned buildings, are located within a wildland fire hazard area. This amounts to $1.9 billion in building values exposed to the wildland fire hazard, making up 23.0% of the total value of all state-owned buildings in the state.

Built Environment

Wildland fires can cause direct damage to buildings and infrastructure through exposure to heat and flames. Fire can ignite and consume structures as most buildings are made from flammable materials. Power lines are the most at risk to wildland fire because most poles are made of wood and susceptible to burning. In a wildland fire, pipelines that provide fuel could be ignited, leading to a catastrophic explosion.

Environment

Wildland fires can increase the probability of other natural disasters, specifically floods and mudflows. Flooding after a wildland fire is often more severe, as debris and ash left from the fire can form mudflows. Wildland fires destroy and contaminate large areas of vegetation, wildlife habitats, and watersheds that can take years to begin recovering recovery.

Economy

Wildland fire management can cost thousands of taxpayer dollars and involve thousands of man hours from volunteer firefighters. Negative effects on communities result from the initial loss of structures, subsequent loss of revenue from destroyed businesses, and a decrease in tourism.

Earthquake

Hazard Ranking: MEDIUM-LOW

Connecticut
Hazard Summary

Locations at Risk

Most earthquakes in the Northeast have a magnitude below 3.0 but can occur frequently. The New Haven-Greenwich and Hartford-East Haddam-Haddam-Portland areas are the most vulnerable to potential earthquakes in Connecticut.

Historic Frequency

Low magnitude earthquakes are likely to occur, but there is only a 3% chance that an earthquake equal or greater than 5.0 will occur in the next 50 years.

Climate Effects

- Evidence that climate change has an impact on the occurrence or magnitude of earthquakes is currently inconclusive.

Community Impacts

People

Hartford and New Haven are large population centers, with a higher concentration of low income and underserved communities, making these areas particularly vulnerable to the impacts of an earthquake.

State Government

Because the state is expected to grow in population and economic activity, areas where higher population growth is expected will be more vulnerable to earthquake impacts if earthquake-resilient building measures are not taken. All state-owned buildings are exposed to earthquakes. This represents 3,697 buildings with a total estimated value of $8.35 billion.

Built Environment

Earthquakes may damage the structural foundations and integrity of buildings and roadways. Earthquakes may damage the structure foundations and integrity of buildings. Ground motion caused by earthquakes can damage roadways and critical infrastructure such as bridges and tunnels.

Environment

Earthquakes may cause changes in the flow of groundwater, landslides, mud flows and soil strength, all of which can damage fragile ecological systems.

Economy

Severe earthquakes may cause high financial losses with the repairs associated with damaged structures and roadways.

5 | Capability Assessment

This chapter outlines State and local natural hazard mitigation policies, programs, and capabilities. In particular, the roles and responsibilities are described for the various agencies, departments, and offices that participated in the NHMP planning process.

5.1 Overview & Updates

Several significant changes have occurred since the development of the 2019 edition of this plan with regard to the State's capabilities analysis. The focus of State Agencies has been to further develop their programs related to hazard mitigation, which has included some internal changes in divisions. The Department of Energy and Environmental Protection (DEEP) established the Connecticut Equity and Environmental Justice Advisory Council (CEEJAC), a critical agency in advancing equitable climate action and minimizing the impact of environmental hazards on disadvantaged communities in the state. The Connecticut Institute for Resilience and Climate Adaptation (CIRCA), which was formed as a partnership between DEEP and UConn and is described in more detail below in **section 5.6.3.3**, has advanced its Resilient Connecticut initiative since the adoption of the last state plan. Furthermore, the Sustainable CT program has been established and many actions completed across the state, promoting local implementation of hazard mitigation activities and coordination between municipalities. Beyond the activities of different agencies and organization, there has been an increase in federal investment and funding towards hazard mitigation preparation and adaptation across the state including the National Fish and Wildlife Foundation Long Island Sound Futures Fund and the Connecticut Department of Energy and Environmental Protection Climate Resilience Fund. These grant opportunities are explained in detail in **section 5.3**.

Other changes to State capabilities that were described in the 2019 edition of this plan included the following state-level committees and task forces (described in **section 5.3.3**), some of which are either inactive at the present time or have ceded their interests to other agencies:

- The Adaptation Subcommittee of the Governor's Steering Committee on Climate Change (formed in 2008).
- The Governor's Two Storm Panel (formed in 2011).
- The Storm Response and Recovery Assessment Group (formed in 2011).

- The Connecticut GIS Council's Storm Response and Recovery Assessment Group (formed in 2011).
- The Shoreline Preservation Task Force (formed in 2012).
- The State Vegetation Management Task Force (formed in 2012).

Aside from internal state agency changes and the enhancement of CIRCA's involvement, several other changes in capabilities have been underway such as the 2019 Connecticut Physical Climate Science Assessment Report, updates to the State Building Code, updates to the State Conservation and Development Policies Plan, and development of a State Drought Preparedness and Response Plan. Although they do not represent new capabilities, this section of the NHMP describes the planning and technical assistance services provided by DCS Technical Services, the University of Connecticut, The Nature Conservancy, and other organizations that work with Connecticut's community leaders and officials.

Local capabilities are largely the same as they were in 2019. However, with the recognition that local communities have a significant role in disaster preparedness and implementation of hazard mitigation measures, this update to the NHMP provides more detail about these local capabilities.

The following sub-sections describe federal, state, intra-state regional, local (municipal), and non-governmental capabilities, in that sequence.

5.2 Federal Capabilities Supporting the State

This section describes the roles, executive orders and programs of the primary federal agencies that assist the State of Connecticut by providing funding for natural hazard mitigation and disaster response. This chapter does not serve as a grant administrative plan, however the general grant administrative procedures for some grants (e.g., FEMA) are included in this chapter. The following descriptions of the grant programs and general administrative practices are not intended to dictate state policy or decision-making procedures or outcomes.

In general, the potential financial support sources listed in this chapter have not changed from the 2019 Plan, except for the enactment of the Building Resilient Infrastructure and Communities Program (BRIC). Hazard mitigation assistance grant programs remain under one umbrella grant program and process, called the Hazard Mitigation Assistance Program (HMA).

5.2.1 Federal Executive Orders

The following Federal Executive Orders apply to natural hazard mitigation:

- Executive Order 11988 – Floodplain Management – This Executive Order requires federal agencies to evaluate the potential effects of any Federal action that may affect floodplains and to eliminate or reduce any negative effects of that action.
- PL-566, Section 205 – This Public Law authorizes the USDA, NRCS and the USACE to undertake flood and erosion control projects in cooperation with the DEEP.
- Executive Order 11990 – Protection of Wetlands.
- Executive Order 13653 - Preparing the United States for the Impacts of Climate Change
- Executive Order 13690 - Establishing a Federal Flood Risk Management Standard and a Process for Further Soliciting and Considering Stakeholder Input. On August 15, 2017, President Trump repealed Executive Order 13690, the Federal Flood Risk Management Standard (FFRMS). The repeal is part of Trump's efforts to eliminate and streamline permitting regulations for infrastructure projects. On May 20, 2021, Executive Order 14030 was signed, reinstating Executive Order 13690.
- Executive Order 13717 - Establishing a Federal Earthquake Risk Management Standard – Requires proactive steps to enhance the resilience of buildings to earthquakes that are owned, leased, financed, or regulated by the Federal Government.
- Executive Order 13728 - Wildland-Urban Interface Federal Risk Mitigation - Section 2 (f) requires agencies assisting in the financing of any buildings above 5,000 gross square feet within the wildland-urban interface at moderate or greater wildfire risk to consider updating its procedures for providing the assistance to ensure appropriate consideration of wildfire-resistant design and construction.
- Executive Order 13744 - Coordinating Efforts To Prepare the Nation for Space Weather Events – Requires a Federal plan to predict, protect against, and recover from extreme space weather events to minimize the extent of economic loss and human hardship.
- Executive Order 14030- Addresses the climate-related financial risks of federal programs. Directs several federal agencies to take action to address such risks. Ensures that climate risk and resilience actions are appropriately factored into the execution of the federal budget.
- Executive Order 14096– Directs agencies to better protect overburdened communities from pollution and environmental harms, including climate change.

Launch a new Office of Environmental Justice within the White House Council on Environmental Quality.

- Executive Order 14082 – Effectively implement energy and infrastructure provisions of the Inflation Reduction Act of 2022 (Public Law 117-169). Accelerate United States leadership in clean energy innovation, manufacturing, and deployment to address the climate crisis and create equitable economic opportunity.
- Executive Order 14017 – Build resilient, diverse, and secure supply chains to ensure national security and economic prosperity. Bolster the supply chains in the face of global disruptions including extreme weather events and climate change.
- Executive Order 14072 – Strengthen nation's forests by pursuing sustainable and science-based land management. Promote forest resilience on federal lands and promote sustainable local economic development.

5.2.2 FEMA (FEMA)

FEMA sponsors the major flood related programs through the Federal Insurance Administration, the National Preparedness Programs Directorate, and the State and Local Programs Directorate. FEMA also provides disaster assistance under Section 404 of the Robert T. Stafford Disaster Assistance and Recovery Act and the Flood Mitigation Assistance Act, Part 78.

5.2.2.1 FEMA Enabling Legislation

FEMA regulations are mandated under the Code of Federal Regulations (CFR), Title 44 Part 14. CFR Title 44, Part 13 entitled Uniform Administrative Requirements of Grants and Cooperative Agreements to State and Local Governments authorized the original FMA Regulations and the eventual HMA umbrella program. Executive Orders 12612 (Federalism), 11990 (Protection of Wetlands), and 11988 (Floodplain Management) have further requirements to be followed by FEMA.

The NFIP is mandated under the CFR Title 44 Sections 59 - 80 inclusive. FEMA Law - Title V, the National Flood Insurance Reform Act of 1994, Subtitles D, E, and F also apply.

5.2.2.2 Robert T. Stafford Disaster Relief and Emergency Assistance Act

On November 23, 1988, President Reagan signed the Robert T. Stafford Disaster Relief and Emergency Assistance Act (42 USC 5121 et seq.) into law. The Stafford Act provides disaster assistance to states and municipalities after major disasters through the Hazard Mitigation Grant Program (HMGP) and through individual assistance and public assistance aid programs. A major disaster is defined as a natural disaster that causes damage equal to

or greater than $1.00 per capita in a state. Based on current population information, this Act would normally be initiated for Connecticut after a disaster that caused greater than $3.2 million in damages statewide. If several states are affected by the same disaster, the $1.00 per capita standard may be waived.

5.2.2.3 FEMA Disaster Preparedness Programs

5.2.2.3.1 The National Flood Insurance Program (NFIP)

The U.S. Congress established the NFIP on August 1, 1968, with the passage of the National Flood Insurance Act of 1968. The NFIP is a Federal program administered by FEMA enabling property owners in participating communities to purchase insurance protection against losses from flooding. This insurance is designed to provide an alternative to disaster assistance to meet the escalating costs of repairing damage to buildings and their contents caused by floods.

The State of Connecticut and all of its communities participate in the NFIP. Connecticut's NFIP coordinator is located within DEEP's Land and Water Resources Division. FEMA prepares Flood Insurance Rate Maps (FIRM) which identify Special Flood Hazard Areas (SFHA), high risk areas defined as any land that would be inundated by a flood having a 1-percent chance of occurring in any given year. Participation in the NFIP is based on an agreement between local communities and the Federal government that states if a community adopts and enforces a floodplain management ordinance to reduce future flood risks to new construction in SFHAs, the Federal Government will make flood insurance available within the community as a financial protection against flood losses.

A major effort of FEMA is the continued implementation of the NFIP. This is accomplished by:

- Requiring the first floor of buildings to be elevated above the base flood elevation;
- Discouraging development in Coastal Barriers Resource Act (COBRA) areas;
- Conducting detailed engineering studies of most watercourses;
- Delineating floodways and floodway fringes showing flood conveyance and storage areas;
- Requiring communities to adopt floodplain management regulations;
- Subsidizing insurance for structures already in flood risk areas;
- Requiring insurance at actuarial rates for new structures proposed for flood risk areas;

- Joining the availability of disaster relief programs, federal grants and loans and federally backed mortgages to a community's willingness to participate in the program; and
- Requiring lending institutions to notify the purchaser or lessee of special flood hazard in advance of the signing of purchase or lease agreements.

The NFIP Community Rating System (CRS) was implemented in 1990 as a voluntary program for recognizing and encouraging community floodplain management activities exceeding the minimum NFIP standards. Above-and-beyond management is rewarded with discounted insurance premium rates within that community. In 2013, the CRS Coordinator's Manual was updated to reflect changing demographics and other built conditions, as well as current understanding of the effects of climate change.

The Biggert-Waters Flood Insurance Reform Act of 2012 was meant to gradually phasing out subsidized and grandfathered rates for Pre-FIRM properties and properties mapped in the floodplain with the goal of making the NFIP more self-sufficient through the use of actuarial insurance rates for all properties.

The Consolidated Appropriations Act of 2014 prohibited the implementation of Section 207 of the Biggert-Waters Act, which ensured properties' flood insurance rates reflect their full risk after a mapping change or update occurs. The 2014 Act stopped rate increases while new law was being developed to address rate concerns. This did not affect any other provision of Biggert-Waters, meaning FEMA is still prohibited from offering subsidized rates to Pre-FIRM properties purchased after Biggert-Waters was enacted, properties not insured when Biggert-Waters was enacted, and properties that experienced a lapse in coverage. Additionally, FEMA will continue to phase-out subsidized rates for Pre-FIRM non-primary residences, businesses, and properties with severe or repeated flooding.

The Homeowner Flood Insurance Affordability Act of 2014 repealed certain parts of the Biggert-Waters Act, restoring grandfathering, putting limits of certain rate increases and updating the approach to ensuring the fiscal soundness of the fun by applying an annual surcharge to all policyholders.

On November 17, 2017, the House passed HR 2874, the 21st Century Flood Reform Act, to revamp the NFIP and authorize the program for five more years.

As of April 1, 2023, FEMA has fully implemented the NFIP pricing methodology "Risk Rating 2.0". This methodology enables FEMA to deliver rates to individuals that are equitable, easy to understand, and more accurately reflect a property's flood risk. With Risk Rating 2.0, FEMA can equitably distribute flood insurance premiums across all policyholders based on home value and flood risk. This is accomplished using more flood risk variables including

flood frequency, multiple flood types, and distance to water source. Property characteristics such as elevation and the cost to rebuild are also accounted for.[233]

5.2.2.3.2 Civil Preparedness Activities

These activities are funded in part by FEMA and are described elsewhere in this chapter under the description for the Division of Emergency Management and Homeland Security (DEMHS).

5.2.2.3.3 FEMA Natural Hazard Mitigation Programs

FEMA administers the following major natural hazard mitigation programs:

- Hazard Mitigation Grant Program (HMGP);
- Building Resilient Infrastructure and Communities (BRIC);
- Pre-Disaster Mitigation (PDM) Grant Program; and
- Flood Mitigation Assistance (FMA).

The Biggert Waters Flood Insurance Reform Act of 2012 eliminated the RFC program, and the former SRL grant is covered under FMA.

The first three programs are administered under the Hazard Mitigation Assistance (HMA) umbrella program. Since the 2019 plan update, the BRIC was enacted under the HMA. Each program is similar in its funding formula (75% federal / 25% State or Local) except FMA, which may have a 90% federal and 10% state or local cost share for RLP and 100% federal share for SRL properties. However, each program has different eligibility criteria and timelines for project completion. Each program also requires that all projects be cost-effective (i.e., at least one dollar of benefit must result from each dollar of cost). This is accomplished through the utilization of FEMA's Benefit-Cost Analysis (BCA) software.

5.2.2.3.4 The Hazard Mitigation Assistance Program

HMA was created by FEMA to unify the application process of three of its current (HMGP, PDM, and FMA) and two of its former hazard mitigation grant programs (RFC, and SRL). As stated in the HMA Guidance document, "these programs provide significant opportunities to reduce or eliminate potential losses to State, Tribal, and local assets through hazard mitigation planning and project grant funding. Each HMA program was authorized by separate legislative action, and as such, each program differs slightly in scope and intent". Table 203 compares the three hazard mitigation grant programs.

[233] FEMA. Risk Rating 2.0: Equity in Action. https://www.fema.gov/flood-insurance/risk-rating

Potential projects under each program are shown in Table 204, as published in the March 2023, 2023 HMA Guidance Document.

Table 203. FEMA grant programs available under the Unified HMA Program

Feature / Program	Hazard Mitagation Grant Program	Flood Mitigation Assistance	Building Resilient Infrastructure And Communities
Program Type	Post-disaster	Pre-disaster	Pre-disaster
Funding Availability	Presidentially declared disaster	Annual appropriations	6% set aside from federal post-disaster grant funding
Competitive	No	Yes	Yes
Eligible Applicants	States, federally recognized tribes, territories, and the District of Columbia (DC)	States, federally recognized tribes, territories, and DC	States, federally recognized tribes, territories, and DC
Eligible Sub Applicants	State agencies, local governments, tribes, and private nonprofit organizations	State agencies, local governments and tribes.	State agencies, local governments and tribes.
Hazard Mitigation Plan Requirement	Yes	Yes	Yes
NFIP Participation	Communities with projects in Special Flood Hazard Areas (SFHAs)	Sub applicants and properties.	Communities with projects in SFHAs.

Source: HMA Unified Guidance Document, 2023

Table 204. Eligible activities by program

Eligible Activities	HMGP	BRIC	FMA
1. Mitigation Projects	✓	✓	✓
Property Acquisition	✓	✓	✓
Structure Elevation	✓	✓	✓
Mitigation Reconstruction	✓	✓	✓
Dry Floodproofing of Non-Residential Structures	✓	✓	✓
Secondary Power Source	✓	✓	

Eligible Activities	HMGP	BRIC	FMA
Localized Flood Risk Reduction Projects	✓	✓	✓
Non-localized Flood Risk Reduction Projects	✓	✓	✓*
Retrofit	✓	✓	✓**
Safe Room Construction	✓	✓	
Stabilization	✓	✓	✓
Wildfire Mitigation	✓	✓	
Tsunami Vertical Evacuation	✓	✓	
Warning System (excluding earthquake early warning system)	✓	✓	
Earthquake Early Warning System	✓	✓	
Aquifer Recharge, Storage, and Recovery	✓	✓	✓***
Innovative Mitigation Projects^	✓	✓	✓
2. Capability and Capacity Building	✓	✓	✓
New Plan Creation and Updates	✓	✓	✓^^
Planning-Related Activities	✓	✓	
Project Scoping/Advance Assistance	✓	✓	✓
Financial Technical Assistance			✓
Direct Non-financial Technical Assistance		✓	
Partnerships		✓	✓
Codes and Standards	✓	✓	

Eligible Activities	HMGP	BRIC	FMA
Innovative Capability and Capacity Building^	✓	✓	✓
3. Management Cost	✓	✓	✓

* For FMA, non-localized flood risk reduction projects such as dikes, levees, floodwalls, seawalls, groins, jetties, dams, and large-scale waterway channelization projects are not eligible unless the administrator specifically determines in approving a mitigation plan that such activities are the most cost-effective mitigation activities for the National Flood Mitigation Fund.

** Only flood-related retrofitting projects are eligible.

*** For FMA, aquifer recharge, storage, and recovery projects may be eligible if the purpose of the project is to provide flood mitigation benefits to NFIP participating communities and is demonstrated to eliminate future claims against the NFIP.

^ Any proposed action will be evaluated on its own merit against program requirements. Eligible activities will be approved on a case-by-case basis if assistance is available.

^^ For FMA, new plans and plan updates must provide for the reduction of flood losses to structures for which NFIP coverage is available.

Source: HMA Unified Guidance document, 2023

The following subsections will provide a more detailed description of each of the grant programs which have been placed under this umbrella grant program for application process efficiency. In Connecticut, DEMHS administers these grants.

5.2.2.3.4.1 The Hazard Mitigation Grant Program (HMGP)

Section 404 of the Stafford Act created the HMGP, which provides federal grants to states and municipalities for post-disaster natural hazard mitigation. HMGP funding is allocated to a state by the use of a sliding scale calculation. The total grant funding from HMGP cannot exceed 15% (for a state with a FEMA approved Standard Natural Hazard Mitigation Plan) or 20% (for a state with a FEMA approved Enhanced Natural Hazard Mitigation Plan) of the total disaster damages for the first $2 billion. After the total aggregate amount of $2 billion in damages the amount of funding for subsequent aggregate damages is decreased according to FEMA's formula. This FEMA formula calculates the next portion of aggregate damages between $2 billion and $10 billion by 10%, and for the next portion of aggregate damages between $10 billion and $35.333 billion, funding is calculated at 7.5%. The monies from this federal grant are given to Connecticut to support local mitigation projects, with a cost share ratio of 75% federal and 25% local match.

The HMGP is active only after a presidentially declared disaster. The HMGP grant provides communities with up to 75% of the total cost of projects that reduce or prevent further damage from natural disasters. Projects may include, but are not limited to: acquisition, relocation, elevation or demolition of flood prone structures, construction of small scale

flood control projects such as levees and small dams, retrofitting of structures to withstand wind and seismic forces and the drafting of plans that lead directly to the implementation of mitigation measures. Municipalities are not able to receive funding under the HMGP without an approved local hazard mitigation plan.

5.2.2.3.4.2 Building Resilient Infrastructure and Communities (BRIC)

The BRIC program was established as part of Section 2134 of the Disaster Recovery Reform Act, which amended Section 203 of the Stafford Act. In its amended version, Section 203 authorizes FEMA to provide technical and financial assistance to state, local, tribal and territorial governments for hazard mitigation measures that are cost-effective and reduce damage and destruction.

Funding is distributed under the BRIC program to support effective and innovative projects that promote partnerships and high-impact investments, promote equity, support strong building codes, and those that reduce future losses and minimize impacts on the Disaster Relief Fund (DRF). The program is designed to support hazard mitigation activities, reducing the risks posed to communities from disasters and natural hazards. Actions include protecting critical facilities and services. BRIC promotes effective activities that will increase resilience and encourage widespread adoption and investment in mitigation policies.

The BRIC program distributes financial assistance annually and requires a cost share. Applicants must have a FEMA-approved mitigation plan that has been adopted by the jurisdiction and applicable mitigation planning policies by the time FEMA obligates funding for activities under BRIC.

5.2.2.3.4.3 The Pre-Disaster Mitigation (PDM) Grant Program

The disaster experiences of the 1990s demanded that federal, state and local emergency managers reassess their approach to disaster response and recovery. It became apparent that the nation needed to shift its approach from a disaster-response driven system to a system based on pre-disaster or ongoing risk analysis so that the nation as a whole could become proactive rather than reactive to hazard events. This acknowledgement caused FEMA to re-evaluate its national strategy, resources and priorities. As a result of this evaluation, a unit for Natural Hazard Mitigation Planning was established in 1998 within FEMA to provide guidance and resources to states and local communities to promote and support the mitigation planning process. FEMA and the State of Connecticut place great value on the planning process as an approach to mitigation that must be promoted and supported in order to build sustainable, disaster resilient communities.

On October 20, 2000, Congress passed the Disaster Mitigation Act of 2000 (DMA 2000) (Public Law 106-390). This was the first major amendment to the Robert T. Stafford Disaster Relief and Emergency Assistance Act since that law was initially passed in 1988. Through DMA 2000, Congress approved the creation of a new mitigation grant program, PDM, to provide a mitigation funding mechanism that is not dependent on a presidential

disaster declaration and could fund both natural hazard mitigation construction projects and natural hazard mitigation planning initiatives. PDM funding has changed since its inception. In the program's initial years, a base allocation of funding was granted to each state and additional funds were provided using a population formula. Recently, FEMA has changed the program to a nationally competitive grant program where projects from all states compete against each other with FEMA choosing the winning projects that will receive funding. Eligible PDM projects include: state and local natural hazard mitigation planning, mitigation projects, and community outreach and education. The PDM grant is a 75% federal 25% local cost-share grant (e.g., cash, in-kind services, etc.).

For fiscal years 2002-2007, a main focus of the PDM program was on the development of local or regional natural hazard mitigation plans to help meet the new local natural hazard mitigation planning requirements of DMA 2000. Communities applying for any FEMA mitigation grant to conduct mitigation projects (e.g. home elevations, acquisitions) must have an adopted local natural hazard mitigation plan in place prior to receiving funds.

5.2.2.3.4.4 Flood Mitigation Assistance (FMA)

In 1994 the United States Congress established FMA to assist state and local governments in funding cost-effective actions that reduce or eliminate the long-term risk of flood damage to buildings, manufactured homes, and other insurable structures. The long-term goal of FMA is to reduce or eliminate claims under the NFIP through the use of mitigation activities with a specific focus on repetitive loss properties. Repetitive loss properties are those properties that suffer at least 2 claims of more than $1,000 each for flood damage in a 10-year period.

The FMA program provides cost-share grants for three purposes: 1) planning grants to states and communities to assess the flood risk and identify actions to reduce that risk; 2) project grants to execute measures to reduce flood losses; and 3) technical assistance grants that states may use to fund staff salary and program expenses in order to administer the FMA program.

Under the FMA program, the definitions of repetitive loss and severe loss properties have been modified and the cost-share requirements have changed to allow more federal funds for properties with repetitive flood claims and SRL properties. There is no longer a limit on in-kind contributions for the nonfederal cost share.

5.2.2.3.5 The Emergency Management Performance Grant Program (EMPG)

The purpose of the EMPG Program is to make grants to States to assist State, local, territorial, and tribal governments in preparing for all hazards, as authorized by the Robert T. Stafford Disaster Relief and Emergency Assistance Act (42 U.S.C. 5121 et seq.). Title VI of the Stafford Act authorizes FEMA to make grants for the purpose of providing a system of emergency preparedness for the protection of life and property in the United States from

hazards and to vest responsibility for emergency preparedness jointly in the Federal Government, States, and their political subdivisions. The Federal Government, through the EMPG Program, provides necessary direction, coordination, and guidance, and provides necessary assistance, as authorized in this title so that a comprehensive emergency preparedness system exists at all levels for all hazards.

The EMPG supports core capabilities across the five mission areas of Prevention, Protection, Mitigation, Response, and Recovery based on allowable costs. Either the State Administering Agency (SAA) or the State's EMA are eligible to apply directly to FEMA for EMPG Program funds on behalf of State and local emergency management agencies, however only one application will be accepted from each State or territory. In Connecticut, the EMPG is administered by DEMHS.

5.2.2.3.6 High Hazard Potential Dam (HHPD) Grants

There are several funding sources at the federal and state level that aim to mitigate vulnerabilities to and from high hazard potential dams, as well as the potential consequences associated with dam incidents. The following overviews a few programs available.

- **FEMA Rehabilitation of High Hazard Potential Dams (HHPD):** Federal grant funding that provides technical, planning, design, and construction assistance for rehabilitation of eligible high hazard potential dams.
- **FEMA National Dam Safety Program (NDSP):** Financial assistance to states for strengthening dam safety programs, including permit review, EAP submittal, dam inspections, and dam safety training.
- **USACE Corps Water Infrastructure Financing Program (CWIFP):** Local investment in infrastructure projects that enhance community resilience to flooding and improve environmental quality. Targeted at water resource infrastructure projects, like dam safety projects for non-federally owned and operated dams.
- **U.S. Fish and Wildlife Service (USFWS) National Fish Passage Program:** Projects investing in restoring aquatic ecosystems and addressing outdated, unsafe or obsolete dams, culverts, levees, and other barriers fragmenting our nation's rivers and streams.
- **National Oceanic and Atmospheric Administration's (NOAA) Restoring Fish Passage through Barrier Removal:** Funding to support projects that reopen migratory pathways and restore access to healthy habitat for fish around the country.
- **Connecticut Office of Policy and Management (OPM) Small Town Economic Assistance Program (STEAP):** Program that delivers grants to small towns for

economic development, community conservation, and quality-of-life capital projects.

- **Connecticut DEEP Flood and Erosion Control Board Program:** Noncompetitive state funding for repair of municipality-owned dams.

5.2.2.3.7 Actions to Reduce Repetitive and Severe Repetitive Loss Structures

The state of Connecticut, along with associated agencies, continues to address the number of repetitive and severe repetitive loss structures in the state, identified in Section 4.3.6.2. CT DEEP provides technical assistance to municipalities who want to decrease risk to properties and encourages all local communities to include a relevant action to RPL and SRL properties in the LHMP. Connecticut and its communities all participate in the NFIP, with increased interest in CRS participation among municipalities. Federal funds available through grant programs like FMA and HMGP support flood mitigation for RLP and assist local governments in reducing long-term flood risk to these properties. Prioritization of mitigation grants for SRL and RL properties support the state's initiative to address the number of these properties in Connecticut.

The Connecticut Interagency Hazard Mitigation Committee helps DEMHS to review and prioritize grant applications. Mitigating RL and SRL properties is a priority, however, the committee prefers acquisition over elevation. With the majority of the State's RL and SRL properties along the shoreline, in affluent areas, recent HMA programmatic changes favoring socially vulnerable populations and placing prioritization limits on the value of properties and the cost of elevation has further challenged the state's ability to assist communities with elevating these properties. Another challenge is with the willingness of some municipalities to participate as subgrantees. In the past two years, WestCOG has stood up a program to assist its member municipalities with elevation and acquisition of RL and SRL properties and to help ease the burden on its communities as subgrantees. Other COGs have expressed interest in similar programs.

5.2.3 Natural Resources Conservation Service

The United States Department of Agriculture's (USDA) NRCS provides significant technical and engineering assistance to the DEEP, DEMHS, and other state agencies in the planning and implementation of activities. Most projects are conducted under Public Law (PL)-566, the Small Watershed Program Authorization and are related to soil erosion and flooding. A member of the NRCS is also appointed to the CIHMC (as discussed later).

NRCS projects are conducted under federal PL-566 and CGS Sections 22a-318 through 324 and provide the framework for state cooperation with the NRCS when utilizing the Watershed Protection and Flood Prevention Act, PL 83-566 Section 6, Statute 666 for planning and implementation of flood damage reduction projects on a watershed basis.

5.2.3.1 NRCS Water Resources Programs

The Watershed Protection and Flood Prevention Act, P.A. 83-566, CGS 22a-318 through 22a-323, authorizes the Secretary of Agriculture to “cooperate with states and local agencies in the planning and carrying out of works of improvement for soil conservation and other purposes." It provides for technical and financial assistance by the department through the NRCS to local organizations representing persons living in small watersheds (less than 250,000 acres). The Act provides for a project-type approach to solving land, water, and related resource problems. Flood prevention is an eligible purpose for which NRCS can pay 100% of the costs for planning studies, design and construction of structural solutions. The local sponsoring organization is solely responsible for land rights, operation and maintenance. Often these costs are equal to 1/2 the total costs of the project. For on-site measures such as flood proofing, the costs for implementation are divided 75% federal and 25% non-federal.

Federal Level Recommendation 3 of "A Unified National Program for Floodplain Management" and Section 6 of PL 83-566 provide the authorization to NRCS for Floodplain Management and Cooperative USDA River Basin studies.

Floodplain Management Studies (FPMS) authorized in Section 6 of PL-566 are a means of NRCS assisting state agencies and communities in the development, revision, and implementation of their floodplain management programs.

A FPMS can identify site-specific flood problem areas (or potential problem areas), inventories natural values, incorporates public participation, studies the community's management alternatives, and provides for study follow-up assistance. A FPMS may serve as the source of technical data for the community to implement local floodplain management programs.

5.2.3.2 Emergency Watershed Protection (EWP)

The Emergency Watershed Protection Program (EWP) is administered by the NRCS under Section 216, PL 81-516 and Section 403 of Title IV of the Agricultural Credit Act of 1978, PL 95-334. The EWP program provides the State and local units of government with technical and financial assistance to plan, design and implement measures that repair watershed impairments resulting from natural disasters. This program’s objective is to assist in relieving imminent hazards to life and property from floods and the products of erosion created by natural disasters. Any corrective measure must prevent flooding or soil erosion, and reduce threats to life or property.

Authorized EWP technical and financial assistance may be made available when an emergency exists. Federal funds may bear a percentage of the construction costs of emergency measures in an exigency situation as well as in a non-exigency situation. Sponsors are responsible for obtaining any needed land rights and federal, state, and local permits. Watershed and Flood Prevention Operations (WFPO)

The Watershed Protection and Flood Prevention Program helps units of federal, state, local and tribal of government (project sponsors) protect and restore watersheds up to 250,000 acres. This program provides for cooperation between the Federal government and the states and their political subdivisions to work together to prevent erosion, floodwater, and sediment damage; to further the conservation, use, and disposal of water; and to further the proper use of land in authorized watersheds. In October 2017, NRCS announced they will be investing $150 million in 48 new projects.

5.2.4 United States Army Corps of Engineers (USACE)

The USACE has undertaken several large flood control projects all across New England to reduce flood levels by retaining storm water runoff in upstream impoundments. These projects located in the Connecticut, Housatonic, Naugatuck, and Thames river basins. These structural measures have saved the State millions of dollars in flood damages.

The USACE has provided significant flood assistance to Connecticut and continues to do so. In its role as an assisting federal agency, the USACE has undertaken several flood and erosion control projects within the State since the 1950s.

The USACE has worked in Connecticut to develop several floodplain management studies. These studies include ice jam protection on the Salmon River in Haddam and East Haddam, and a feasibility study of flood protection on the West River in West Haven, Connecticut and New Haven, Connecticut.

Connecticut is able to undertake projects with the USACE as authorized under CGS Section 25-76 entitled "Small Flood Control, Tidal and Hurricane Protection and Navigation Projects; and State Cooperation with Federal and Municipal Governments," and through CGS Section 25-95 entitled "Agreements Concerning Navigation and Flood and Erosion Control."

The USACE works in cooperation with the DEEP by providing technical assistance on flood control and prevention projects, and assistance to the State's flood warning system.

The USACE Building Resilience website contains information on how to improve building conditions to be more resilience to natural disasters.[234]

[234] US Army Corps of Engineers. Building Resilience. http://www.usace.army.mil/Missions/Sustainability/Building-Resilience/

5.2.5 United States Department of Agriculture (USDA)

Funding for state and local governments with regard to wildfire mitigation is available from the USDA Forest Service. Grant programs under this federal agency include the following:[235]

Volunteer Fire Assistance - The Volunteer Fire Assistance program provides critical funding and technical assistance directly to local and volunteer fire departments that protect communities with populations under 10,000. Funds improve the ability of rural fire departments to respond to wildfires, especially in the wildland/urban interface. Funding can be used for training and equipment to complement federal firefighting commitments, so protection capabilities can be enhanced across ownerships. Delivery is through consolidated grants to the State Forester, and funds are cost-shared on a 50/50 basis.

State Fire Assistance - The State Fire Assistance program provides technical training, financial assistance, and equipment to states to ensure that state and local firefighting crews can deliver a safe, effective, and coordinated response to wildland fire. Funding is available for preparedness, high priority prevention, and mitigation education programs including FIREWISE. These funds complement readiness levels at the federal level and are available through consolidated grants to State Foresters. Funds are cost-shared on a 50/50 basis.

Community Planning - Funding is available for development and revision of communities' strategic, action, and fire risk management plans. The goal for these funds is to increase community resiliency and capacity while creating an environment for development and growth. Funding will be targeted to communities most impacted by fires. Delivery is through grants awarded directly to communities and to a variety of other partners including state, county, and tribal governments, and not-for-profit corporations identified by the National Forestry Service in conjunction with the State Department of Commerce. Funds are cost-shared 80/20.

5.2.5.1 USDA Climate Hubs

In an effort to mitigate climate-related risks, USDA has established seven regional hubs for risk adaptation and mitigation to climate change. These Hubs will deliver science-based knowledge and practical information to farmers, ranchers and forest landowners on a regional basis to support decision-making related to changing climate. The Hubs provide technical support for land managers to respond to drought, heat stress, floods, pests, and changes in the growing season, and assessments and regional forecasts for hazard and adaptation planning to provide more time to prepare. They also facilitate outreach and

[235] Source: grant program descriptions excerpted from the USDA Forest Service website: http://www.fs.fed.us/r1/pgr/afterfire/keypoint4/contacts.shtml. This site provides a description of many of the USDA Forest Service grants available and links to other webpages that describe additional grant programs.

education for farmers, ranchers and forest landowners on ways to mitigate risks and thrive despite change. The Northeast Climate Hub encompasses 12 states, including Connecticut. There is also a Northern Forests Climate Hub, which prepares regional land managers for climate change risks, supporting them to make climate-informed management decisions.[236]

5.2.5.2 USDA Disaster Resource Center

The USDA Disaster Resource Center provides information about specific disasters and emergencies, how to prepare, recover, and help build long-term resilience, as well as information about USDA assistance during disaster events. Categories of disasters include climate, drought, storms, hurricanes, tornadoes, flooding, and wildland fire.[237]

5.2.5.3 Extension Disaster Education Network

The Extension Disaster Education Network (EDEN) is made possible by USDA Cooperative Extension and NOAA Sea Grant Extension programs. The program reaches over 300 delegates in 50 states and 3 US territories. Their Resource Catalog combines research-based publications, websites, webinars, courses and exercises developed by the Network's member institutions, helping increase knowledge-sharing between states. [238]

5.2.6 U.S. Environmental Protection Agency Resilience and Adaptation in New England

Resilience and Adaptation in New England (RAINE) is a database that catalogs actions being taken by New England communities to adapt to climate change. The goal of the site is to share lessons being learned, discover how to better assist municipalities, and promote collaboration. RAINE provides information about actions at the state, regional or local level. It not only includes links to web pages, reports and plans but also examples of presentations that communities use to engage their citizens, what tools they used to identify their vulnerabilities and who funded their projects.[239]

5.2.6.1 Climate Change Adaptation Resource Center

EPA's Adaptation Resource Center (ARC-X) is an interactive resource to help local governments effectively deliver services to their communities even as the climate changes. Decision makers can create an integrated package of information tailored specifically to their needs. Once users select areas of interest, they will find information about: the risks posed by climate change to the issues of concern; relevant adaptation strategies; case

[236] USDA. Climate Resilience Hubs. https://www.climatehubs.oce.usda.gov/
[237] USDA. Disasters. https://www.usda.gov/topics/disaster
[238] Louisiana State University. Extension Disaster Education Network. https://eden.lsu.edu/
[239] US EPA. Resilience and Adaptation in New England. https://www.epa.gov/raine

studies illustrating how other communities have successfully adapted to those risks and tools to replicate their successes; and EPA funding opportunities.[240]

5.2.6.2 Climate Ready Estuaries Program

The Climate Ready Estuaries program works to help the National Estuary Programs (NEPs) and all environmental mangers to address climate change in watersheds and coastal areas. This effort, initiated in 2008, brings together EPA's Oceans and Coastal Protection Programs and Climate Change Programs to build additional capacity in the NEPs and coastal communities as they prepare to adapt to the effects of climate change. The program coordinates and communicates with other federal agencies and external partners that work on coastal adaptation efforts to share information, identify opportunities for collaboration, and minimize duplication of effort.[241]

5.2.6.3 Drinking Water and Wastewater Resilience

The U.S. EPA provides resources for assessing, planning, and training communities on improving the resilience of their water and wastewater systems. Resources include instructions for conducting risk assessments, assessing financial impacts of a water disruption, developing emergency response plans, building hazard resilience, sharing resources during emergencies, and finding federal funding for utilities. They also provide tools such as the Response On-The-Go Tool, and the Route to Resilience Tool, which guides users through the process of building their own unique Roadmap to Resilience.[242]

5.2.6.4 Water Infrastructure and Resiliency Finance Center

The Water Infrastructure and Resiliency Finance Center is an information and assistance center, helping communities make informed decisions for drinking water, wastewater, and stormwater infrastructure to protect human health and the environment. The Center's goals focus on research, advising stakeholders, innovation, and building large networks.[243]

5.2.6.5 Governor's Institute on Community Design

The Governors' Institute on Community Design helps governors and their staff make informed decisions about investments and policy decisions that influence the economic health and physical development of their states. Working with a governor's staff and cabinet, the institute provides tailored technical assistance, typically through one- to two-day workshops that bring together the governor and his or her staff with nationally renowned experts to address issues the governor has identified. This assistance is designed to provide state leaders with practical strategies for creating vibrant, economically competitive communities. Assistance often includes exploring the

[240] US EPA. Adaptation Resource Center. https://www.epa.gov/arc-x
[241] US EPA. Climate Ready Estuaries. https://www.epa.gov/cre
[242] US EPA. Water Resilience. https://www.epa.gov/waterresilience
[243] US EPA. Water Finance Center. https://www.epa.gov/waterfinancecenter

connections among economic development, transportation, land use, housing, energy, and the environment. The Governors' Institute has helped the governors of Iowa, Vermont, and New Hampshire recover from disaster events and prepare for a more resilient future.[244]

5.2.6.6 Smart Growth Strategies for Disaster Resilience and Recovery

In 2016, EPA and the FEMA updated a Memorandum of Agreement that makes it easier for the two agencies to work together to help communities become safer, healthier, and more resilient. The agencies collaborate to help communities hit by disasters rebuild in ways that protect the environment, create long-term economic prosperity, and enhance neighborhoods. FEMA and EPA also help communities incorporate strategies that improve quality of life and direct development away from vulnerable areas into their hazard mitigation plans. EPA and FEMA are using the lessons they learn from working together under this agreement and with other federal agencies to better coordinate assistance to communities on hazard mitigation planning and post-disaster recovery. The Memorandum of Agreement also helps the agencies work together on climate change adaptation.[245]

In February 2023, EPA along with other agencies published the Disaster Resilient Design Concepts report. The design in the document can help communities reduce the impact of disaster, recover more quickly, and create more equitable living conditions by reducing hazards. Concepts are intended to be used by stakeholders to reimagine the design of towns and neighborhoods to serve multiple purposes and provide co-benefits for hazard mitigation or adaptation. The report covers natural hazards including wildfire, hurricane and coastal flooding, extreme heat, and drought.[246]

5.2.6.7 Other Resilience and Adaptation Resources

EPA provides a variety of resources for preparing communities for the effects of climate change. These include the Coastal Adaptation Toolkit, Adaptation Planning Workbook, Risk Identification Checklists, Online Tool for Vulnerability Assessments, Sea Level Rise Resources, Adaptation Options for Coastal Areas, King Tides Fact Sheet, and archives of Climate Change Adaptation Projects.[247]

[244] US EPA. Governor's Institute Community Design. https://www.epa.gov/smartgrowth/governors-institute-community-design
[245] US EPA. Smartgrowth. https://www.epa.gov/smartgrowth
[246] US EPA. Disaster Resilient Design Concepts. February 2023. https://www.epa.gov/system/files/documents/2023-03/Disaster-ResilientDesignConcepts_Feb2023v-6_Final.pdf
[247] US EPA. https://www.epa.gov/cre

5.2.7 U.S. Department of Housing and Urban Development

The U.S. Department of Housing and Urban Development (HUD)'s Office of Economic Development leads multiple programs that aim to prepare for the impacts of climate change.[248] In the HUD Strategic Plan for 2018 – 2022, Strategic Objective: Support Effectiveness and Accountability in Long-Term Disaster Recovery is to "facilitate housing, infrastructure, and economic recovery while ensuring investments mitigate against future disasters and create resilience communities."[249] In support of this objective, the following programs provide support for greater capacity in and utilization of resilient approaches to community development at the local, regional, and state levels.

- Rebuild by Design: Launched in 2013 in response to Hurricane Sandy, Rebuild by Design was a design competition for implementable resilience solutions for impacted areas. Bridgeport, CT was chosen as a winner, and received $10 million for a comprehensive project in the South End of the city.

- National Disaster Resilience Competition: Based on the success of Rebuild by Design, the National Disaster Resilience Competition (NDRC) was a collaboration between HUD and the Rockefeller Foundation that competitively awarded nearly $1 billion in HUD Disaster Recovery funds to eligible communities. Connecticut was one of 13 winners, receiving $54,277,359 to support a pilot program in Bridgeport that is part of the broader Connecticut Connections Coastal Resilience Plan.

- Climate Change Adaptation Plan: HUD created a department-wide Climate Change Adaptation Plan as part of the Obama Administration's objective to ensure preparedness in the face of more extreme weather events and climate-related risks.

- Community Resilience Portal: HUD created the Community Resilience Portal to provide a catalogue of resources that local planners could use to help plan and prepare for changing natural hazards when undertaking HUD-funded activities. HUD's annual programs fund the construction and maintenance of infrastructure and housing in communities across the country. In addition, Congress has appropriated over $45 billion to HUD since 2000 to fund disaster recovery activities.

- Climate Action Plan: HUD released a Climate Action Plan in November of 2021, detailing a comprehensive strategy to reduce the agency's energy and carbon

[248] US Department of Housing and Urban Development. Economic Development. https://www.hud.gov/program_offices/economic_development/resilience/about
[249] US Department of Housing and Urban Development. HUD Strategic Plan. 2018. https://www.hud.gov/sites/dfiles/SPM/documents/HUDSTRATEGICPLAN2018-2022.pdf

footprint and direct communities toward building more equitable, efficient, and sustainable housing infrastructure.[250]

- Community Development Block Grant (CDBG) Program: provides flexible federal funding to localities and states to support economic development, community development, and infrastructure. CDBG Program supports community development activities to build stronger and more resilient communities.

In addition to these programs, HUD prioritizes environmental justice (EJ) in all its initiatives. In 2012, HUD published its first Departmental Environmental Justice Strategy to address EJ concerns and increase access to environmental benefits through HUD programs. In particular, programs related to climate resilience, energy efficiency, and place-based work address environmental justice.

5.2.8 U.S. Climate Resilience Toolkit

The U.S. Climate Resilience Toolkit is a partnership of federal agencies and organizations led by NOAA and initially launched on November 17, 2014. This inter-agency initiative operates under the auspices of the United States Global Change Research Program. The site is managed by NOAA's Climate Program Office and is hosted by NOAA's National Centers for Environmental Information. The Toolkit improves people's ability to understand and manage their climate-related risks and opportunities, and to help them make their communities and businesses more resilient to extreme events. The Toolkit offers information from all across the U.S. federal government in one easy-to-use online location.[251]

5.3 State Hazard Mitigation Capabilities

Connecticut has many state statutes, regulations, policies and practices that achieve the goal of natural hazard mitigation in areas prone to natural hazards. During the past 100 years, flooding has caused more damage and loss of life than any other natural disaster in the State. Most of the State's programs and policies deal either directly (structural mitigation) or indirectly (non-structural methods through enforcement, education and monitoring) with flooding. These state programs and policies focus on damage prevention within special flood hazard areas (SFHAs) and in some cases the 500-year flood zones (0.2% annual chance flood zones). Since all municipalities within Connecticut contain mapped SFHAs areas within their political boundaries, these programs are implemented on a statewide basis and affect every municipality.

Structural flood mitigation projects in Connecticut have either dealt with the initial causes of flooding (e.g., construction of flood control projects to reduce the frequency of flooding)

[250] US Department of Housing and Urban Development. Climate Action Plan. November 2021. https://www.hud.gov/sites/dfiles/Main/documents/HUD-Climate-Action-Plan.pdf
[251] US Climate Resilience Toolkit. https://toolkit.climate.gov/content/about

or the effects of the flooding (e.g., elevating or moving structures out of the floodplain). The DEEP has historically been the lead agency for the pursuance of flood hazard mitigation activities and administration of federal mitigation grants in Connecticut, although this responsibility was transferred to DEMHS in 2013. The two agencies work together to address flooding and flood mitigation.

The distribution of state or federal funding requires full compliance with all regulations. Federal funding for the programs are provided through the smart-link system maintained between FEMA and DEMHS. Transfer invoices are utilized to channel approved funding to the eligible projects. A formal contract is entered into between the applicant and the State to ensure compliance with all applicable regulations.

5.3.1 State of Connecticut Enabling Legislation

State participation in the NFIP, Stafford Act, and related actions are authorized under the Connecticut General Statutes Section 25-68b through 25-68h and associated regulations. Other provisions of FEMA grant programs are authorized under Connecticut General Statutes Title 28, Chapter 517, Section 28 9, 28 15a, and 28 15b, Civil Preparedness and Emergency Services. Additional authorization is found in the Federal Aid Connecticut General Statutes, Title 4, Chapter 24, Section 4 28a, Management of State Agencies, State Properties and Funds, Advisory Commission, and Section 25-68b et seq. flood control projects.

5.3.1.1 State Floodplain Management Act

The Flood Management Act as referenced in the Connecticut General Statutes (CGS) Section 25-68b through Section 25-68h outlines the flood management responsibilities of DEEP and lays out the rules and regulations to be used by all state agencies when undertaking or funding activities within or affecting floodplain areas, which are normally coincident with SFHAs in this context.

CGS Section 25-68b defines the terms (e.g., Floodplain, Base Flood, etc.) used in the Flood Management Act. Section 25-68c goes beyond the regulations contained within the National Flood Insurance Program (NFIP) in many aspects and references the NFIP standards as a minimum standard.

The Commissioner of DEEP has the following powers and duties under Section 25-68c:

- To coordinate, monitor and analyze the floodplain management activities of state and local agencies.
- To coordinate flood control projects within Connecticut and be the sole initiator of a flood control project with a federal agency.
- To act as the primary contact for federal funds for floodplain management activities sponsored by the State.

- To regulate actions by state agencies affecting floodplains except conversion by the University of Connecticut of commercial or office structures to an educational structure.
- To regulate proposed state actions that impact natural or man-made storm drainage facilities located on property that the commissioner determines to be controlled by the state, including, but not limited to, programs that regulate flood flows within a floodplain and site development that increases peak runoff rates.
- To designate a repository for all flood data within the State.
- To assist municipalities and state agencies in the development of comprehensive floodplain management programs.
- To determine the number and location of State-owned structures and uses by the State in the floodplain and to identify measures to make such structures and uses less susceptible to flooding including flood-proofing or relocation.
- To mark or post the floodplains within lands owned, leased or regulated by state agencies in order to delineate past and probable flood heights and to enhance public awareness of flooding.
- To designate the base flood elevation for a critical activity where no such base flood elevation is designated by the NFIP. The Commissioner may add a freeboard factor to any such designation.
- To require that any flood control project be designated to provide protection equal to or greater than the base flood.

Section 25-68f mandates that if more than one floodplain designation exists for the same area, the most stringent designation shall be used to fulfill the provisions of sections 25-68b to 25-68h, inclusive.

5.3.1.2 An Act Concerning Floodplain Management and Hazard Mitigation

During the 2004 session, the State legislature passed the Floodplain Management and Hazard Mitigation Act. This legislation covers many aspects of floodplain management. It requires municipalities to revise their current floodplain zoning regulations or ordinances to include new standards for compensatory storage and equal conveyance of floodwater. Municipalities were not required to make such revisions until they revise their regulations for another purpose. The DEEP has developed model regulation language which incorporates these new State requirements and has issued this model floodplain ordinance to communities for their use since 2007.

Other enabling State Legislation related to flood plain management includes:

- Sections 22a-28 through 22a-45, inclusive – Inland Wetlands and Watercourses Act.
- Section 22a-401 through 22a-410, inclusive – Dam Safety.
- Section 13a-94 – Construction Over and Adjacent to Streams.
- Section 25-84 through 25-98 – Flood & Erosion Control Board Statutes.
- Section 22a-318, 22a-321 – NRCS Statutes.
- Section 25-74 through 25-76 – Authorization to perform flood and erosion projects under Federal authority.
- Section 22a-342 through 22a-350 – Stream Channel Encroachment Line Program Statutes.
- Section 22a-365 through 22a-378 – The Connecticut Water Diversion Policy Act.

Table 205 shows each state funded program related to floodplain management and whether it is associated with pre-disaster mitigation or post-disaster mitigation efforts.

Table 205. State funded programs related to floodplain management

State Funded or Staffed Program in Hazard Prone Area.	Pre or Post Disaster
Flood Management Section 25-68	Pre and Post Disaster
Dam Safety Section 22a-401 – 22a-410	Pre and Post Disaster
Flood and Erosion Control Boards Section 25-84	Pre and Post Disaster
National Flood Insurance Program	Pre-Disaster
Stream Channel Encroachment Line Program Section 22a-342 through 22a-350	Pre-Disaster
Section 22a-318, 22a-321 – NRCS Statutes	Pre and Post Disaster
Section 25-74 through 25-76 – Authorization to perform flood and erosion projects under Federal authority.	Pre and Post Disaster
Floodplain Management and Mitigation Act	Pre-Disaster
PDM Planning	Pre-Disaster

5.3.1.3 An Act Concerning the Coastal Management Act and Shoreline Flood and Erosion Control Structures

In 2012 the Connecticut General Assembly passed Public Act 12-101, An Act Concerning the Coastal Management Act and Shoreline Flood and Erosion Control Structures. This legislation combined a number of initiatives to address sea level rise and to revise the regulatory procedures applicable to shoreline protection. Through this Act, the concept of sea level rise was incorporated into the Connecticut Coastal Management Act (CCMA)'s general goals and policies of coastal planning for the very first time. The following goal was added to the CCMA:

> "To consider in the planning process the potential impact of a rise in sea level, coastal flooding and erosion patterns on coastal development so as to minimize damage to and destruction of life and property and minimize the necessity of public expenditure and shoreline armoring to protect future new development from such hazards" [CGS section 22a-92(a)(5), as amended]

The Act also allows the Commissioner of the Department of Energy and Environmental Protection to establish a pilot program to encourage "innovative and low-impact approaches to shoreline protection and adaptation to a rise in sea level. Such approaches may include living shorelines techniques utilizing a variety of structural and organic materials, including, but not limited to, tidal wetland plants, submerged aquatic vegetation, coir fiber logs, sand fill and stone to provide shoreline protection and maintain or restore coastal resources and habitat." It is possible that some of these methods will be evaluated in the coming years, helping to build capabilities at the state and municipal levels to increase hazard mitigation.

PA 12-101 also contains a requirement for communities to consider Sea Level Rise in their plans of Conservation and Development. This was detailed more in the 2013 legislative session, and a bill to require Clean Water Act funded projects to consider climate was also passed.

5.3.1.4 An Act Concerning Climate Change and Data Collection

Pursuant to Special Act 13-9, "An Act Concerning Climate Change and Data Collection," the State of Connecticut must establish a "Center for Coasts" that will conduct research, analysis, design, outreach and education projects to guide the development and implementation of technologies, methods and policies that increase the protection of ecosystems, coastal properties and other lands and attributes of the state that are subject to the effects of rising sea levels and natural hazards. Specifically, the Connecticut Center for Coasts was charged with undertaking the following activities:

- Mapping exercises to assess and visualize key characteristics of shoreline resiliency, such as shoreline changes,
- Pilot-scale engineering and impact assessment studies,
- Consensus building efforts to determine state-wide uniform guidelines for planning and development purposes, including the expected rate of sea level rise for the next 100 years,
- Ways to develop state-wide, science-based planning and management alternatives,
- Development in science and information-based outreach and technology transfer programs for state and local agencies and officials involved in planning and development,
- An assessment of soft shore protection strategies in Long Island Sound and the development of instructional guides for the use of such soft shore protection strategies,
- A comprehensive coastal infrastructure inventory and risk assessment,
- An analysis of the impact of seawalls in urban and rural communities,
- The development of uniform, state-wide models that predict inundation flood scenarios under slow, constant sea level rise and under storm surges,
- Projects that lead to the development of rapid storm damage assessment technology,
- Developing design guidelines for the construction and repair of structural and non-structural shore protection, and
- Developing tools for determining appropriate shore protection strategies and providing coastal protection information to a diverse range of end users.

Subsequently, the DEEP Office of Planning and Program Development and the former OLISP teamed with the University of Connecticut to establish the Connecticut Institute for Resilience and Climate Adaptation (CIRCA). CIRCA has been actively engaged in outreach, education, local partnerships, and dispensing of funds since 2014. More information about CIRCA is provided below in **section 5.6.3.3**.

5.3.1.5 An Act Concerning the Permitting of Certain Coastal Structures by the Department of Energy and Environmental Protection

Public Act 13-179 clarifies several Connecticut statutes by making reference to the National Oceanic and Atmospheric Administration (NOAA) sea level rise discussions in

Technical Report OAR CPO-1 (Global Sea Level Rise Scenarios for the United States National Climate Assessment, December 6, 2012).

Pursuant to Public Act 13-179, the definition of sea level rise was changed as follows: "Rise in sea level" means the arithmetic mean of the most recent equivalent per decade rise in the surface level of the tidal and coastal waters of the state, as documented in National Oceanic and Atmospheric Administration online or printed publications for said agency's Bridgeport and New London tide gauges.

The Act states that municipalities shall consider sea level rise when developing Plans of Conservation and Development, and also states that in the preparation of any municipal evacuation plan or hazard mitigation plan, a municipality shall consider sea level change scenarios published by NOAA in Technical Report OAR CPO-1.

5.3.1.6 An Act Concerning Sea Level Rise and the Funding of Project by the Clean Water Fund

Public Act 13-15 allows DEEP to maintain a priority list of eligible water quality projects and established a system setting priority for making project grants, grant account loans and project loans. This law essentially incorporates climate change planning into funding of wastewater (sanitary sewer system and sewage treatment) projects.

In establishing such priority list and ranking systems, DEEP shall consider factors deemed relevant including but not limited to the following: (1) public health and safety; (2) protection of environmental resources; (3) population affected; (4) attainment of state water quality goals and standards; (5) consistency with the state plan of conservation and development; (6) state and federal regulations; (7) the formation in municipalities of local housing partnerships; and (8) the necessity and feasibility of implementing measures designed to mitigate the impact of a rise in sea level over the projected life span of such project.

5.3.1.7 An Act Concerning Climate Change Planning and Resiliency

This bill (SB 7 (PZ 18-82)) establishes a new greenhouse gas (GHG) emissions reduction requirement and integrates GHG reductions into various state planning documents and efforts, such as the state's Integrated Resources Plan and its plan of conservation and development. It also incorporates the new reduction into the law's existing energy source solicitation requirements.

The bill integrates sea level change projections, determined by UConn's Marine Sciences Division as an update of existing federal projections, into various municipal and state planning documents, such as state and municipal plans of conservation and development

and municipal evacuation or hazard mitigation plans. It also applies these projections to the state's coastal management and flood management laws.

The bill renames the state's Comprehensive Energy Strategy as the Comprehensive Climate and Energy Strategy and requires it to be updated to account for the state's GHG reduction requirements.

The bill establishes the Connecticut Council on Climate Change as a statutory council, which must facilitate and coordinate efforts with various parties to reduce GHG emissions and increase the state's resiliency to climate change.

The bill also makes many minor, technical, and conforming changes, including those to account for the council's renaming and incorporate the revised content, eliminate obsolete provisions such as a law on the Governor's Steering Committee subcommittee on climate change, replace a reference in the flood management statutes to "one-hundred-year flood" with "base flood," and eliminate an incorrect statutory reference.

The Act incorporates the State's official sea level rise projections into various statutes, and amends the definitions in Chapter 476A, Floodplain Management (CGS 25-68(b) through 25-68(o)) to incorporate freeboard directly into the definition of floodproofing:

(6) "Flood-proofing" means any combination of structural or nonstructural additions, changes or adjustments which reduce or eliminate flood damage to real estate or improved real property, to water and sanitary facilities, and to structures and their contents, including, but not limited to, for properties within the coastal boundary, as established pursuant to subsection (b) of section 22a-94, not less than an additional two feet of freeboard above base flood and any additional freeboard necessary to account for the most recent sea level change scenario updated pursuant to subsection (b) of section 25-68o, as amended by this act.

5.3.1.8 An Act Concerning Revisions to Certain Environmental Quality and Conservation Programs

Public Act 18-181 goes by the full title of "An Act Concerning Revisions to Certain Environmental Quality and Conservation Programs of the Department of Energy and Environmental Protection and Certain Farmland Preservation Programs of the Department of Agriculture and Establishing a Working Group on Microfiber Pollution, Authorizing School Instruction and Curriculum on Climate Change, Requiring Updated Hazardous Mitigation Plans for Certain Hazardous Chemical Facilities, Permitting Sunday Bow Hunting of Deer Throughout the State and Establishing a Pilot Program on the Separate Collection of Glass from other Recycling Programs." This Act contains a section on emergency planning for companies using hazardous chemicals, which can help guide companies in reducing chemical spills after a hazard event.

5.3.1.9 Executive Orders

Executive Order 46 (2015) and Executive Order 50 (2015) are described in the 2019 edition of this plan. The following executive orders build on these state efforts related to climate change and resilience. Each was issued subsequent to the 2019 edition of this plan.

Executive Order Number 1

Executive Order No. 1 (EO1) was signed on April 24, 2019. It is drafted to address state goals on sustainability, with a particular focus on waste, water consumption, and GHG reductions. The Executive Order identifies GHG target reduction goals for 2030, based off the Governor's Council on Climate Change (GC3) report of 2018, water consumption goals as outlined in the State Water Plan, and waste disposal reductions in accordance with the Comprehensive Materials Management Strategy.

The EO1 also directs the Secretary of OPM, the Commissioner of DAS, and the Commissioner of DEEP to establish, and serve as co-chairs of, an interagency steering Committee on State Sustainability (GreenerGovCT). This Committee is tasked with developing goals and targets to address GHG reductions from heating and cooling, electricity, vehicle fleet, and product procurement, as well as materials management and water use. The Committee is also tasked with developing a strategy to achieve a 70% GHG reduction from 2016 levels by 2040, and net zero by 2050.

Each State agency designated to participate is also to designate a Senior Sustainability Officer to serve on the committee. Officers are to compile historical information based on agency performance to develop a performance baseline, including electricity and water consumption, in which targets can be tracked. Officers are also responsible for quarterly reporting on progress and effectiveness.

In addition, each agency designated to participate in the Order are to develop a Sustainability Performance Plan that outlines actions, milestones, and responsible parties to achieve EO1 specific goals and targets.

Executive Order Number 2

Executive Order No. 3 (EO3) was signed on September 3, 2019. In comparison to EO1, EO3 addresses climate change more broadly with targeted directives at climate change adaptation and resilience, with mentions of increasing intensity of weather events. The order first expands the role of the GC3 to monitor the state's progress on carbon mitigation, as well as to develop and implement climate change adaptation strategies regarding infrastructure, agriculture, natural resources, and public health. Under EO3, the GC3 is to establish working groups and subcommittees including, but not limited to, a Climate Change Mitigation Subcommittee and a Climate Change Adaptation and Resiliency Subcommittee. The State Agencies Fostering Resilience (SAFR) Council is also designated as a subcommittee.

In general, the GC3 is charged with oversight of climate mitigation progress, which consists of monitoring implementation of GHG reduction and climate change adaptation and resiliency, including preparing a Statewide Adaptation and Resilience Plan.[252]

Executive Order 21-3

Executive Order 21-3, signed on December 16, 2021, continues to direct state agencies on GHG reduction, energy efficiency, and waste reduction, but expands directives to address infrastructural, natural, and health and equity challenges the state is facing. Ultimately this order works to continue state agency and facility progress, particularly with stringent interim reduction goals, but also directs specific state agencies to address specific needs in supporting communities. The order touches on transportation, infrastructure, jobs, health and equity, and land. The order calls for specific types of vulnerability and feasibility assessments, the creation of new offices and committees, and the development of a new municipal funding program for resilience.

5.3.2 Connecticut State Agencies Associated with Natural Hazard Mitigation

There are a number of state agencies that are associated with natural hazard mitigation within Connecticut. Some divisions and agencies such as DEMHS and DEEP share the roles and responsibilities for hazard mitigation. These are the two primary entities associated with natural hazard planning and mitigation efforts.

Other agencies are associated with natural hazard mitigation through their policies or plans in which they are charged with developing and implementing. The following is a presentation of the state agencies and their relative divisions associated with natural hazard mitigation in Connecticut.

5.3.2.1 Department of Emergency Services and Public Protection, Division of Emergency Management and Homeland Security (DEMHS)

Title 28 of the Connecticut General Statutes outlines the roles and responsibilities of the DEMHS. DEMHS is responsible for:

- Providing a coordinated, integrated program for state-wide emergency management and homeland security;
- Directing the preparation of a comprehensive plan and program for the civil preparedness of the State;

[252] Phase I of the Statewide Adaptation and Resilience Plan: https://portal.ct.gov/-/media/DEEP/climatechange/GC3/GC3_Phase1_Report_Jan2021.pdf

- Coordinating with state and local government personnel, agencies, authorities, and the private sector to ensure adequate planning, equipment, training, and exercise activities;
- Coordinating emergency communications and communication systems of the state and local government personnel, agencies, authorities, the general public, and the private sector; and
- Distributing and coordinating the distribution of information and security warnings to state and local government personnel, agencies, authorities, and the general public.

The NHCOG MJ HMP discusses the benefits of the Litchfield County Dispatch in assisting with emergency communications to residents through the Reverse 9-1-1 program.

The division assumes many roles for the State including:

- Maintains the local branch of the National Warning System (NAWAS).
- Serves as the Alternate State Warning Point (AWSP). DESPP serves as the Primary State Warning Point (PSWP).
- Develops and maintains various types of emergency operations plans for state government.
- Provides technical planning assistance to communities as requested or as needed.
- Provides emergency management and homeland security training programs for state and local governments.
- Conducts emergency operations drills and exercises.
- Administration of the Hazard Mitigation Programs of the state.
- In times of disaster or emergency, alerts key state, federal and local response organizations and acts as a central coordination point for all state agencies at the State Emergency Operations Center (EOC) in Hartford, CT.

DEMHS and DESPP currently operate the state's "Alert" Emergency Notification System (ENS) which is powered by Everbridge. The Alert ENS utilizes the state's Enhanced 911 database for location-based notifications to the public for potentially life-threatening emergencies. The Enhanced 911 database includes traditional wire-line telephone numbers in the state (the "land line" phones). However, residents may register on-line at www.ct.gov/despp for other means of communication to the Alert ENS, in addition to the land line. Residents can receive emergency alerts on communication methods such as a mobile phone, e-mail, text message, or certain hearing-impaired receiving devices.

At the present time, most of the state's municipalities subscribe to the Everbridge-powered Alert system. However, a handful of towns opted out of the system and utilized the CodeRED notification system (or other), citing reasons such as cost and control of their abilities to distribute messages.

DEMHS Disaster Preparedness Programs

DEMHS is responsible for administering the State's disaster preparedness programs and for developing and implementing Connecticut's Natural Disaster Plan, which outlines the steps to be taken prior to, during and after the occurrence of a disaster event. In addition, DEMHS administers the following disaster preparedness programs:

- **State Homeland Security Grant Program** – DEMHS is the State Administering Agency (SAA) for Emergency Management and Homeland Security grants provided by the U.S. Department of Homeland Security (DHS) and FEMA. These grants include the State Homeland Security Grant Program (SHSGP) Emergency Management Performance Grant Program (EMPG). The Buffer Zone Protection Program and Urban Area Security Initiative are now contained under the SHSGP cadre of grants. Funds from these programs are used for providing planning and equipment grants to state, regional, and local government agencies. The purchase of interoperable communication systems has been a major activity in ensuring disaster preparedness.
- **Radiological Emergency Preparedness (REP) Program** – This program is responsible for off-site planning and preparedness in the event of an accident at either the Millstone Nuclear Power Stations in Waterford or the station at Indian Point, New York. The REP program develops and maintains radiological plans and procedures, which are regularly evaluated by FEMA. The REP network includes ten emergency planning zone communities including Fishers Island, five host communities, numerous key state agencies, and local emergency responders. In addition, the REP program conducts other related activities such as annual conferences for public officials, media briefings, and training of state and local emergency workers.

5.3.2.2 Department of Energy and Environmental Protection

Public Act 11-80, "An Act Concerning the Establishment of the Department of Energy and Environmental Protection and Planning for Connecticut's Energy Future" (Act), combined the former Department of Public Utility Control (DPUC) and an energy group from the Office of Policy Management (OPM) with the Department of Environmental Protection (DEP) to form the Department of Energy and Environmental Protection (DEEP) to better address the challenges of the modern environmental world and energy market. The former Department of Public Utility Control is now called the Public Utility Regulatory Authority (PURA) and continues to perform the regulatory functions of the former DPUC. The Act also required DEEP establish a Bureau of Energy and Technology Policy – the first energy policy office in decades for the state.

The DEP was established in 1971 at the dawn of the environmental movement, while the public utilities regulatory authority traces its roots back more than 150 years to the state's Railroad Commission.

DEEP is charged with conserving, improving and protecting the natural resources and the environment of the state of Connecticut as well as making less expensive, cleaner and more reliable energy available for the people and businesses of the state. The DEEP is organized into three main branches and the Office of the Commissioner:

The Environmental Quality Branch is comprised of the Bureaus of Air Management, Materials Management and Compliance Assurance, and Water Protection and Land Reuse. These bureaus protect the air, land and water resources of the state by regulating air emissions, wastewater discharges and solid and hazardous wastes. Tools used include the development of regulations, policies and standards; permitting and enforcement; air and water quality monitoring; and public outreach and education.

The Environmental Conservation Branch consists of two bureaus. The Bureau of Natural Resources is charged with managing the state's natural resources (particularly fish, wildlife, and forests) through a program of regulation, management, research, and public education. The Bureau of Outdoor Recreation is charged with the conservation and management of statewide recreation lands and resources through the acquisition of open space and the management of resources, including state parks, to meet the outdoor recreation needs of the public.

The Energy Branch includes the Public Utilities Regulatory Authority (PURA) – formerly the Department of Public Utility Control – which reviews rates for electricity, water, cable television and other utilities as well as a Bureau of Energy and Technology Policy, which develops forward-looking energy efficiency, infrastructure and alternative power programs.

The Office of the Commissioner, including the Offices of Chief of Staff, Planning and Program Development, Information Management, Adjudications, Environmental Justice, and Legal Counsel, provides administrative management, staff assistance, and ancillary service to aid the Commissioner and Bureau Chiefs in their efforts to carry out the mission of the agency. In addition, the centralized Bureau of Central Services provides a wide array of services including financial management, human resource management and purchasing.

DEMHS is the principal flood management agency in the State, with DEEP assisting. Within DEEP, the Land and Water Resources Division (LWRD) formerly housed the Flood Management Program. The LWRD was merged with the Office of Long Island Sound Programs (OLISP) in 2016 and their functions are now part of the Land and Water Resources Division within the Bureau of Water Protection and Land Reuse. The Land and Water Resources Division is therefore the lead division for planning and coordinating flood management and post natural disaster mitigation responses. Other assisting DEEP divisions

are the Water Planning and Management Division (also within the Bureau of Water Protection and Land Reuse) and the Forestry Division (within Natural Resources).

Connecticut Equity and Environmental Justice Advisory Council (CEEJAC)

The Connecticut Equity and Environmental Justice Advisory Council (CEEJAC) was established within DEEP through Governor Lamont's recent Executive Order 21-3. According to the Executive Order, "the purpose of the CEEJAC is to advise DEEP on current and historic environmental injustice, pollution reduction, energy inequity, climate change mitigation and resiliency, health disparities, and racial inequity." This includes:

- Integrating environmental justice considerations into the programs, policies, and activities of DEEP.
- Providing mechanisms for Environmental Justice Communities to have a meaningful opportunity to participate in the decision-making around the development of facilities that have the potential to increase environmental and public health stressors within the community.
- Developing a model plan for community engagement and stakeholder outreach centered around participation.
- Strengthening DEEP's partnerships with other governmental agencies and community leaders regarding environmental justice issues.[253]

The Connecticut General Statutes have established a definition for environmental justice (EJ) communities in the state. In Connecticut, an EJ community is either a distressed municipality, as designated by the Connecticut Department of Economic and Community Development, or a defined census block group where 30% of the population is living below 200% of the federal poverty level.[254] DEEP maintains a publicly accessible GIS database mapping the 2022 Environmental Justice Census Block Groups based on the previously defined criteria.[255]

Climate Resilience Fund

The DEEP Climate Resilience Fund (DCRF) was established by Executive Order 21-3 and was one of the recommendations of the GC3 in 2021. Under the Climate Resilience Fund, grants are provided to help municipalities plan and implement projects to help build resilient communities in the face of climate change. The Fund is intended for climate resilience planning at the regional, municipal, and neighborhood scales, and to support project scoping and development. The creation of the funding program will assist

[253] CT DEEP. Connecticut Equity and Environmental Justice Advisory Council. https://portal.ct.gov/DEEP-CEEJAC
[254] CT DEEP. Learn More About Environmental Justice Communities. https://portal.ct.gov/DEEP/Environmental-Justice/05-Learn-More-About-Environmental-Justice-Communities
[255] CT DEEP EJ Home. Connecticut 2022 Environmental Justice Communities. https://ctdeep.maps.arcgis.com/apps/webappviewer/index.html?id=d04ec429d0a4477b9526689dc7809ffe

Connecticut communities in securing competitive federal investments in climate resilience through the Infrastructure Investment and Jobs Act and the Inflation Reduction Act.

The Fund includes two tracks. The first is Resilience Planning, which supports all activities and costs associated with developing a climate resilience plan or community engagement to support planning projects. Track 2 is Resilience Project Development. Under this track, activities related to advancing identified resilience project ideas and developing federal grant applications are eligible.[256]

Governor Ned Lamont announced that the state has awarded $8.8 million in grants through the DCRF as of June 2023. The funds will support 21 resilience plans and projects across 17 municipalities and COGs, displayed in the following lists:[257]

Resilience Planning Grants

- Groundwork Bridgeport: Neighborhood-level plan to reduce heat island impacts in the East Side neighborhood. Plan will identify cool corridors for reducing urban heat island effect.
- City of Bridgeport: Comprehensive climate risk and vulnerability assessment. Develop a prioritized list of strategies, actions, and projects. Identify funding opportunities, assess municipal level match funding, and identify implementation strategies.
- Town of Bristol: Develop a flood resilience plan for areas along and near the Pequabuck River and Coppermine Brook that assesses how to restore floodway's function and identify opportunities for property buyouts.
- Town of Groton: Develop a town-wide climate resilience plan that looks at all hazards.
- City of Hartford: Develop citywide flooding and climate resiliency assessment. Create a prioritized list of resilience projects for future advancement.
- Town of Manchester: Develop a townwide flood resilience plan focusing on understanding how extreme precipitation events will affect the town. Identify next steps to reduce risks.
- City of Norwalk: Develop a citywide flood resilience workplan to prioritize and execute resilience strategies, related land-use planning, and identify site-specific

[256] CT DEEP. DEEP Climate Resilience Fund. https://portal.ct.gov/ConnecticutClimateAction/Executive-Order/DEEP-Climate-Resilience-Fund

[257] The Office of Governor Ned Lamont. Governor Lamont Announces $8.8 Million in State Funding To Support 21 Climate Resilience Plans and Project Development Grants. 6/14/2023. https://portal.ct.gov/Office-of-the-Governor/News/Press-Releases/2023/06-2023/Governor-Lamont-Announces-State-Funding-To-Support-21-Climate-Resilience

projects to mitigate climate impacts. Framework of nature-based solutions that would increase community resilience and improve water quality.

Resilience Project Development Grants

- Capitol Region Council of Governments: Stormwater authority feasibility assessments.
- Metro Council of Governments: Conduct engineering studies and community engagement for proposed living shoreline and transportation infrastructure alternatives along Johnson's Creek in Bridgeport's East End Neighborhood.
- Naugatuck Valley Council of Governments: Develop and advance culvert replacement and drainage system improvement projects in 9 municipalities to reduce stormwater flooding.
- Town of Hamden: Develop and design a pump station replacement in lower Pardee Brook Watershed. Nature-based green infrastructure in upper Pardee Brook Watershed.
- City of New Britain: Identify comprehensive flooding solutions in Willow Brook watershed.
- Greater New Haven Water Pollution Control Authority: Conduct studies on street flooding and sewer back-ups in the Westville neighborhood. Identify and evaluate options for potential projects that include nature-based solutions.
- Norwich Public Utilities: Conduct site and engineering studies related to relocating the Shipping Street sewage pump station out of the floodway of the Thames River.
- City of Stamford: Conduct modeling, identify alternatives, and develop conceptual designs for reducing stormwater flooding in Cummings Pond watershed in the Cove and East Side neighborhoods.
- City of Stamford: Evaluate flooding issues in Toilsome Brook watershed. Develop concept-level flood mitigation recommendations that will include drainage system improvements, stream daylighting, and relocating or elevating structures and infrastructure.
- City of Waterbury: Update studies related to flooding in the Clough Brook watershed and develop designs for culverts and drainage systems.
- Town of West Hartford and Hartford: Engineering studies and preliminary designs for reducing flooding near Kennedy Brook and Kane Brook.

- City of West Hartford: Preliminary designs for reducing flooding in Sanford Street Basin, including new piping, culverts, a structured wetland, and a new outfall path to the Cove River. The City will conduct a feasibility study for a stormwater authority.

Water Planning and Management Division

The Water Planning and Management Division includes the Dam Safety and State Dam Programs (both from the former IWRD) and the Flood Alert Center.

The following actions were undertaken by DEEP's IWRD and other state agencies in the 1980s and 1990s to improve the State's capability to respond to flood emergencies. These measures were taken as a result of recommendations formulated in the 1983 and 1989 Flood Hazard Mitigation Reports:

- State Sandbag Policy and Procedures (OCP, currently DEMHS 1984)
- Guidance for municipal flood emergency planning issued (1983)
- Operational Guide for the Connecticut Automated Flood Warning System (updated in 2000) prepared, Emergency Operations Guidelines prepared for the Flood Warning System (1987)
- Installations of Advanced Technology NOAA Weather Radios (A.K.A WRSAME) in schools, state parks, and command centers (1992-93)
- Expansion and upgrading of equipment and technology within the Automated Flood Warning System (1992, 2002)
- Installation of telemetry equipment to receive satellite and radar information (1993)
- Establishment of a fax/email weather warning system (1994).

Dam Safety Program

The Connecticut DEEP Dam Safety Program has jurisdiction over all non-federally owned or licensed dams in the State which would by failing or otherwise endanger life or property. The five program staff maintain an inventory for nearly 4800 dams in Connecticut. Smaller dams determined to be of Negligible Hazard and other small dams of undetermined hazard classification while inventoried, are not presently being closely monitored. CT DEEP does not monitor or have jurisdiction over dams that are federally owned including US Army Corps of Engineers (USACE) flood control dams and hydropower dams licensed by Federal Energy Regulatory Commission (FERC). As of September 2022 this includes:

- 268 total and 247 DEEP jurisdictional High Hazard (Class C) dams,
- 266 total and 255 DEEP jurisdictional Significant Hazard (Class B) dams,
- 697 total and 691 DEEP jurisdictional Moderate Hazard (Class BB) dams, and

- Approximately 1894 Low Hazard (Class A) dams

The Program's ultimate responsibility is to ensure all jurisdictional dams in the state are being operated and maintained in a safe condition. The owners of high and significant hazard dams are required by statue to regularly inspect, maintain, and repair their dams and have current Emergency Action Plans (EAPs) ready for implementation should hazardous conditions arise.

The programs major responsibilities include:

1. Inspections. The responsibility to undertake regulatory inspections was transferred from the State DEEP, to Dam owners through legislation in 2013. Program staff still perform inspections of all types, but all regulatory inspections are required to be performed by engineers hired by the dam owner. (In rare cases, DEEP has the authority to perform these inspections and charge the property owner. Regulatory Inspections must meet the requirements of section 22a-409 of the regulation.
    a. Since 2019, through January 13, 2023, Program staff have issued or re-issued over 1000 Notices of Required Inspections (NORI) for state-owned and privately owned dams in CT.
    b. Non-compliance has required program staff to issue notices of violation or reminder letters. Dams that remain in a state of non-compliance with assigned inspections require staff to issue notices of violations or the appropriate response.
2. Emergency Action Plans (EAP) for B and C dams every two years. Program staff review all EAPs for conformance with section 22a-411a of the regulation. Staff attend EAP Tabletops and Drills. The owners of the larger Flood Control Levee's in the state (which are DEEP jurisdictional), have more recently been accredited by FEMA and certified by the USACE are not presently being required to submit an EAP pursuant to 22a-411a of the regulations, as an appropriate guideline for writing an EAP for these levee structures does not exist at this time. The need to have updated EAPs for this small subset of dams was put on hold until guidelines could be written and because the existing levee operations plans written by the USACE are the presiding documents for these structures.
3. Permitting. Program staff attend pre-application technical meetings, review general and individual permit applications, issue permits and approvals, follow up on repair projects.
4. Enforcement. When a dam is found to be in need of repairs and the dam owner not responsive, program staff initiate enforcement as needed. Informal enforcement such as Notices of Violation or Non-Compliance and formal enforcement such as unilateral and consent orders are available to ensure that critical issues such as

regulatory inspections requirements, EAP preparation requirements, and critical needed repairs are undertaken by the dam owners.

   a. If an emergency condition exists which represents a clear and present danger to the public, Dam Safety can order the repair or removal of the structure. Should the dam owner fail to repair or remove the structure in the time specified by the order, the Department may do so and bill the owner for the costs.

5. Technical Support. Program staff provide technical support to the staff of the DEEP State-owned dams program and other state agencies. There are over 250 DEEP-owned dams and approximately 50 additional dams owned by other CT State agencies or institutions. Program staff also respond to calls and emails and FOIA requests submitted to the program from dam owners, consultants, elected officials, other state officials, and the general public.

6. Inventory. Program staff maintain an Inventory of dams in CT in an Access database which is regularly updated with dam owner information, inspection report data, EAP's and status, dam physical size and shape data, and communications data. Program staff also maintain an electronic document archive of word and Adobe Acrobat PDF documents, and an email archive for each dam along with the original paper files.

7. GIS Data. Program staff maintain a GIS data layer which has an old dam failure inundation shapefile which was obtained by digitizing the dam failure inundations maps prepared for the 1980-1982 era Phase I and II dam inspection reports. While outdated, they remain a useful resource in a flood event. Unfortunately section 22a-411 of the regulation does not require dam owners to submit their EAPs and the inundation area mapping electronically or in a GIS shapefile.

8. Critical Facilities. DEEP State-owned Dams program staff maintain Critical Facilities mapping.

9. DamWatch. The DEEP subscribes to the US Engineering DamWatch program for DEEP owned dams. DamWatch is an online real-time Nexrad radar precipitation based monitoring application for dams. All 250 DEEP owned dams are monitored by DamWatch. DamWatch will notify DEEP staff whenever a pre-set precipitation threshold has been surpassed within the drainage area to one of the monitored dams. The notice allows staff to know as early as possible when precipitation intensity and duration may create flood conditions at a monitored dam. The DamWatch also makes archived data for each monitored dam such as reports, the EAP and construction drawings available online and includes an assignment ticketing system that allows managers to assign designated field staff to inspect dams in their area.

Automated Flood Warning Systems

The original automated flood warning system was installed in Connecticut by the NRCS in cooperation with DEP in 1985 as a direct result of the June flooding of 1982. The flood warning system aided the NWS in issuing faster flood watches and warnings, and aided communities in responding more rapidly to impending flooding situations. In several communities, flood audits were prepared by the NRCS. These flood audits identified which structures were in danger at specific water levels as measured by the water level gages in the warning system.

At its peak, the DEEP owned and maintained 45 ALERT gages. However, due to funding issues, staffing cuts, and obsolescence of the system, the ALERT program has been discontinued. DEEP and other flood response agencies rely on data from USGS and NOAA for information.

Land and Water Resources Division

The Land and Water Resources Division (LWRD) includes the Flood Management Program (formerly in the IWRD) which coordinates directly with FEMA on RiskMap and NFIP as noted below; the Coastal Planning Program (formerly in OLISP) which is charged with coordination on Coastal Zone Management matters including coastal hazard mitigation; and the Coastal Resources Program (formerly in OLISP) which oversees permitting related to coastal resources.

The State of Connecticut reviews local flood management programs, local NFIP procedures, mitigation actions and local capabilities through the Community Assistance – State Support Services Element (CAP-SSSE) of the NFIP. Each year DEEP LWRD staff perform a number of Community Assistance Visits. During the Community Assistant Visit, the community's ordinances are reviewed along with any variances, which have been granted in the floodplain. DEEP staff meet with the local floodplain coordinators and travel around local floodplain areas looking for compliance issues and checking on possible violations. DEEP staff prepare a written report on the Community Assistant Visit and submit it to FEMA. The report is placed in the community's NFIP file and becomes part of the participating community's compliance history. During Community Assistant Visits for communities that have RL or SRL properties, there is emphasis placed on mitigating those properties. Capability and desire to administer grants of that complexity varies dramatically from community to community.

Community Assistant Visits are targeted for coastal communities once every five years due to their increased vulnerability to flooding. Inland communities normally receive a Community Assistant Visit once every ten years. Plans for potential future projects are also reviewed back at the DEEP to determine if they are in compliance with NFIP and State floodplain management regulations. The Community Assistant Visit program has uncovered violations and continues to allow the DEEP to more effectively monitor local municipal flood management regulations. Every municipality in Connecticut is a member of the NFIP and is required to submit to a Community Assistant Visit upon request. This has

made the program very effective in assisting municipalities to monitor and prevent floodplain violations.

Flood Management Section

The Flood Management Section is the state coordinating entity for the National Flood Insurance Program (NFIP). This section reviews and approves state agency activities within or affecting floodplains and conducts municipal NFIP compliance audits, training workshops, and aids with the development of local floodplain ordinances. The Flood Management Section provides general technical assistance to municipalities on flood mapping and floodplain management inquiries. Furthermore, this section is responsible for the implementation of FEMA's Map Modernization Program at the state level.

NFIP Administration

CT DEEP oversees NFIP Administration, including changes in participation, insurance coverage trends, and substantial damage administration both pre- and post-disaster. State agencies work together to administer the NFIP through working with and through appropriate DEEP divisions. This helps to overcome challenges that may arise during regular communication and coordination between FEMA and state agencies.

NFIP Participation Trends

Connecticut has had full participation in the NFIP since the 1980s. The floodplain management program is mature in and has had consistent leadership since the late 1990s.

Community Rating System Trends

There are currently 14 communities enrolled in the CRS program. Of them, two are class 9, nine are class 8, and three are class 7. Since the last plan update in 2018, the towns of Guilford, Stratford, and Trumbull, and the City of Norwich have joined the CRS, representing a 40% increase in participation. Five communities listed as class 10 previously participated in the program but are not currently active (Cheshire, East Haven, Hamden, Norwalk, Westbrook).

Due to the COVID-19 pandemic and lack of staff at FEMA Region I office to perform the required CRS entry CAVs, Connecticut has not had any recent entries into the program or active applications. The last entry was Norwich in May 2020. There have been some communities that have expressed interest in entering the program: Bridgeport, Colchester (has reconsidered recently, not interested now), Darien (had CRS CAV on September 26, 2018, but is currently cleaning up violations found during CAV), Groton (Town), Norwalk, Old Lyme, and Waterford. Some of these communities have reconsidered participation in the program due to a lack of staff to implement the program.

East Lyme, Newtown and West Hartford have all participated since 1991, and Westport since 1995.

Milford is currently a Class 9 but has been working through violations from Irene and Sandy to try to improve their rating class, hoping to reach Class 8 or 7. The Town of Stonington entered the CRS program in 2004 along with the Borough of Stonington, then was removed from the program in 2015 due to some administrative and processing errors, but then re-entered in October 2017.

The communities who have been participating since the 90s and 2000s tend to settle into the class at which they can comfortably maintain the program. Overall, there has been an increased interest in the program, with CIRCA and some of the COGs (Southeastern and RiverCOG) providing support in addition to the support provided by the Flood Management Program at DEEP.

Insurance Coverage Trends

Since December of 2018, when the last state NHMP was adopted, through November of 2023, policy count has gone from 36,584 to 31,635, a decrease of 1.2 percent. Since the inception of Risk Rating 2.0, nationwide policy counts have been trending down. Connecticut has not been an exception. There are currently 31,603 policies in force in CT with total coverage of $8.5 billion. As of July of 2023, Connecticut saw just under a 1 percent reduction in flood insurance policies over the same date in 2022. This trend is likely due to Risk Rating 2.0 which is an effort to better match a properties rate to actual risks. It resulted in reductions in flood insurance premiums for many, but sharp increases for others with the most exposure.

Education around flood insurance is conducted annually by DEEP as part of its training under the Community Assistance Program – State Support Service Element (CAP-SSSE). DEEP also works with the State Insurance Department to keep insurance providers and agents informed about the NFIP. The State Insurance Department has been an active participant in the update of this plan since Super Strom Sandy and participates on the Governor's Council on Climate Change.

NFIP Administrative Challenges

The singular challenge is one of limited financial resources to expand the reach of the program. This is discussed during coordination with FEMA Region I.

Coordination with other Agencies

Under the Flood Management Certification Program (described below) DEEP also oversees and regulates all projects conducted in flood prone areas whether by state agencies or with state agency funding. Through this program, DEEP's NFIP administration program works regularly with other state agencies, particularly the DOT and DAS. DEEP's NFIP program administration support of flood hazard mapping is described below.

Post-Disaster NFIP Administration

Post disaster, CT DEEP provides support to its participating municipalities with enforcement, technical reviews, substantial damage estimator training and coordination with FEMA. The Floodplain Management program typically participated in Preliminary Damage Assessments with FEMA prior to a Presidential disaster declaration request and staffs the State Emergency Operations Center (EOC) to field requests from municipalities for support.

The floodplain management program also works with FEMA staff at the Joint Field Office (JFO) and coordinates with the Flood Response Office (FRO) on flood insurance issues from policy holders. Connecticut has been blessed with no catastrophic flooding disasters in recent years and typically towns are able to administer the NFIP during recovery, including substantial damage determinations on their own, with support of the State and FEMA.

Map Modernization

In the past, FEMA's NFIP re-mapping efforts have been limited by both technology and funding. In recognition of these limitations, Congress has committed to a Multi-Hazard Flood Map Modernization Management Program (MHFMMM); herein referred to as Map Modernization. Starting in fiscal year 2003 the goal of Map Modernization was to upgrade flood hazard data and mapping to create a more accurate digital product by 2010. Upgrading the maps was planned to improve floodplain management throughout the nation by providing more accurate flood data for use in planning and regulatory decision-making and by providing a product in a digital format that will be easily accessible to multiple users. The Map Modernization Program has been phased in over the course of several years with priority given to areas of greatest flood risk as determined by the State and approved by FEMA.

The purpose of this Map Modernization Plan; herein referred to as Business Plan, is to outline the DEEP's strategic approach for partnering with FEMA to participate in Map Modernization through DEEP's existing Floodplain Management Program (FMP). The Plan describes the FMP's current roles and responsibilities related to floodplain management, outlines its future role, organizational design, and execution strategy to meet the data and mapping needs of communities within the State of Connecticut.

The FMP currently includes a proactive approach that combines two key elements under one organization: (1) NFIP community compliance, and (2) technical assistance and outreach to communities and agencies. It is envisioned that the compliance element will expand significantly based on map modernization activities due to municipal floodplain management ordinance changes. This linkage of NFIP community status assurance from the existing NFIP Compliance efforts, within the DEEP Community Assistance Program (CAP), will complement and enhance the effectiveness of the expanded FMP. If fully funded by FEMA, program management of the FMMP will be achieved through the expertise of a diverse, skilled project team complemented by external support from an

independent state mapping contractor, and other state and federal partners. Program management will be centered on the identification of program goals and clear implementation and tracking of these goals during the program execution. Program management will be further enhanced by a data management system such as the Management Information Portal (MIP) provided by FEMA's National Service Provider.

The Business Plan addresses how Map Modernization will integrate with existing program needs over time, such as coastal erosion mapping, stream flow modeling for varying flow conditions, comprehensive land use planning, and others.

Education and outreach play a vital role in Map Modernization by promoting and building floodplain management capacity throughout the State, which includes training, workshops and presentations for local officials, lenders, insurance agents, land surveyors, engineers, regional planning commissions, and various state agencies and programs.

The success of the FMP and related programs within the DEEP is contingent on the receipt of adequate funding over multiple years from our Federal partners. Approximately $1.45 million per year (on average) is required to implement this plan. Of that amount, the FMP anticipates that approximately $480,000 per year may be available from state and partner contributions, which are mostly in-kind, and data matches. Total implementation costs over the five-year period are estimated to be $8 million. In order to adequately pursue efforts to manage mapping activities and contractors a multiple year commitment from FEMA for funding for staff is essential.

Risk MAP

Risk Mapping, Assessment, and Planning (Risk MAP) is the FEMA program that provides communities with flood information and tools they can use to enhance their mitigation plans and take action to better protect their citizens. Risk MAP focuses on products and services beyond the traditional FIRM and works with officials to help put flood risk data and assessment tools to use, effectively communicating risk to citizens and enabling communities to enhance their mitigation plans and actions.

The initial Risk MAP products in Connecticut were associated with the new coastal flood mapping prepared by the STARR team for FEMA. These coastal maps were distributed to the communities of Fairfield, New London, New Haven, and Middlesex counties in 2011 as drafts and will be adopted by the communities in 2013. Along with the new FIRMs, the Risk MAP product "Changes Since Last FIRM" (CSLF) was distributed to the coastal communities. These maps were created as communication tools and were presented to the communities at meetings with the intent that communities will better understand the changes due to the updated coastal analysis.

The Land and Water Resources Division (LWRD) includes the Floodplain Management Program and NFIP Administration. It coordinates directly with FEMA on Risk MAP, including reviews of new technical products and support of the post-preliminary processing activitiesThis includes working with communities to update ordinances to be compliant with

the new mapping and support of FEMA and its contractors with stakeholder engagement. Once adopted, the state shares flood risk data for community planning and mitigation actions. CIRCA also serves FEMA Risk MAP, SLR and other flood mapping data with communities via its flood viewer. The State also has statewide digital elevation models available online via OPM and most of the COGs that enable users to obtain ground elevations in flood prone areas to determine flood depths.

Local/Regional Hazard Mitigation Plans encourage the use Risk MAP data in their analysis of flooding. Most of the plans identify areas in need of study or restudy. For example, the RiverCOG's latest effective plan incorporated a statistical flood susceptibility that covers the entire region. That model was funded through a partnership with CIRCA and the Department of Housing. It provides more granular supplemental flood risk data in areas outside of FEMA's SFHA. DEEP has also partnered with CIRCA to develop sea level risk mapping along the coast to supplement FEMA's flood modeling for use for local planning and decision making.

Flood Management Certification

The Flood Management Certification Program regulates all state actions in or affecting floodplains including regulating state sponsored changes to storm water drainage. Any state activity or grant funds supporting an activity located in a FEMA-mapped SFHA or 0.2% annual chance flood zone must certify to the DEEP that certain statutory and regulatory requirements have been met. These requirements always are equal to or exceed NFIP minimum standards (e.g., critical facilities and activities must be mitigated up to or elevated above the 500-year floodplain elevation, no increase in "intensity of use" in the floodplain without going through an exemption request demonstrating that the project is "in the public interest" and that the project "will not injure persons or damage property in the area of the project", etc.).

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DEEP Energy Branch

The Public Utilities Regulatory Authority (PURA), along with the Bureau of Energy and Technology Policy, is part of the Energy Branch of DEEP.

PURA is statutorily charged with regulating the rates and services of Connecticut's investor owned electricity, natural gas, water and telecommunication companies and is the franchising authority for the state's cable television companies. In the industries that are still wholly regulated, PURA balances the public's right to safe, adequate and reliable utility service at reasonable rates with the provider's right to a reasonable return on its investment. PURA also keeps watch over competitive utility services to promote equity among the competitors while customers reap the price and quality benefits of competition and are protected from unfair business practices.

The Bureau of Energy and Technology Policy is charged with developing forward-looking energy efficiency, infrastructure and alternative power programs. Together, PURA and the Bureau of Energy and Technology Policy have overseen several key efforts in the last few years.

DEEP developed the first-ever Comprehensive Energy Strategy (CES) for the State of Connecticut. This is an assessment and strategy for all residential, commercial, and industrial energy issues, including energy efficiency, industry, electricity, natural gas, and transportation. The strategy was developed as called for in the milestone energy legislation, Public Act 11-80, passed in June of 2011 prior to the storms of 2011 (Tropical Storm Irene and Winter Storm Alfred) and 2012 (Sandy) , and as amended by PA 13-303, that impacted energy utilities. Under Section 16a-3d of the Connecticut General Statutes, DEEP is required, in consultation with the Connecticut Energy Advisory Board (CEAB), prepare a Comprehensive Energy Strategy for Connecticut every four years. In 2017, DEEP prepared an update to the CES to advance the State's goal to create a cheaper, cleaner, more reliable energy future for Connecticut's residents and businesses.[258] As of 2022,

[258] CT DEEP. Comprehensive Energy Strategy.
http://www.ct.gov/deep/cwp/view.asp?a=4405&q=500752&deepNav_GID=2121

DEEP has been working on updating the CES and per "Governor Lamont's Executive Order 21-3, the update must include a set of strategies to: (1) provide for more affordable heating and cooling for Connecticut residents and businesses, (2) achieve reductions in GHG emissions from residential and industrial facilities as needed to enable the state to meet the economy-wide GHG reduction targets for 2030 and 2050 established in the Global Warming Solutions Act, and (3) improve the resilience of the state's energy sector to extreme weather, fuel commodity price spikes, and other disruptions."[259]

The 2019 edition of this plan discusses previous efforts and responsibilities under the jurisdiction of the DEEP Energy Branch, including the Connecticut Energy Assurance Plan and Public Acts and Dockets relevant to energy infrastructure in the state. The following are recent strategic plans and reports published by the DEEP Energy Branch:

- Energy Action Plan: State's long-term strategy to improve energy affordability and reliability by reducing dependence on fossil fuel supplies that are vulnerable to extreme weather events and other disruptions. The focus is on energy efficiency and clean energy resources.[260]
- 2019-2021 Greenhouse Gas Emissions Inventory (April 20, 2023): Reports economy-wide greenhouse gas emissions and summarizes the state's progress towards climate-related targets.
- Integrated Resources Plan (October 7, 2021): Assessment of pathways to achieve 100% zero-carbon electric sector by 2040. Focuses on near term activities and essential reform to facilitate the transition to zero carbon electric sector.[261]
- EV Roadmap for Connecticut: Outline pathways to accelerate wide-scale deployment of electric vehicles with strategies including purchasing incentives, education, and expansion of charging infrastructure.[262]

The Energy Efficiency Board (EEB) is a group of advisors who utilize their experience and expertise with energy issues to evaluate, advise, and assist the state's utility companies in developing and implementing comprehensive, cost-effective energy conservation and market transformation plans to help Connecticut consumers reduce energy use in their homes and businesses and to help Connecticut meet its changing and growing energy needs. The Board was created in 1998 by the Connecticut State Legislature, and now operates under a mandate in Public Act 11-80. The EEB has nine voting members and five non-voting representatives of Connecticut's electric and gas utility companies. By statute the Chairman of the EEB is Commissioner of the DEEP. Other members represent the Office

[259] CT DEEP. Comprehensive Energy Strategy Plan. https://portal.ct.gov/DEEP/Energy/Comprehensive-Energy-Plan/Comprehensive-Energy-Strategy
[260] CT DEEP. DEEP Energy Action Plan. https://portal.ct.gov/-/media/DEEP/energy/Equity-and-Affordability/DEEP_Energy_Action_Plan.pdf
[261] CT DEEP. Connecticut Integrated Resources Man. 2021. https://portal.ct.gov/-/media/DEEP/energy/IRP/2020-IRP/2020-Connecticut-Integrated-Resources-Plan-10-7-2021.pdf
[262]CT DEEP. EV Roadmap. https://portal.ct.gov/DEEP/Climate-Change/EV-Roadmap

of the Attorney General, the Office of Consumer Council, statewide business, the environmental field, the manufacturing sector, and retail organizations, a chamber of commerce, and retail customers.

Forestry Division

There are 32 state forests (totaling nearly 170,000 acres) in the Connecticut state forest system managed by the Division of Forestry. These forests provide a variety of recreational experiences, natural diversity (including threatened, endangered and special concern species), and the preservation of unique sites (both geologic and archeological), the provision of raw materials as forest products, and the maintenance of wildlife and fisheries habitats. The Division's professional foresters work to insure that these forests remain healthy and vigorous while meeting the wide range of demands that the public places on these lands.

The Division of Forestry maintains an active forest fire prevention program and a specially trained force of firefighting personnel to combat forest fires. The division also has crews ready to assist the USDA Forest Service in controlling large fires across the nation. The Division prepares a daily Forest Fire Danger Report. Division of Forestry programs and activities related to forest fire prevention include:

- Maintaining a fully trained and equipped crew of fire fighters "on call" for assistance both in-state and to the federal government in fighting fires in the other parts of the U.S.
- Conducting a forest fire prevention program utilizing Smokey Bear as a focus.
- Coordinating the timely suppression of all forest fires in the state using trained DEEP personnel, the Connecticut Interstate Fire Crew, local fire departments, and the Connecticut National Guard.
- Administering the federally funded Volunteer Fire Assistance Program, which provides federal funds for equipment and training to fire departments which serve small communities.
- Participating in the Northeastern Forest Fire Protection Commission to coordinate mutual aid in fire prevention and suppression efforts among compact members.

Since prevention is still the primary means of reducing wildfire risks, DEEP regularly posts updates about wildfire risk and circulates warnings to the press. A list of prevention tips is included on the DEEP Forestry webpage, stating that the majority of wildfires in the state are human caused by improper burning of debris, campfires, and discarded ashes. Tips are

provided for those planning to build fires in any open space or park, as well as steps for homeowners to protect life and property.[263]

Solid Waste Division – Debris Management Plan

The DEEP prepared the State of Connecticut Disaster Debris Management Plan in 2007 (the Plan) as a component in the State's overall comprehensive efforts to support and implement improved planning for disaster debris management. This Debris Plan was made an Annex to the State's Natural Disaster Plan (2009). An update was prepared in June 2013, remaining an annex to the State Natural Disaster Plan. According to the NHMP maintenance portion of the report, The Plan must be reviewed annually by DEEP, and in conjunction with DEMHS. The Plan establishes the framework for State agencies and municipalities to facilitate proper management of debris generated by a natural disaster.

In addition to the Plan, DEMHS has established pre-need and pre-event contracts to assist the State in disaster debris management preparedness. These contracts will be activated only by the Governor as the result of an emergency declaration and will cover debris removal operations and the monitoring of these operations. These contracts have been active on six occasions (Hurricane Henri, Tropical Storm Isaias, Severe Storm Event of 8/27/2020, Severe Weather on 1/20/2019 – Snow and Ice Storm, Natural Disasters on 5/15/2018 - Microbursts, and Natural Disasters on 9/25/2018 - Heavy Rains and Flooding) in the past three years by the Governor, as a result of emergency declarations. The plan describes the State contracts that are in place to use in response to a natural disaster.

The Plan is based on guidance provided by FEMA, EPA, USACE and lessons learned from the destructive hurricanes in the gulf coast states in 2004 and 2005. The Plan outlines the DEEP's processes to consider, approve or disapprove requests for authorizations, variances, and waivers as needed for rapid and environmentally sound waste management, specifically with regard to managing the natural-disaster debris waste stream. In addition, this Plan outlines debris removal and monitoring roles and responsibilities and presents an overview of eligible federal reimbursable costs resulting from debris clean up and monitoring. State government agencies and municipalities will be the primary users of this Plan. Municipalities in particular, will make use of the information for planning pre-positioned contracts with waste haulers, as well as identifying disaster Temporary Debris Storage and Reduction Sites (TDSRS) that may be called into use during disaster recovery operations. Much of the information will also be useful to the waste management industry as they develop their own in-house plans for participating in a potential disaster recovery scenario.

The Disaster Debris Management Plan implemented by Connecticut state agencies and municipalities is based on recycling and material separation at the point of generation to the extent possible with additional segregation occurring at TDSRS in order to minimize

[263] CT DEEP. Forest Fire Prevention Tips. https://portal.ct.gov/DEEP/Forestry/Forest-Fire/Forest-Fire-Prevention-Tips

disposal and reduce potential threats to human health and safety. TDSRS will be those sites that have been identified by local and state government, and which have been evaluated and approved by DEEP for the purposes of collection, volume reduction, and transfer to final permitted disposal and recycling facilities. The DEEP is responsible for the permitting of these sites. The goal will be to maximize potential processing and recycling options consistent with the State Solid Waste Management Plan. This strategy will be of highest priority and public education together with municipal, State, and federal cooperation will be imperative to effectively carry out this mission.

State Parks Outdoor Recreation and Public Outreach

The Bureau of Outdoor Recreation oversees programs and environmental education workshops for the general public, informal education centers and formal education districts throughout Connecticut. This division is the licensed provider for national curriculum materials such as Project WET- Water Education for Teachers. The focus of Project WET is to provide curriculum materials to teachers in the K-12 educational system, integrating current educational standards and objectives while advancing knowledge of natural resources and conservation activities. As such the Project WET workshops target understanding of water science through watersheds, human impacts and environmental changes that include climate change. A series of workshops currently provided to educators includes emergency preparedness materials for natural disaster planning, as well as using natural disasters as a teaching tool to highlight concepts of sea level rise, flooding, public health and safety, cost analysis and land use planning.

The application of educator workshops that combine DEEP materials and policy with Project WET activities helps illustrate the road to management decisions. The inclusion of such materials in school programs helps support the goals of DEEP and Connecticut's Environmental Literacy Plan – to provide for an environmentally literate citizen. The public outreach office also serves to connect DEEP's actions and policy with non-government organizations and educational centers through professional development workshops that support their educational outreach, in order to provide for current information and consistent messaging about resource policy and management decisions.

Connecticut Geological Survey

It is a role of the State Geologist and the Connecticut Geological Survey to reduce risks from geologic and seismic hazards through assessment and mapping of areas vulnerable to natural hazard events. Geologic research and field investigations support hazard assessments and assist policy makers to minimize damages of future events. These investigations are accomplished through cooperative efforts between the State Geological Survey of DEEP, Connecticut State Universities, private colleges and Universities, and other State and federal agencies.

The following CT Geological Survey cooperative efforts are related to hazards:

- Surficial Geologic Mapping for NEHRP (National Earthquake Hazards Reduction Program) site effect classification in HAZUS-MH (NE SGs/NESEC) (2010)
- Geochemical Landscapes Soil Analyses and Mapping (DEEP/USGS) (2008-2010) – natural vs. anthropogenic geochemical information
- Subsurface Geologic Mapping from Well Completion Reports (DEEP/USGS) (2008/09) – ground water resource mapping
- Surficial Aquifer Potential Mapping (DEEP/EPA) (2006-2008) – water resource protection
- Characterization of Bedrock Aquifers (DEEP/USGS) (2002) – source water protection; surface/groundwater interactions
- State Geological Map of Connecticut digitized (DEEP/CT DEM) (1998-99) – seismic hazards mapping
- Indoor Radon Potential Mapping (DEEP/DPH/EPA) (1990-1997) – well water & indoor air radon distribution mapping

The Connecticut Geological Survey provided support for DEEP efforts involving erosion susceptibility (1:24,000 scale) as a planning tool for predicting terrace escarpment erosion. This mapping was derived from a synthesis of Quaternary geology and soil mapping characteristics. Field testing at 60 key locations enabled mapping methodology to be applied statewide. Erosion susceptibility mapping is available to environmental planners within DEEP through GIS and to the public through free data download.

The Connecticut Geological Survey has prepared digital geologic and soils data for hazards assessments and analyses through cooperative efforts with the NRCS and the U.S. Geological Survey. These data support agency assessments of seismic risk, inland and coastal flooding, shoreline erosion, and sea level rise.

The catalog of digital GIS data available from DEEP, including geologic and soils data is available through https://ct-deep-gis-open-data-website-ctdeep.hub.arcgis.com/.

5.3.2.3 Department of Transportation (DOT)

In addition to its overall responsibility to provide a safe, efficient and cost-effective transportation system that meets the mobility needs of its users, the Connecticut Department of Transportation (DOT) is responsible for several short- and long-term natural hazard mitigation objectives in Connecticut. The short-term objectives include plowing of roads during winter storms and repairing the public transportation network after natural disasters. CTDOT's long-term goals include the design of flood and earthquake resistant roads and bridges.

Four of CTDOT's major short-term mitigation efforts are their Storm Control Center, State Tracking Automated Request System (STARS), Advanced Traffic Management System (ATMS), and Bridge Inspection Program:

The CTDOT Storm Control Center is operational during severe weather events ranging from winter storms to hurricanes. The Storm Control Center coordinates the plowing operations of over 600 crews during winter storms, as well as tree and debris removal crews when deemed necessary during all other severe weather events winter or summer.

The CTDOT has implemented STARS, a program to post road closures to the CTDOT's internet site for the public during major storms.

The ATMS system is a network of cameras and road sensors that monitor road conditions and traffic flow on Connecticut's Interstate Highways. Using automated road signs, the ATMS system also warns drivers of traffic congestion, accidents, or hazardous driving conditions.

The Bridge Inspection program uses an automated computer-based monitoring system that alerts CTDOT personnel when a scour critical bridge is experiencing a high rainfall or stream flow event. The system uses rain intensity and river gage information to trigger alerts so that bridge inspectors can be dispatched to the identified bridge(s). A plan of action has been developed for each scour critical bridge to aid the inspector in monitoring and possible closure of the structure.

Some of CTDOT's long-term mitigation efforts include:

- Improving the design of roads and bridges above the 100-year floodplain.
- Seismic resistant bridge retrofit projects and designing new bridges to resist earthquakes.
- Storm evacuation route planning.
- Increasing the clear zone on all roadways where needed to prevent road closures and damage due to downed trees and limbs.

DOT commenced a "Climate Change and Extreme Weather Pilot Project" in 2013 using a grant from the Federal Highway Administration. The project will include vulnerability assessments of culverts and bridges in Litchfield County that are between six and 20 feet in length, with regard to flooding caused by increasing precipitation and extreme rainfall events. The assessment will evaluate the existing storm event design standards, the recent (ten year) historic actual rainfall intensity and frequency and evaluate the hydraulic capacity of these structures using the projected increases in rainfall based on best available data and studies. Litchfield County was selected due to the inland flood damages observed in the northwest corner of the state over the last few years. The scope of this project was identified in the Connecticut Climate Change Preparedness Plan which was a product of a statewide effort that took place from 2005 through 2011.

In addition to the vulnerability assessment, the project will include a process that assigns a criticality value to the risk of failure. This will assist the Department in prioritizing replacement and reconstruction efforts to these structures where they pose the greatest risk to human health and safety, public and private property loss, and the economic risk of replacement after failure versus proactive replacement. This project will add to the existing framework by providing a model process for assessing the hydraulic capacity of smaller structures in the rural urban fringe and the criticality of those assets in similar geographies.

DOT provides technical assistance to DEEP and DEMHS in reviewing projects concerned with implementing roadway construction projects and other related transportation issues. A member of the CTDOT is appointed to the CIHMC.

5.3.2.4 Department of Public Health (DPH)

In the course of a day, more than 2.86 million Connecticut residents, as well as many others who visit the state, come into contact with drinking water provided by a public water system, whether community, non-community or non-transient, non-community. The CT Department of Public Health (DPH) Drinking Water Section (DWS) is responsible for ensuring that all public water supply systems provide a water supply of adequate quantity and quality to their consumers.

The DPH maintains the following two plans that relate to emergency response and mitigation: 1) Connecticut Public Health Emergency Response Plan and 2) DWS Emergency Contingency Plan.

DPH provides technical assistance to DEEP and DEMHS in reviewing projects with respect to drinking water issues including sources, adequacy, and infrastructure. A member of the DHCD may be appointed to the CIHMC.

Connecticut Public Health Emergency Response Plan

The DPH is the lead administrative and planning agency in Connecticut for public health initiatives including public health emergency preparedness. DPH works with federal, state, regional, and local partners to improve the State's ability to respond to public health emergencies. The Connecticut Public Health Emergency Response Plan (PHERP) identifies the appropriate DPH response activities during a public health emergency. This plan supports the public health and medical care component in existing state disaster and emergency plans.

The purpose of the PHERP is to support the following four functions of the Connecticut emergency response effort:

- Maximize the protection of lives and properties.

- Identify the DPH procedures to implement when responding to a natural, biological, chemical, radiological, nuclear, or explosive emergency that threatens the public health of Connecticut.
- Contribute to emergency support functions, as appropriate, particularly emergency support function #8 of the PHERP (Health and Medical Services) at the state level to define policies and procedures for DPH and other public health partners in preparation for and in response to a public health emergency.
- Enable the State of Connecticut to continue to operate and provide services as normally and effectively as possible in the event of a public health emergency.

Connecticut Drinking Water Section Emergency Contingency Plan

Acting on behalf of the DPH, the DWS protects public health through regulatory oversight of public water systems throughout the state. Implicit in this mission statement is providing immediate "emergency" support to water supplies and the public. It is part of the DPH's mission to influence, through regulation and communication, the operation of public water systems so that all necessary precautions to protect and preserve sources and systems of supplies are taken.

The DPH DWS requires all public water systems serving 250 or more customers or 1,000 or more people to develop an Emergency Contingency Plan. The plan aims to avoid or address emergencies by evaluating vulnerabilities and how to mitigate potentially harmful events. The public water systems are encouraged to address risk prone items and areas where a system may fail and take steps to correct them. The DPH DWS addresses emergencies by communication with and responding to water quality issues at public drinking water systems Emergency Contingency Plans are developed to address emergencies including contamination of water, power emergencies, drought, flooding, and/or failure of any or all critical water system components.

Connecticut Department of Public Health Drinking Water Section Incident Report Forms: Standard Operating Procedure

There is a formal standard operating procedure (SOP) for the DWS Public Water System Security Incident Report Form and the DWS Public Water System Emergency Incident Report Form. The form describes the scope of public water system's distribution and storage. The procedure provides a consistent means for internal notification of staff on emergency and security situations at Public Water Systems. The Incident Report Forms also provide the DWS a means to notify key personnel within the Department of Public Health as well as other partners outside the Department of Public Health. Emergency and security situations at Public Water Systems can be divided into two categories, routine operating emergencies such as pipe breaks, pump malfunctions, acute risk water quality issues and power outages; and non-routine emergencies such as intentional acts of sabotage, chemical spills, floods, hurricanes, windstorms or droughts. The DWS Public

Water System Security Incident Report Form and the DWS Public Water System Emergency Incident Report Form have been provided to capture all emergency scenarios. As of 2018, DPH is in the process of updating the report forms and SOP to include key stakeholders and response actions like putting a system on interim measures.

Connecticut Water Supply Planning

All public water systems serving 1,000 or more persons, or 250 or more consumers are required by the DPH to prepare water supply plans in accordance with CGS 25-32d Sections 1a – 5 in order to maximize efficient and effective development of the state's public water supply systems and to promote public health, safety and welfare. The water supply planning process provides for a coordinated approach to long-range water supply planning by addressing water quality and quantity issues from an area-wide perspective. In CT, there are approximately 90 water utilities that fall under this category. These 90 systems must provide updates on the water supply plan every five years and plan their system viability over a five, 20, and 50-year period. The water supply plan also includes an emergency contingency plan section (described above).

Per Public Act 85-535, the State also has a program for Public Water Supply Coordination to maximize efficient and effective development of the state's public water supply systems and to promote public health, safety and welfare. This Act provides for a coordinated approach to long-range water supply planning by addressing water quality and quantity issues from an area-wide perspective. The process is designed to bring together public water system representatives and regional planning organizations to discuss long-range water supply issues and to develop a plan for dealing with those issues. The state has been divided into three management areas based upon a number of factors, including similarity of water supply problems, proliferation of small water systems, groundwater contamination problems, and over-allocated water resources. The three regions have completed coordinated planning and have water utility coordinating committees (WUCCs) in place to continue region-wide planning.

Connecticut Water Planning Council

The Connecticut Water Planning Council was created by the Energy and Technology Committee of the Connecticut General Assembly in 2001 with representation from four state agencies (DPH, OPM, and the predecessors of DEEP and PURA [DEP and DPUC]). The charge of the WPC is to "identify issues and strategies which bridge the gap between the water supply planning process and water resources management in order that water can be appropriately allocated to balance competing needs while protecting the health, safety and welfare of the people of Connecticut and minimizing adverse economic and environmental effects."

The WPC initially established three Committees to investigate specific issues identified in PA 01-177 and submitted an Issues Work Plan to the Legislature on January 28, 2002. The three committees were the Water Resource Management Committee, the Water Utility

Committee, and the Technical Management Committee. Each committee supervised the work of two subcommittees that, together, evaluated 11 issues. The WPC established the Water Planning Council Advisory Group (WPCAG) pursuant to PA 07-4, Section 2(c) in 2007 to assist in researching and analyzing water resources issues. The WPCAG has formed a number of work groups over the years. To date, the WPC and WPCAG have not undertaken any initiatives directly related to water-related natural hazards. However, they have addressed climate change, floods, and droughts through the development of the State Water Plan described below.

State Water Plan

On July 1, 2014, Public Act 14-163, "An Act Concerning the Responsibilities of the Water Planning Council," became effective in the State of Connecticut. The Act directs the Water Planning Council to develop a State Water Plan. In 2015, the WPC formed a Steering Committee with representatives from the WPC and the WPCAG to work with any parties providing services during the development of a State Water Plan. The plan was developed in 2016-2017 with delivery of a draft in June 2017 and submittal to the State Legislature in January 2018.

The State Water Plan includes a climate change analysis completed by the consultant. Results of a "hybrid delta ensemble" (HDe) analysis were presented in the plan. Four scenarios were the focus of the analysis: "warm/dry," "warm/wet," "hot/dry," and "hot/wet." Summary output included a.) monthly time series plots of average temperature and total precipitation, b.) mean monthly temperature and precipitation bar charts, and c.) monthly temperature and precipitation percentile plots. The first summarized the raw output and

illustrates month to month variability, the second provided insight into the seasonality of the projected changes, and the third showed the full range of projected changes including extreme months. Differences across sets of ensemble plots highlighted the variability and uncertainty associated with the climate model projections and potential differences associated with greenhouse gas emissions pathways. For example, the "hot/dry" ensemble projects a mean monthly temperature change of 4.5 °C and a mean monthly precipitation change of 10 mm/month, while the "warm/wet" ensemble projects a temperature change of 2.6 °C and a precipitation change of 17 mm/month.

All model ensembles project an increase in temperature for all calendar months. Projected temperature changes appear relatively consistent across calendar months and percentile levels for each of the ensemble scenarios. In other words, both summer and winter temperatures are projected to increase by similar amounts; and a similar shift is observed for both extreme-cold and extreme-hot months. Precipitation projections are more variable, although consistently projecting a generally wetter future for all four scenarios. The largest precipitation increases are projected for the wetter months (higher percentiles), including extreme wet months. The seasonality plots in the NHMP show that winter and spring precipitation changes are projected to be larger than summer and autumn changes. Drier months are generally projected to remain about the same in terms of both frequency

and rainfall level. Small decreases in extreme dry month precipitation were projected for the "hot/dry" scenario.

Implied by the results presented in the State Water Plan is the potential for decreased water availability due to significantly higher temperatures and evapotranspiration losses. However, this dynamic would be offset to a certain extent by increased rainfall. Typical climate forecasts tend to suggest that increased temperatures coupled with increased annual precipitation generally correspond to higher intensity storms (greater flood risk) and longer dry periods in the summer months (more frequent and/or intense droughts).

The State Water Plan notes that there is general consensus in the climate models for a hotter and wetter future. Mean annual temperature changes for the 2080 planning horizon, compared to historical baseline, range from approximately +0.5 ˚C to + 6.5 ˚C. Mean annual precipitation changes range from approximately -5% to +30%, with most of the projections predicting an increase in mean annual precipitation.

State Drought Planning

Public water systems that conduct water supply planning have developed drought planning and response plans as part of their emergency contingency plans. Currently, the drought planning and response plans developed by public water systems are either based on the Water Supply Plan Regulations (25-32d-3) or the parameters identified in the 2022 Connecticut Drought Preparedness and Response Plan prepared by the Interagency Drought Work Group. Public Act 17-211 requires that drought planning and response procedures developed by public water systems now be available to the public. As a result, drought planning and response plans will need to be decoupled from emergency contingency plans as they are updated.

For public water systems primarily reliant on reservoir sources, the amount of storage in the reservoir is typically used to define the criteria for each drought stage. Public water systems primarily reliant on groundwater sources typically use the amount of storage in a primary storage tank over a period of days, or a combination of precipitation and groundwater levels, to define the criteria for each drought stage. The 2022 Connecticut Drought Preparedness and Response Plan identifies five drought stages of increasingly dry conditions, as well as potential impacts and recommended mitigation and preparedness actions for each stage. Certain stages are guided by drought criteria thresholds. The stages are defined as follows, referencing their previous definitions in the 2018 and 2003 State Plans.

- Stage 1 (formerly Below Normal Conditions)
- Stage 2 (formerly Incipient Drought or Drought Advisory)
- Stage 3 (formerly Moderate Drought or Drought Watch)

- Stage 4 (formerly Severe Drought or Drought Warning)
- Stage 5 (formerly Extreme Drought or Drought Emergency)

Utilities have strengthened these goals where appropriate. For example, many utilities identify the 20% reduction goal under Drought Warning to be mandatory, as utilities have found that a better reduction in demand is realized when mandatory conservation measures are enacted. In addition, some utilities also define and utilize an "Alert" cautionary stage to prepare internally for implementation of voluntary and mandatory water conservation measures.

However, some water utilities still utilize the older five-stage method that pre-dates the 2003 Connecticut Drought Preparedness and Response Plan:

- "Alert" which did not include a reduction goal
- "Advisory" with a voluntary 10% reduction goal
- "Emergency Phase I" with a voluntary 15% reduction goal
- "Emergency Phase II" with a voluntary 20% reduction goal
- "Emergency Phase III" with water rationing

Over time, the State expects that these water utilities will shift to the four stages described in the Water Supply Plan Regulations (25-32d-3).

The drought of 2015-2016 raised public awareness of voluntary and mandatory water conservation measures, which are enacted by many utilities to reduce demands during a drought. Typically, such reductions are requested on a percentage basis for each customer. Utilities typically request reductions from all users concurrently. Many utilities have Emergency Contingency Plans that focus water conservation enforcement on high-volume users by recommending more frequent (weekly) meter readings of high-volume customers when conservation measures are requested or mandated and recommending requiring large customers to file a water conservation "plan of action" with the utility to demonstrate how that customer will reduce its water usage to the requested percentage.

It has long been recognized that water utilities, particularly non-municipal utilities, have limited methods to enforce voluntary and mandatory conservation measures. As noted in the 2022 Connecticut Drought Preparedness and Response Plan, municipal authority may be necessary to locally enforce any measures, but many municipalities do not have local ordinances in place to ensure proper implementation of water conservation measures during droughts and other emergencies. To that end, a model ordinance was developed to encourage adoption of these policies at the local level, but few municipalities have adopted the model ordinance. The model ordinance includes examples of banned uses, the procedures for announcing the need for conservation measures, and procedures for issuing fines or even curtailment of service. Municipal drought ordinances have been successful in southwest Connecticut. This occurred through municipal interest prior to the drought of

2015-2016 (for example, in Greenwich), as well as during reaction to the drought of 2015-2016 (in Stamford, Darien, and New Canaan).

For reservoir systems, the number of days of supply remaining has been suggested by some water utilities as a method that could potentially be used for determining drought stage criteria in conjunction with the percentage of storage remaining. The number of days of supply remaining should be tied to a relatively predictable number for a water system, such as maximum month average day demand (MMADD) or MMADD from a year with a similar drought. There are several reasons for this suggestion:

- For some storage-rich systems, a Drought Emergency could be issued under the current plans despite the system having more than 300 days of supply remaining, and there is concern that this could result in increased political pressure to not request or mandate emergency water conservation measures.
- The use of MMADD provides a condition where water would be withdrawn faster than would be expected given implementation of conservation measures. As such, it provides a baseline against which users in a system could be encouraged for their conservation efforts. Projecting that a system has 90 days of supply remaining, but then still having 80 days of supply remaining a month later despite minimal rainfall, can provide quantitative reinforcement to a community of the positive effects being developed.
- Furthermore, such a procedure would standardize the triggers between utilities. The volume of reservoir storage between utilities vastly differs, but a method based on the days of supply remaining would provide consistency for state agencies attempting to understand the status of multiple public water systems across the state. For example, CT DPH would immediately understand that a utility entering a Drought Warning was projecting a certain amount of days of supply remaining, regardless of the size of the system or storage available.

Alternatively, a risk-based approach could be used based on historical drought data and the projected frequency of hitting drought triggers. A variety of approaches along this vein are presently under consideration by utilities. Regardless of approach, a delicate balance must be achieved where activating drought triggers can ensure that water is properly conserved, but where activation does not result trigger "fatigue" among end users who become immune to constant announcements of rapidly changing levels of requested and mandatory conservation.

In summary, drought-related capabilities are changing rapidly in Connecticut. The next edition of this Natural Hazard Mitigation Plan will revisit drought capabilities and report on changes to the Drought Preparedness and Response Plan.

5.3.2.5 Department of Administrative Services

Division of Construction Services

Within the Department of Administrative Services is the Division of Construction Services (DCS). DCS consolidated services provided by the Bureau of Design and Construction from the former Department of Public Works, the Bureau of School Facilities from the State Department of Education and the Division of Fire and Building Services from the former Department of Public Safety, which includes the Office of the State Building Inspector, the Office of Education and Data Management and the Office of State Fire Marshal.

DAS is the state's primary agency for executive and judicial branches for facility planning, design, and construction-related services; administration of the state school construction grant program; and development, administration and training of state building and fire safety codes.

Office of Design and Construction

The Office of Design and Construction (ODC) implements and administers state capital projects planning and management for the majority of state agencies by working with them in the areas of facilities planning, design, construction, and technical expertise. ODC administers and promotes the following:

- High Performance Building or Sustainable Design guidelines for capital projects.
- Design and implement energy retrofit projects to existing state buildings.
- Review and approve Life Cycle Cost Analysis submissions for all state-funded new buildings, additions or renovations.
- Provides technical expertise in regulatory compliance in the areas of permits, mitigation, hazardous materials (lead, asbestos, PCBs, mold), and soil contamination.
- Administers the State Asbestos Program.
- Provides geographical information system (GIS) support for state agencies, including State real estate inventories.

DCS – Environmental Planning and GIS Services

The Technical Services Unit within DCS provides important technical reviews and analysis of DCS administered State projects. This unit works closely with other state agencies when they are in the initial planning phases and in particular, siting a new facility. Part of this review involves assessing potential impacts relating to natural hazards, recommendations of alternatives to avoid, minimize or mitigate potential natural hazard impacts, and regulatory approvals (e.g., Flood Management Certification).

DCS offers GIS services to the majority of state agencies, which include custom maps/figures, geographic analysis for relocation of state facilities, assisting in overall statewide facility planning efforts, project pre-planning, and identification of potential environmental impacts for proposed projects. This Unit also maintains a GIS inventory of state land and buildings. In conjunction with DESPP and OPM staff, this unit is also involved with mapping of critical infrastructure and key resources data and conducting assessments of such resources as they relate to natural or man-made hazards.

Office of School Facilities

The Office of School Facilities (0SF) is responsible for overseeing the local school construction grant program. In addition to design and construction oversight, OSF Code Reviewers and DCS Technical Services Unit evaluate building code and environmental requirements and determine adequacy and appropriateness of proposed new school facility sites. In addition, DDC Technical Services reviews and approves these local school construction projects for consistency with the State's Flood Management Act.

Fire and Building Services: Office of the State Building Inspector, Office of State Fire Marshal, and Office of Education and Data Management

These offices provide the following functions: works with the State Codes and Standards Committee to develop, adopt and administer state building and fire safety codes and the fire prevention code, provide interpretations and clarifications of code language; act upon requests for code modifications and waivers; review construction drawings, issue building permits and inspect large state buildings; train and credential building and fire code officials; inspect and issue operating certificates for boilers and elevators; issue demolition and crane licenses; maintain burn injury and fire incident reporting systems; and provide technical assistance to state agencies, municipal code officials, design and construction professionals, and building owners.

Office of the State Building Inspector (OSBI)

The lead authority for the adoption and administration of building code provisions for wind speed, flood, snow load, and seismic matters design criteria is OSBI. The 2019 edition of this plan noted that, effective October 1, 2018, the Office of the State Building Inspector (OSBI) amended the previous state building code to adopt the 2015 International Residential Code (IRC). The State Building Inspector, State Fire Marshal, and the Codes and Standards Committee announced on December 29, 2016 the intent to adopt the 2018 State Building and Fire Safety Codes based on the 2015 editions of the ICC and National Fire Protection Association (NFPA) documents. Technical review of these codes was conducted by the Committee's Codes Amendment Subcommittee (CAS) along with DAS staff. This review began January 2017 and was completed with the Codes and Standards Committee's approval for DAS to move both codes to the legislative approval process at its November 8, 2017 meeting. The adopted codes under the 2018 State Building Code (SBC) were described in the 2019 edition of this plan.

The adoption of the 2015 IRC under the 2018 SBC made significant changes to the elevation requirement for new construction and substantially improved structures in 100-year floodplains, especially coastal floodplains, which may be different than the standards previously contained in local floodplain zoning regulations or ordinance. The new code requires one foot of freeboard in all A, AE, and VE zones; coastal A zones will be regulated like VE zones where the LimWa is delineated; flood openings will be required in breakaway walls; and essentially facilities must be elevated two feet above the BFE or to the 0.2% annual chance flood elevation.

As of October 1, 2022, the 2022 Connecticut State Building Code applies to projects. The SBC is based on the International Code Council's (ICC) widely adopted 2021 International Codes. It also references the ICC standard for accessibility. The 2022 SBC adopts the following model codes:

- 2021 International Building Code
- 2021 International Existing Building Code
- 2021 International Plumbing Code
- 2021 International Mechanical Code
- 2021 International Residential Code
- 2021 International Energy Conservation Code
- 2021 International Swimming Pool and Spa Code
- 2020 NFPA 70 National Electrical Code
- 2017 ICC A117.1 Accessible and Usable Buildings & Facilities
- 2022 Connecticut State Fire Safety Code
- 2022 Connecticut State Fire Prevention Code

Office of Policy and Management

Given its role as the Governor's staff agency, OPM plays a central role in providing the information and analysis used in formulating state policy. OPM provides the Governor with an objective view of the issues and with an assessment of available policy alternatives. OPM also assists state agencies and municipalities in implementing policy decisions on behalf of the Governor. Integrating natural hazard mitigation considerations with development, resource management and public investment policies helps minimize the loss of life and property due to natural disasters.

Beyond its broader role in the development and implementation of state policy, OPM is responsible for coordinating drought management activities of state agencies. OPM is a member of the Interagency Drought Working Group and of the Water Planning Council

described above. OPM also provides technical support to DEMHS and DEEP in reviewing project applications. A member of OPM is appointed to the CIHMC.

OPM is responsible for the Connecticut Conservation and Development Policies Plan (informally known as the State Plan of Conservation and Development [POCD]) which identifies the state's development, resource management and public investment policies. The POCD identifies the policies that guide the state in (1) addressing human resource needs and development; (2) balancing economic growth with environmental protection and resource conservation concerns; and (3) coordinating the functional planning activities of state agencies to accomplish long-term effectiveness and economies in the expenditure of public funds.[264]

Conservation & Development Policies, the Plan for Connecticut

OPM is required to continuously incorporate consideration of natural hazards into the revision of the Conservation & Development Policies Plan as part of the compliance with the Floodplain Management and Hazard Mitigation Act. The Conservation & Development Policies Plan 2018-2023 incorporates this requirement and was adopted in May 2022. Revised policies include:

- Minimize the siting of new infrastructure and development in coastal areas prone to erosion and inundation from sea level rise or storms, as anticipated in sea level change scenarios published by the National Oceanic and Atmospheric Administration, ensure that coastal hazards are accounted for when considering options for the replacement, expansion, or reduction of existing infrastructure under Policy 1.1, and otherwise limit development activities within coastal areas to those consistent with statutory goals and policies set forth in the Connecticut Coastal Management Act.
- Discourage new development activities within areas prone to flooding and coastal erosion, manage any unavoidable activities in such areas in an environmentally sensitive manner and in compliance with applicable laws, and seek to prevent the loss of life and property by maintaining existing dikes, channels, dams, and other barriers, or removing such structures where removal would be a more cost- effective option for reducing threats to downstream property.

5.3.2.6 Department of Economic and Community Development

State Historic Preservation Office

[264] For a copy of the CT Plan of Conservation and Development and more information please see the following web page: http://www.ct.gov/opm/cwp/view.asp?a=2990&q=383182.

The State Historic Preservation Office (SHPO) is responsible for overseeing the governmental program of historic preservation for Connecticut's citizens. Originally established as the Connecticut Historical Commission in 1955, the agency was merged into the Commission on Culture & Tourism in 2003 and was renamed the Historic Preservation and Museum Division. The State Historic Preservation Office was again moved in 2011 into the Department of Economic and Community Development providing new opportunities for collaboration on restoration and community revitalization.

SHPO administers a range of federal and state programs that identify, register and protect the buildings, sites, structures, districts and objects that represent Connecticut's cultural heritage. These include administration of the State and National Register of Historic Places programs; regulatory compliance review; technical assistance; grants and tax credit programs supporting historic preservation; the development of a statewide Historic Preservation Plan; and the operation of four state-owned museums.

5.3.3 Connecticut Legislative and Executive Programs and State-Level Committees and Task Forces

There are a number of high-level programs and inter-agency planning groups that are associated with natural hazard mitigation within Connecticut. While some groups have a direct role, other inter-agency planning groups are associated with natural hazard mitigation through their policies or plans in which they are charged with developing and implementing. The following is a presentation of the inter-agency planning groups associated with natural hazard mitigation in Connecticut.

5.3.3.1 Connecticut Interagency Hazard Mitigation Committee (CIHMC)

As a result of a Federal disaster declaration in July 1989, the State of Connecticut formed the Hazard Mitigation Grant Review Committee (HMGRC). The purpose and goal of the HMGRC was to oversee the new post-disaster Hazard Mitigation Grant Program (HMGP) that became law with the passage of the Stafford Act in 1988.

The HMGRC consisted of representatives of the DEP (now DEEP), NWS, Connecticut Department of Education (DOE), Connecticut Office of Emergency Management (OEM, currently DEMHS), Connecticut OPM, Natural Resources and Conservation Service (NRCS), Small Business Administration (SBA), and FEMA. The Department of Transportation (DOT) and the Connecticut Department of the Military joined the HMGRC in the late 1990s. A private group, the Hartford Financial Services Group (Hartford Group) also joined the HMGRC to give private companies representation on the Committee.

During the 1990s the HMGRC met quarterly after each disaster and met annually in non-disaster years to review hazard mitigation project applications. The HMGRC began reviewing and approving applications for the newly developed Flood Mitigation Assistance (FMA) grant program in 1998.

The HMGRC was renamed to the Connecticut Interagency Hazard Mitigation Committee (CIHMC) in 1998. The Connecticut Interagency Hazard Mitigation Committee continued the duties of discussing and overseeing mitigation-related activities and issues within the State. Due to the group's name change, the CIHMC developed a revised MOU that was signed by the top agency official of each participating state and federal agency in 2001. The five participating state agencies and divisions at this time are DEEP, DEMHS, OPM, Department of Transportation (DOT), and the Office of the State Building Inspector (OSBI). The one participating federal agency is the NRCS. In addition, one private sector representative from the Hartford Life Insurance Company sits on the Committee.

5.3.3.2 Prioritization of Local Mitigation Funding

The State of Connecticut's CIHMC reviews and approves projects submitted by eligible applicants for formal submission to FEMA under the State's grant application for FEMA grants programs FMA, PDM, and HMGP. The CIHMC meets annually, but may meet more frequently, if necessary, to review and approve potential FEMA grant funded projects. Although the final responsibility for selection of projects remains with the SHMO, the CIHMC advises the SHMO. It is the responsibility of the SHMO to reconvene or re-staff the committee as necessary for future grant awards.

The CIHMC ranks potential projects for submission to FEMA. Projects must have a benefit to cost ratio of one-to-one (1:1) or greater for each project application. Projects must solve the problem being addressed. HMGP, FMA and PDM funding may not be used as a substitute or a cost share for any other federally funded projects. In addition, sub-grantees may secure funding from other state and local programs to provide their required cost share for a particular project.

Proposed sub-applicant and state projects are evaluated and selected for funding based on the degree to which they address the following stated criteria put forth in the State's annual PDM and FMA grant guidance documents, such as how a project will:

- Utilize the best strategy to ensure the success of the project goal.
- Allocate sufficient staff and resources for the successful implementation of the proposed mitigation project.
- Demonstrate that the proposed mitigation activity reduces the overall risks to the general population and structures.
- Result in a long-term solution to a flooding problem with minimal maintenance required.

- Provide a benefit to the general population of an area (ex. culvert upgrade, storm damage system upgrade, public education).
- Protect critical facilities.
- Leverage Federal/State/tribal/local/private partnerships to enhance the outcome of the proposed activity.
- Promote measures that prevent future construction or development in hazard-prone areas.
- Promote stormwater management practices according to CGS Section 25-68h.
- Are located in a community listed on the Public Investment Community Index with a PIC rank of 1-42 (OPM website).
- Have a multi-objective mitigation purpose.
- Are consistent with the State Natural Hazard Mitigation Plan.
- Are consistent with Local or Regional Hazard Mitigation Plans.

Proposed projects are given a score based on several factors such as the ones stated above. Specific evaluation criteria may be modified for a particular grant year in response to FEMA stated requirements as set forth in FEMA grant guidance document for a particular grant and fiscal year or based upon state mitigation grant priorities for any given year.

Ranking: The CIHMC will rank and assign priorities for funding to all eligible projects. The CIHMC has developed a ranking form (Table 206) which integrates the top strategies and goals of the State Natural Hazard Mitigation Plan and in accordance with the criteria in Section 4, 4.2 of the Administrative Plan and 44 CFR Section 206.434 (c).

List of Projects: An ongoing list of potential HMGP projects shall be identified and maintained by DESPP for various types of mitigation projects. This shall include those applications not funded in prior rounds of funding.

Table 206. Ranking Form

The extent to which the project ranks:	0%	20%	40%	60%	80%	100%
Does the proposed measure prevent losses to a NFIP insurable building?						
Does the proposed measure prevent losses to a Severe Repetitive Loss (5pts) or Repetitive Loss Property (3pts)?						
Does the measure directly mitigate the effects of a frequent natural disaster such as flooding, high winds or ice and snow?						

The extent to which the project ranks:	0%	20%	40%	60%	80%	100%
Will the measure result in a long-term solution to natural disasters which require min. maintenance?						
Does the proposed measure provide benefits to a large population of an area (e.g., Culvert upgrade, Bridge Replacement, Public Education…)?						
Does the project represent an innovative approach which can serve as a pilot project in another jurisdiction?						
Project Type: Acquisition (5pts) Elevation (3pts)						
Drainage/ Other Infrastructure (4 pts)						
5% Initiative (1 pt)						
Planning (5 pts)						
Will the measure eliminate future vulnerability to a common natural hazard (e.g., land acquisition, elevation of buildings, hurricane clips etc.)?						
Does the project protect a critical facility such as a police or fire station?						
Totals						
Grand Total Score						

5.3.3.3 Connecticut GIS State Coordination (OPM)

OPM is the lead agency for GIS coordination within the state and with other states; it is the successor to the CT GIS Council. OPM is responsible for coordinating, within available appropriations, a GIS capacity for the state, regional planning agencies, municipalities, and others as needed. OPM guides and assists state and local officials involved in transportation, economic development, land use planning, environmental, cultural, and natural resource management, public service delivery, and other areas as necessary.

Since natural hazard mitigation is intrinsically linked to location and geography, the following are highlights of the past GIS Council efforts and are anticipated to continue under the direction of OPM:

Critical Infrastructure and Key Resources (CI/KR) Subcommittee

The purpose of this subcommittee is to be knowledgeable of all available CI/KR GIS data that exists at the federal, state, and local level within the state; and to develop data inventories and data development and maintenance protocols and procedures. Beginning in 2012 and through 2013, the CI/KR Subcommittee is working on a draft CI/KR Data Standards and Guidelines.

Critical infrastructure includes those assets, systems, networks, and functions – physical or virtual – that are vital to Connecticut, the region, and the country so that their incapacitation or destruction would have a debilitating impact on security, economic security, public health or safety, or any combination. Key resources are publicly or privately controlled resources essential to minimal operation of the government and economy.

The federal government has organized CI/KR into 16 sectors that together provide essential functions and services that support various aspects of State and local government, private entities, and the general public. For purposes of identifying and organizing Connecticut's CI/KR GIS data, the subcommittee has adopted the U.S. DHS data classification and taxonomy. The following are the 16 sectors which GIS data will be collected and organized:

- Food and Agriculture
- Financial Services
- Chemical
- Commercial Facilities
- Communications
- Critical Manufacturing
- Dams
- Defense Industrial Base
- Emergency Services
- Energy
- Government Facilities
- Healthcare and Public Health
- Information Technology
- Nuclear Reactors, Materials and Waste
- Transportation Systems
- Water Systems and Wastewater Pollution Control Facility (WPCF) Systems

It should be noted that within DEMHS is a Critical Infrastructure Unit that assesses, evaluates, and inventories CI/KR information, but not in a GIS-based database. This Unit acknowledges DHS's definitions and criteria for what constitutes CI/KR.

Recently, for purposes of establishing a "microgrid" grant and loan pilot program, Public Act 12-148 defined "critical facility" as, "any hospital, police station, fire station, water treatment plant, water pollution control facilities (WPCFs), public shelter or correctional facility, any commercial area of a municipality, a municipal center, as identified by the chief

elected official of any municipality, or any other facility or area identified by the Department of Energy and Environmental Protection as critical…." For purposes of this plan, for developing mitigation strategies and other statewide programs/projects going forward, the more inclusive definitions and understandings of what constitutes CI/KR will take precedence over the above definition.

5.3.3.4 Governor's Council on Climate Change (GC3)

The GC3 was originally established in 2015 by Governor Dannel P. Malloy's Executive Order No. 46. The GC3 was formally tasked with examining the effectiveness of existing policies and regulations designed to reduce greenhouse gas emissions and identify new strategies to meet the state's greenhouse gas emissions reduction target of 80% below 2001 levels by 2050. The GC3 submitted its recommendations on December 18, 2018. On September 3, 2019, Governor Ned Lamont issued Executive Order No. 3, reestablishing and expanding the membership and responsibilities of the GC3. The GC3's membership now includes more than 20 members from state agencies, quasi-public agencies, businesses, local governments, and nonprofits; and is tasked with two primary objectives:

1. Monitor and report on the state's implementation of the greenhouse gas emissions reduction strategies set forth in the inaugural GC3's December 2018 report Building a Low Carbon Future for Connecticut: Achieving a 45% GHG Reduction by 2030.
2. Develop a statewide Adaptation and Resilience Plan for Connecticut that encompasses the most current and locally scaled scientific information and analysis available with respect to the effects of climate change and provide updated recommendations for adapting to and improving the state's resilience to such changes in areas such as infrastructure, agriculture, natural resources, and public health.

In January of 2021, the GC3 released the Phase 1 Report on Near Term Actions titled Taking Action on Climate Change and Building a More Resilient Connecticut for All. The report includes recommendations of the GC3 for Near-term actions to be implemented in 2021 and early 2022 and status of identified mitigation strategies. Within the document, the council, based on the best available data and the GC3 Science and Technology Working Group, commits to evidence-based actions driven by the adoption of findings regarding the impacts of climate change on sea-level, temperature, and precipitation in Connecticut.[265]

5.3.3.5 State Agencies Fostering Resilience

State Agencies Fostering Resilience (SAFR) was created by Executive Order No. 50, signed by Governor Dannel P. Malloy on October 26, 2015. SAFR is a permanent working group committed to strengthening the state's resiliency to extreme weather events including

[265] GC3 Governor's Council on Climate Change. Phase 1 Report: Near-Term Actions. January 2021. https://portal.ct.gov/-/media/DEEP/climatechange/GC3/GC3_Phase1_Report_Jan2021.pdf

hurricanes, flooding, extreme heat, and slow onset events such as sea-level rise. SAFR Council is comprised of 12 members, appointed by the Governor, including agency heads and experts. The SAFR Council is charged with authoring a Statewide Resilience Roadmap using climate impact research and assisting Connecticut's Office of Policy and Management in creating state policies that incorporate forward looking risk analysis. They also assist municipalities in incorporating climate analysis into their coastal resilience plans, as well as consulting on CIRCA's Resilient Connecticut project and stakeholder engagement.

The organization of SAFR changed in 2019 per Executive Order No.3, which identified the SAFR Council as a subcommittee of the GC3. The objectives and initial scope of work assigned to the SAFR have expanded to the following[266]:

- Collaborate on the creation of a Statewide Resilience Roadmap based on climate impact research and data including extensive research studies that inform land use patterns.
- Assist the OPM in the creation of state policy on Disaster Resilience by using science-based analysis.
- Coordinate with National Incident Management System (NIMS) informed recovery plans and protocols.
- Ensure that information developed as part of the Statewide Resilience Roadmap and state policy on Disaster Resilience is incorporated into planning processes of the SAFR Council member agencies.
- Support municipalities in incorporating the above information into coastal resilience plans and local plans of Conservation and Development.
- Coordinate with the Long-Term Recovery Committee and the GC3 to implement a holistic approach to adaptation, resilience, and recovery.

5.3.3.6 State-Wide Long-Term Recovery Committee

Established as part of Governor Malloy's Emergency Planning and Preparedness Initiative from 2012, the State of Connecticut identified the Department of Economic and Community Development (DECD) and Department of Insurance (DOI) to serve as co-chairs of the State's Long-term Recovery Committee. The purpose of the committee is to provide support for local and tribal governments, non-governmental organizations and the private sector, which will enable them to recover from significant incidents. This is accomplished by facilitating problem solving, improving access to resources and fostering coordination among State and federal agencies and other stakeholders.

[266] CONN CIRCA. State Agencies Fostering Resilience (SAFR) Council. https://resilientconnecticut.uconn.edu/engagement/safr/

As part of this effort, the Long-Term Recovery Committee is establishing working groups or Recovery Support Functions (RSFs) to address specific needs, which is consistent with those established at the federal level under the National Disaster Recovery Framework (NDRF). The NDRF is a guide that defines roles and responsibilities; promotes establishment of post-disaster organizations to manage recovery; promotes a deliberate, transparent process that provides well-coordinated support to the Community; and offers strong, focused recovery leadership at the State and Tribal level, supported by strong Federal recovery leadership.

Members of the RSF's consist of public, private, and non-profit organizations that work together to address the unmet needs of a community. The RSF's that have currently been established include:

- Individual Assistance, which includes a housing taskforce and volunteer organizations active in disasters.
- Natural and Cultural Resources (discussed above in **section 5.3.2.2** under the discussion related to Land and Water Resources Division (previously OLISP) capabilities).
- Economics.
- Community Planning and Capacity Building.

The RSFs are designed to take advantage of private and public agencies' existing resources and fully integrate community planning, public works, economic development, housing, health and social services expertise and resources of other organizations. Through the RSFs, relevant stakeholders and experts are brought together during the pre-disaster planning stage and when activated post-disaster and are used to identify and resolve recovery challenges that are not being met at the local level. Together, these RSFs help facilitate local stakeholder participation and promote intergovernmental and public-private partnerships, which ultimately support recovery and resiliency.

It is notable that the NDRF is being launched on a state level in Connecticut through the RSFs for the first time ever in the United States. Connecticut is the first state to ever partake in this type of effort.

The framework of the Long-Term Recovery Committee was used during the state response to the COVID-19 pandemic, stating that these agencies would be critical in ensuring all communities have the resources they need to recover and thrive. The committees were tasked with maximizing participation of partners, establishing systems to identify unmet needs of residents, properly advocating for resources and funding, and other responsibilities relating to public well-being.

5.3.3.7 Connecticut Interagency Debris Management Task Force

In the event of a declared state of Civil Preparedness Emergency, the Governor will authorize the Interagency Debris Management Task Force (IDMTF). Members of the task force will participate in all preparedness activities, serve as operational representatives when debris management and monitoring activities are undertaken, and assign work for the State Debris Management and Monitoring Contractors by developing task orders. The core membership of the IDMTF includes the Department of Emergency Services and Public Protection (Division of Emergency Management and Homeland Security), Department of Energy and Environmental Protection, Department of Administrative Services, Department of Transportation, and the state debris contractors. Connecticut National Guard, Northeast Utilities, and United Illuminating will provide continuing participation throughout the event. Other agencies and organizations that may be requested to participate on the task force as needed.[267]

5.3.3.8 Connecticut Green Bank

The Connecticut Green Bank is the nation's first green bank. Established by the Connecticut General Assembly on July 1, 2011, as a part of Public Act 11-80, Connecticut Green Bank supports the Governor's and Legislature's energy strategy to achieve cleaner, less expensive, and more reliable sources of energy while creating jobs and supporting local economic development. The Connecticut Green Bank evolved from the Connecticut Clean Energy Fund (CCEF) and the Clean Energy Finance and Investment Authority (CEFIA), which was given a broader mandate in 2011 to become the Connecticut Green Bank. The powers of the Connecticut Green Bank are vested in and exercised by the Board of Directors, which is governed through Section 16-245(n) of the Connecticut General Statutes.[268]

The Connecticut Green Bank works with private-sector investors to create low-cost, long-term sustainable financing in the residential (single and multifamily), commercial, industrial, institutional and infrastructure sectors. Since its inception, the Connecticut Green Bank and its private investment partners have deployed over $1 billion in capital for clean energy projects across the state. Projects recorded through fiscal year 2016 show that for every $1 of public funds committed by the Green Bank an additional $6 in private investment occurred in the economy.

[267]CT DEEP. Plan for Disaster Debris Management. http://www.ct.gov/deep/lib/deep/waste_management_and_disposal/debris_management/conceptofoperationsplanfordisasterdebrismanagement.pdf
[268] Connecticut Green Bank. http://www.ctgreenbank.com/

5.3.4 Interstate Programs

There are several interstate groups and compacts that are associated with natural hazard mitigation within Connecticut.

5.3.4.1 National Fish and Wildlife Foundation Long Island Sound Futures Fund

The National Fish and Wildlife Foundation's (NFWF) Long Island Sound Futures Fund (LISFF) supports projects to fully restore the health and living resources of the Long Island Sound. The program is managed by NFWF, the EPA, and the Long Island Sound Study (LISS). The LISFF is the result of partnerships between federal and state agencies, foundations, non-governmental organizations, and educational institutions dedicated to the protection of the Sound.

The LISFF supports innovative approaches to conservation that support the people and communities surrounding the watershed. The funding priorities of the program include[269]:

- Clean Waters and Healthy Watersheds: improving water quality by reducing pollution from the waters that flow into and the land surrounding the Sound.
- Thriving Habitats and Abundant Wildlife: restoring coastal habitats and fostering abundant populations of fish, birds, and wildlife.
- Sustainable and Resilient Communities: Supporting vibrant, informed, and engaged communities that use, appreciate, and help protect and sustain the Sound; and enhance natural and community resilience.

5.3.4.2 United States Climate Alliance

In response to the U.S. federal government's decision to withdraw the United States from the Paris Agreement on climate change, the United States Climate Alliance was created on June 1st, 2017, with Connecticut joining on June 2nd. This bi-partisan coalition of states is committed to the goal of reducing greenhouse gas emissions consistent with the goals of the Paris Agreement: a 26-28% reduction in greenhouse gas emissions below 2005 levels by 2025. They published the first U.S. Climate Alliance Annual Report in 2017, which takes stock of the progress being making towards achieving this objective and discusses future initiatives that will help meet or exceed their goals.[270]

Recent publications since the 2019 edition of this plan include:

[269] National Fish and Wildlife Foundation. Long Island Sound Futures Fund. https://www.nfwf.org/programs/long-island-sound-futures-fund
[270] US Climate Alliance. States United for Climate Action. https://www.usclimatealliance.org/

- 2022 The Just and Equitable Transition State Policy Framework: Toolkit for states that want to build and strengthen equitable transition policies as energy transition is likely to significantly change established infrastructure, economies, and energy use.
- 2021 Governors' Climate Resilience Playbook: Support states in building resilience to extreme weather events and climate impacts. Sections of the report include assessing existing programs and goals, centering equity within resilience agendas, and identifying funding opportunities.
- 2021 Building Decarbonization Roadmap: Tool designed to summarize the highest-impact actions that states can take to decarbonize buildings

5.3.4.3 Land Use Law Center at Pace University

The Center provides research, training, technical assistance, support, and strategic planning services to communities and individuals. Working with trained law students, the Center quickly, affordably, and effectively develops techniques to remedy nearly all types of land use problems that afflict urban, suburban, and rural communities. Some topics they cover include smart growth, urban revitalization, climate change mitigation, local wind and solar energy, and community resiliency. For example, in 2015 the Land Use Law Center worked with the Town of Derby, CT to improve public engagement during the creation of a plan for conservation and development.[271]

5.3.4.4 New England Resilience and Transition Network

The New England Resilience & Transition (NERT) Network is a network connecting grassroots groups working on community resilience, Transition, new economy, economic and environmental justice initiatives, permaculture, renewable local energy, local food, time banking, and sustainability projects to foster an equitable, inclusive, and thriving world for all.[272]

od, time banking, and sustainability projects to foster an equitable, inclusive, and thriving world for all.

5.3.4.5 Thames River and Connecticut River Flood Control Compacts

There are two active interstate flood control commissions: the Thames River Valley Flood Control Compact (1957 TRVFCC), and the Connecticut River Valley Flood Control Compact (CRVFCC 1953) (http://crvfcc.org/). These compacts were enacted to provide the authority to create detention reservoirs. The creation of each of the compacts required an act of Congress and legislative authorization from each of the signatory states. The CRVFCC is

[271] Pace University. Our Programs. http://www.law.pace.edu/our-programs
[272] New England Resilience & Transition Network. https://nertnetwork.org/

composed of three representatives each, from Connecticut, Massachusetts, New Hampshire, and Vermont, while the TRVFCC has three representatives from Connecticut and three from Massachusetts.

Representatives of the CRVFCC are chosen by their respective governors, and in Connecticut, are appointed for six-year terms. The CRVFCC requires all states to share in the cost of the office located in Massachusetts, and to share in reimbursements of property tax losses to the 21 communities in which the reservoirs are located. The office fees and tax reimbursements are fixed in the Compact according to proportional benefits. Because Connecticut and Massachusetts benefit most from the upstream dams, they pay more relative to the other states. Although tax reimbursement proportions are fixed, property assessments change, correspondingly yearly payments change.

The costs of building the 16 dams and 16 local protection projects along the Connecticut River and its tributaries have been principally borne by the Federal government.

Similar to the CRVFCC, the TRVFCC assesses each state for the tax losses associated with the flood control benefits provided by upstream communities. DEEP pays for the two flood control commission assessments on behalf of the state through a dedicated budget line item.

Figure 159 and Figure 160 show the land areas associated with both flood control compacts.

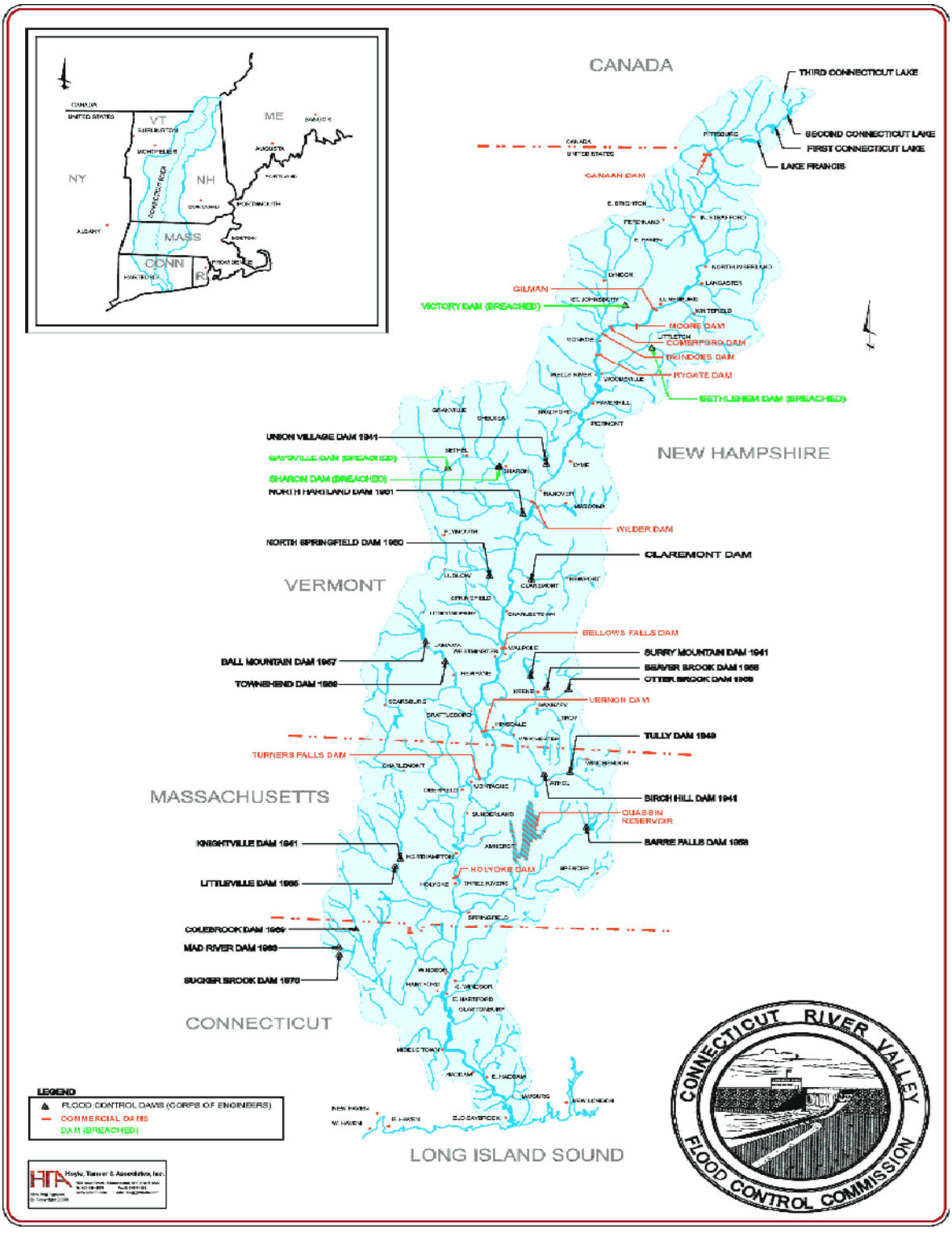


Figure 159. Map of Connecticut River flood control facilities

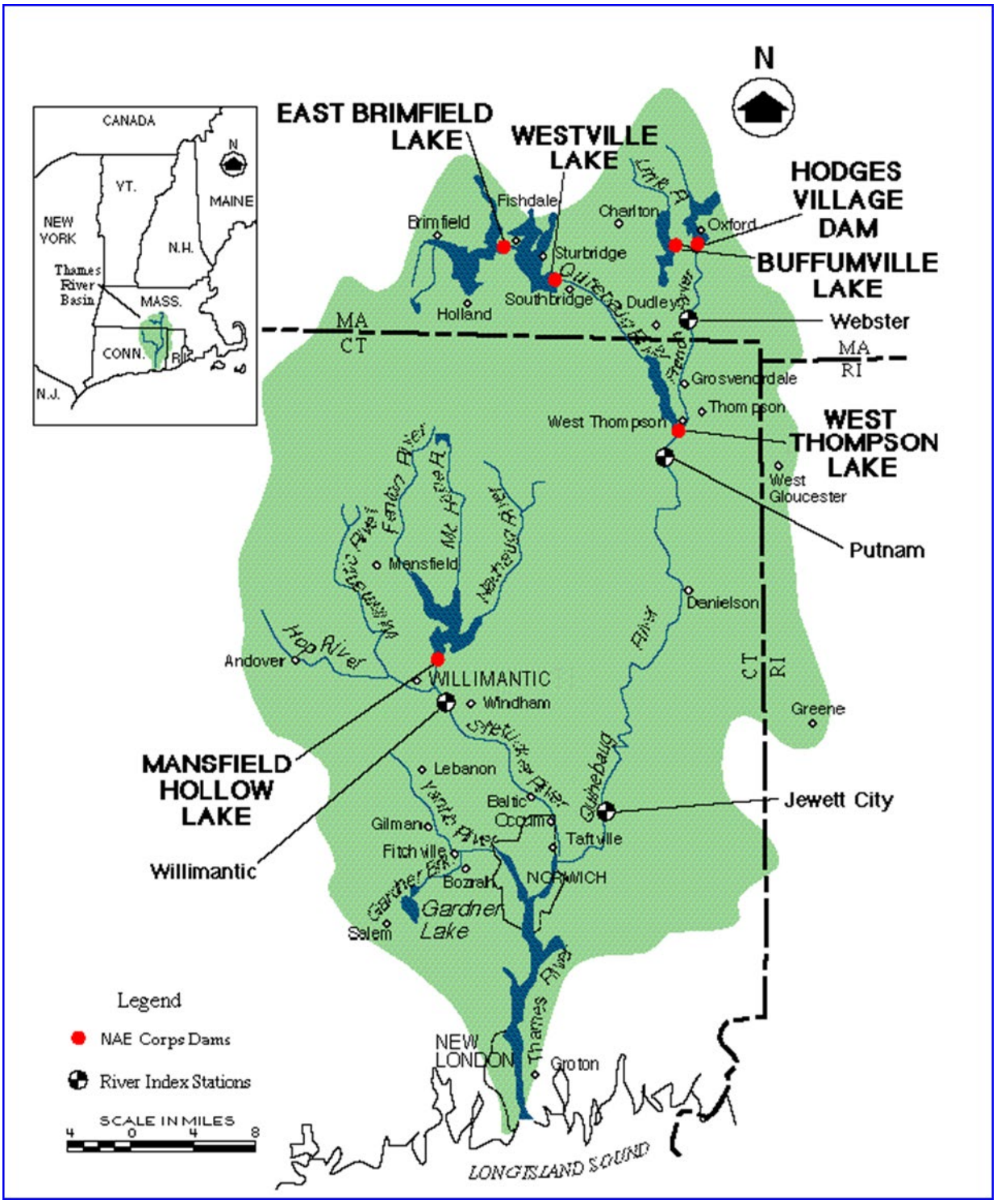


Figure 160. Map of Thames River Basin

5.3.4.6 The National Weather Service and the State Severe Weather Warning System

NWS offices in Albany, NY, Upton, NY (on Long Island), and Taunton, MA share Forecast and warning operations for Connecticut (see Figure 161 for NWS Connecticut county responsibility).

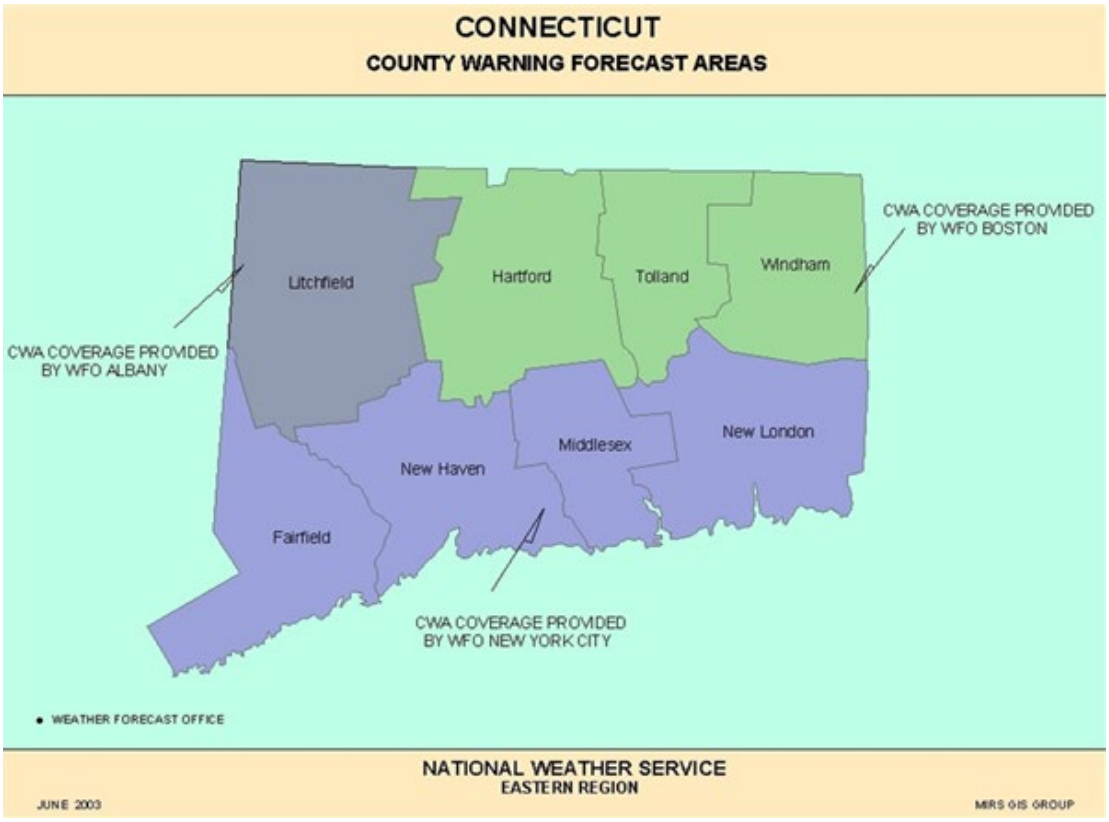


Figure 161. Map of NWS county warning forecast areas in Connecticut

Connecticut's eight counties are sub-divided into 13 weather forecast zones to account for topography and climate variation across the State. See Figure 162 for a depiction of Connecticut forecast zones.

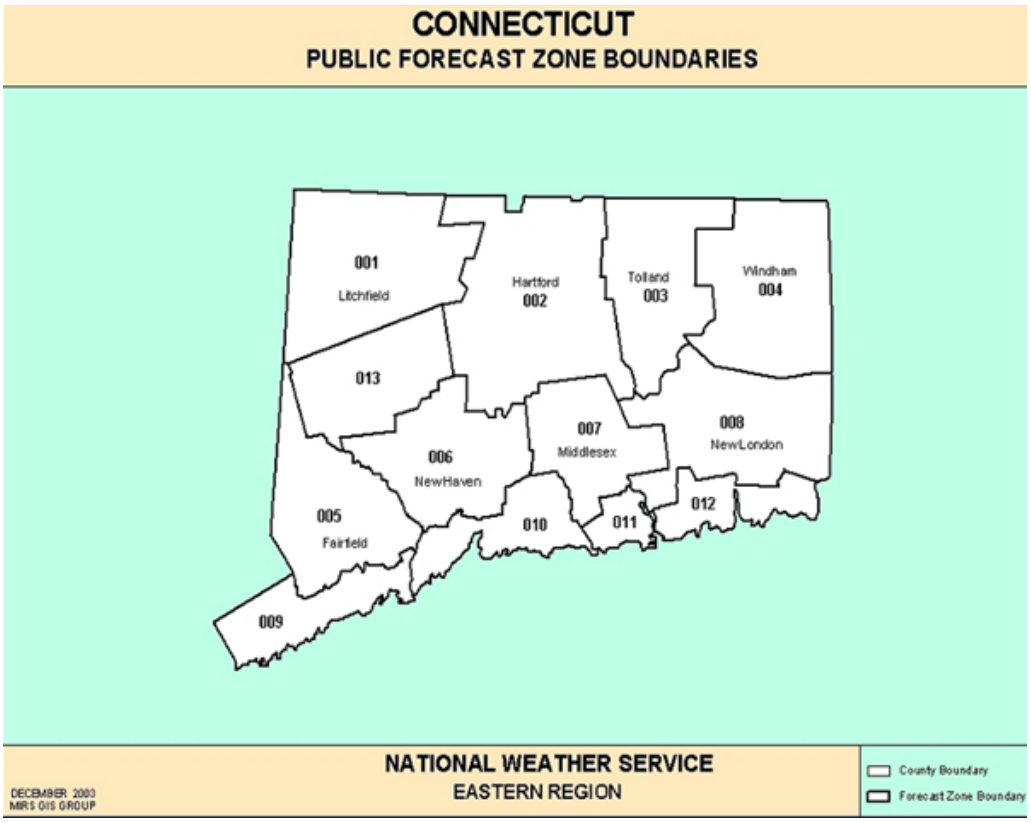


Figure 162. Depiction of Connecticut forecast zones

Each NWS office maintains sophisticated computer forecasting technology and Doppler radar for continuous weather and radar surveillance of Connecticut. NWS offices collaborate on forecast and warning services for Connecticut. Furthermore, each NWS office enlists the aid of volunteer severe weather observers through Skywarn training across the State.

Four NOAA Weather Radio All Hazards (NWRAH) transmitters are located in Connecticut. These transmitters are located in Cornwall, Meriden, Hartford, and New London. The Cornwall transmitter serves Litchfield County and is controlled by the NWS office in Albany, New York. In addition, NWRAH transmitters in neighboring states provide forecast and warning information for adjacent Connecticut municipalities. Computer-generated depictions of NWRAH coverage in Connecticut are provided in Figure 163. NWRAH is the official voice of the NWS and delivers weather forecasts, watches and warnings 24 hours per day, and as requested by emergency management officials' other hazardous awareness information such as Civil Emergency Messages. Table 207 provides a summary of hazard types for which NWS provides warning and advisory alerts.

As a direct result of the 1989 western Connecticut tornado outbreak, the State purchased 300 advanced technology Specific Area Message Encoder (SAME) radios in 1992 and 1994. These SAME radios allow the NWS to issue watches and warnings to specific counties in Connecticut when severe weather threatens the State. In 2006 the U.S. Department of

Homeland Security purchased 92,000 NWRAHs and provided one to every public school in the United States. In 2007-2008 the U.S. Department of Homeland Security purchased additional NWRAH's for all private schools in the United States.

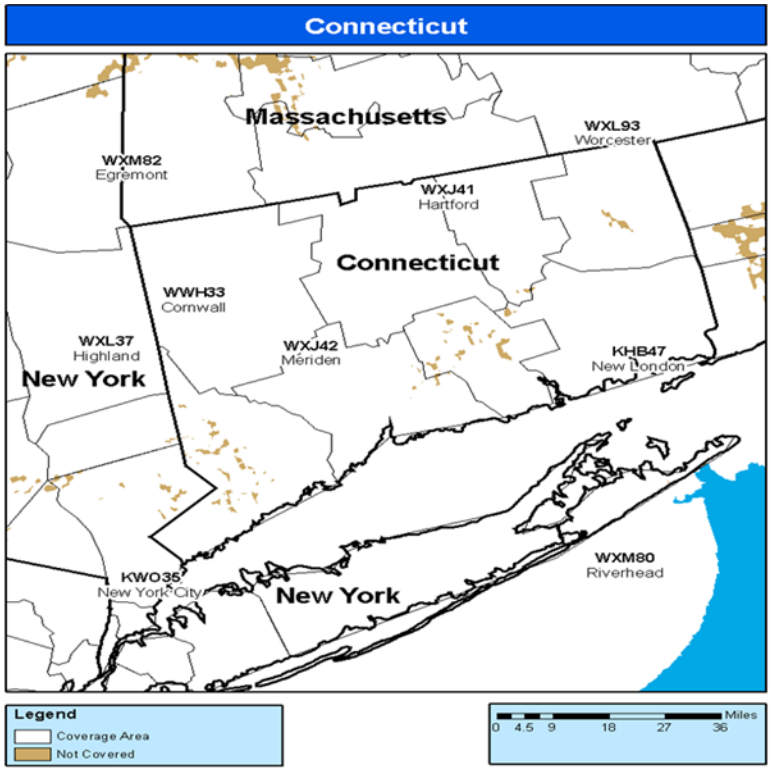


Figure 163. Depiction of NWRAH coverage in Connecticut

Table 207. NWS Warning/Advisory summary

WINTER WEATHER	COLD	HEAT	WIND	STORM	TROPICAL CYCLONE	MARINE	FLOOD	FIRE	FOG
Winter weather advisory	Wind chill advisory	Excessive heat warning	Wind advisory	Storm warning	Tropical storm warning	Small craft advisory	Flood advisory	Red flag warning	Dense fog advisory
Winter storm warning	Wind chill warning	Heat advisory	High wind warning	Severe thunderstorm warning	Hurricane warning	Gale warning	Flash flood warning		Freezing fog advisory

WINTER WEATHER	COLD	HEAT	WIND	STORM	TROPICAL CYCLONE	MARINE	FLOOD	FIRE	FOG
Blizzard warning	Frost advisory	Heat wave	Hurricane force wind warning	Tornado warning	Storm surge warning	Special marine warning	Flood warning		
Ice storm warning	Freeze warning		Extreme wind warning				River flood warning		
							COASTAL FLOOD ADVISORY		
							COASTAL FLOOD WARNING		
							HIGH SURF ADVISORY		

5.4 Regional Planning Organization Capabilities

Regional planning organizations in Connecticut include the Councils of Governments (COGs). COGs have traditionally conducted or overseen transportation planning, emergency planning, and some types of land use and environmental planning for their member communities. COGs may provide land use guidance to municipalities and assist with drafting of ordinances or zoning regulations in the more rural communities of the state.

All of the COGs in Connecticut have been responsible for the development of multi-jurisdiction hazard mitigation plans for member communities. The COGs have administered

the planning grants to develop these plans, then either developed the plans using in-house planning staff or contracted a consultant to develop the plans.

As of 2023, there are nine COGs.

The Regional Performance Incentive (RPI) Program, administered by the Connecticut Office of Policy and Management, was established under the provisions of Section 8 of Public Act 07-239, "An Act Concerning Responsible Growth". The goal of the RPI Program is to encourage municipalities to participate in voluntary inter-municipal or regional shared services projects that have the potential to produce measurable "economies of scale", provide desired or required public services, and lower the costs and tax burdens associated with the provision of such services. Eligible applicants include any COG, any two or more municipalities acting through a COG, any Economic Development District, or any combination thereof.[273]

CT Council of Small Towns (COST) is a member-driven organization committed to giving Connecticut's 139 smaller communities a strong voice in the legislative process. Founded in 1975, COST is the state's only organization dedicated exclusively to the interests of Connecticut's smaller towns. COST marshals the collective talent, experience and vision of municipal leaders to help shape public policies in ways that help Connecticut's smaller communities provide critical services to residents.[274]

CT Conference of Municipalities (CCM) was founded in 1966 and is the state's largest nonpartisan organization of municipal leaders, representing 165 member municipalities. Their mission is to improve everyday life for every resident of Connecticut through sharing best practices and objective research and advocating at the state level for issues affecting local taxpayers. CCM is governed by a board of directors that is elected by the member municipalities.[275]

Several hazard mitigation capabilities provided by COGs were identified in local hazard mitigation plans. The range of capabilities related to hazard mitigation planning, community resilience, and climate risk varies by COG and exposed hazards. Thoese thatseThose that are mentioned in local hazard mitigation plans are summarized in Table 208.

[273]Connecticut OPM. 2017 Annual Report on the Regional Performance Incentive Program. http://www.ct.gov/opm/lib/opm/igp/grants/rpi/2017_annual_report_on_the_regional_performance_incentive_program.pdf
[274] Connecticut Council of Small Towns. http://www.ctcost.org/Pages/index
[275] Connecticut Conference of Municipalities. http://www.ccm-ct.org/

Table 208. Hazard mitigation capabilities of COGs

Capability	Summary	Details
Technical Assistance	Some COGs provide training to municipal staff and other partners around skills such as GIS, grant writing, engineering, regulation enforcement, benefit and cost analysis services and more.	• RiverCOG, WestCOG, and NECCOG all mention GIS assistance in their MJ HMP. • NEECOG mentions providing engineering services to municipalities. • RiverCOG mentioned staff training with benefit and cost analysis can be provided by the COG to municipalities. • WestCOG manages a regional program to assist municipalities and property owners in applying to FEMA grant programs, like BRIC and FMA.
Tools	Regional map viewers available through COGs can help support municipal hazard mitigation capabilities.	• NHCOG and CRCOG both mention regional map viewers with different data layers in their MJ HMP.
Plans	Regional economic development plans produced by several COGs.	• RiverCOG developed GrowSMART plan guided by the RiverCOG Economic Growth Strategy Committee that aims to capitalize on existing assets to develop a regional vision for future growth.
Studies	Reports evaluating natural hazards, climate projections, and risks and opportunities in the region.	• WestCOG has released studies addressing flooding risk, in addition to renewable energy reports and decarbonization of land use strategies.

5.5 Municipal Capabilities

All municipalities within Connecticut have developed and implemented, locally or on a regional level, several sets of plans and regulations that are used to effectively manage natural resources on a community level. These plans and regulations are updated on a regular basis either due to a statutory requirement or through normal practices at the local level. Since all these mechanisms exist and are available to all municipalities, largely through the State's enabling legislation, the State understands that local communities maintain adequate capability for pursuing and implementing hazard mitigation activities.

Table 209, Table 210, and Table 211 list many of the local regulations, plans, and programs that communities have developed and continue to maintain, and the connection of these plans and regulations to hazard mitigation. Additional details are provided after each table.

Table 209. Local regulations

Regulations	Significance to Hazard Mitigation
Floodplain Management Regulations/ Ordinance or Flood Damage Prevention Regulations/ Ordinance	These regulations assist a community in effectively manage its floodplain areas and are typically organized similar to the NFIP regulations. These regulations are usually part of a community's land use regulations (described below). However, depending on the community, they may be a part of the municipal code of ordinances. These regulations may require specific minimum design/construction/or development elements which must be complied with for health and safety reasons.
Zoning Regulations	Primary tool for community for shaping the character and development of a community. Zoning regulations may restrict particular uses or structures from being located in vulnerable areas in a community. These regulations may also require specific minimum design/construction/or development elements which must be complied with for health and safety reasons. If the flood damage prevention regulations are not in the municipal code of ordinances, they are typically in the Zoning Regulations.
Subdivision Regulations	Important tool for community for shaping the character and development of a community through subdivisions. These regulations often describe how flood prone areas must be addressed, specify minimum and maximum roadway dimensions, specify where utilities may be placed (underground vs. above-ground), and specify how fire protection will be provided. Some elements of the flood damage prevention regulations are often repeated in the Subdivision Regulations.
Stormwater Regulations	Some communities have developed stormwater regulations or ordinances that are separate than the Zoning and Subdivision Regulations. Stormwater regulations provide requirements for addressing stormwater in connection with development, redevelopment, and road projects.
Wetland Regulations	In Connecticut, all wetland regulations describe wetlands as necessary for a number of functions including flood management. These regulations help a community maintain and protection the integrity of its wetland resources. Wetland areas often coincide with FEMA delineated floodplain areas in a community.
Local Adoption of CT State Building Code	Critical to maintain adequate safety and building integrity factors in construction. In addition, these codes may limit structure size, type or place additional requirements in the construction of structures located in a identified hazard area (i.e., high wind, coastal, floodplain, wildland/urban interface area, etc.).

Many communities employ a number of creative ways to enhance their local Zoning and Subdivision Regulations. Sustainability metrics may be incorporated into regulations and development review procedures; for example, Avon referenced the eight measures of sustainability used in their local regulations. Additional measures include Green Infrastructure Regulations, which were reported by Stamford, Hartford, and Newtown in their Local Hazard Mitigation Plans.

22 Towns reported having Low Impact Development within their zoning, and 45 towns reported requirements for underground utilities in new developments. In the town's Local Hazard Mitigation Plan, Morris described the Low Impact Sustainable Development Design Manual utilized by the community to educate residents on techniques to properly capture, infiltrate, and manage stormwater, as well as the importance of recharging groundwater. The Manual includes a framework to improve water quality through engineering specifications, enforcement tools, and development standards to reduce erosion and impacts from pollution.

7 Towns reported the use of a development checklist to help walk developers through relevant bylaws, regulations, and codes. The checklist cross-references regulations related to flood damage prevention, and other important ordinances that may be applicable to a proposed project. The list is available to potential applicants.

Table 210. Local plans used by communities

Plans	Significance to Hazard Mitigation
Emergency Operations Plans	Assist local communities in the preparation and implementation of resources prior to and during an emergency, including natural hazard events. The plans are updated as needed and help local communities assess the locations of vulnerable areas within their communities and how to handle these areas during an emergency. This plan may be a good source of information for local risk assessment activities. A new template was issued by DEMHS in 2016, and most communities are working toward a revision toward the new template.
Local Plan of Conservation and Development	Primary plan that helps guide a community in its land use and management decisions with regard to development and conservation and/or preservation of open space.

Several towns have completed additional plans to further understand the specific hazards facing their communities and advance mitigation and adaptation efforts. This includes Sustainability Plans and Climate Change Adaptation Plans. There were Local Hazard Mitigation Plans that reported writing Post Disaster Recovery Plans to establish a framework for recovery following extreme events that may cause significant disruption. Habitat Conservation Plans and Debris Management Plans are other examples of planning efforts to mitigate damage and protect environmental features. Some municipalities for which sea level rise and coastal flooding are a top concern have developed Coastal Resilience Plans or Studies, Harbor Management Plans, and Coastal Zone Management Plans.

Drought and wildfire conditions are becoming an increasing concern, especially in the face of future extreme temperature and precipitation patterns due to climate change. Examples of how communities are preparing for such events include the Town of Burlington Water Supply Plan and the incorporation of Drought Mitigation into the Town of Weston's 2020 POCD Update. Wildfire planning may include Forestry Plans, Forest Management Plans, or

Community Wildfire Protection Plans, which were reported in select Local Hazard Mitigation Plans.

Table 211. Other programs

Program	Significance to Hazard Mitigation
Local Municipal Coastal Programs	Assists local coastal communities with development and management of coastal resources and preventing adverse impacts on coastal resources. As the municipal coastal programs are updated, communities typically increase the emphasis on coastal hazard mitigation and management.

Energy Generation initiatives were mentioned in some Local Hazard Mitigation Plans. There have been efforts to encourage the installation of solar panels and create microgrids in communities to promote enhanced power resilience. Hartford has installed a microgrid that, in the event of a power outage, would be able to power certain critical facilities such as the Senior Center, the Library, a Health Center, the school, and a grocery store. New Milford reported evaluating potential locations where a microgrid may be installed in the future. Developing a microgrid that includes critical facilities and support systems can help make a community more resilient to natural disasters. Solar installations accomplish similar goals, diverting reliance on traditional power systems vulnerable to extreme weather. Several towns have reported placing solar panels on municipal buildings, including New Canaan and Chester. Solar farms have been built in Somers, as well as at municipal landfill sites in Norfolk and Stafford. Middletown reported the development of a solar incubation building at the Water and Sewer Department.

Technical assistance programs are available in some communities, including GIS capabilities or digitally mapped infrastructure systems. 15 towns reported mapped stormwater and drainage systems in GIS. Several communities mentioned technical capabilities regarding public reporting in their Local Hazard Mitigation Plan. This includes tracking debris blockages and drainage issues around town. Some municipalities have their own websites, applications, or other online methods where residents can report issues to the DPW so that the town may properly address the hazard; for example, South Windsor described “Connect South Windsor” which is a smartphone application where residents can report and track drainage issues, downed trees, power lines, or other public complaints.

Communication and education programs are an important part of hazard mitigation. Several towns have employed initiatives to engage residents about the risks of extreme weather and necessary preparation techniques. Information about hazards and specific dangers may be posted to the town website. A few towns reported using social media, such as Twitter or Facebook, to communicate with residents about risks and important information. Public education and announcements of drought conditions were reported by some towns to be included in communication efforts, followed by outreach to residents encouraging water conservation. Engagement with the youth about extreme weather and disasters is a valuable measure. Some municipalities mentioned visiting schools to educate children about the risk of natural hazards and what actions exist to properly prepare. Southington

and Avon reported that the town participates in the FEMA Student Training in Emergency Preparedness Program. 19 communities stated active Community Emergency Response Teams (CERT), which are local citizens trained to aid emergency responders and are responsible for purchasing new response equipment when necessary. Sharon promoted its status as a NOAA Weather Ready Nation Ambassador in their Local Hazard Mitigation Plan.

A critical component of hazard response and disaster preparedness is financial capabilities. This is often cited as a challenge for effective municipal programs. Several towns reported the establishment of budgets designated specifically to hazard mitigation actions and disaster recovery costs. Deep River reported a "rainy day" fund for emergency response and recovery, Essex and Killingworth stated having a similar funding reserve. Other budgets were designed for open space protection to preserve natural resources in communities, which in turn may minimize damage from extreme weather and climate change impacts. In the Local Hazard Mitigation Plans, Middletown described a $5 million dollar bond to use toward open space acquisition and Roxbury reported having a fund for open space protection.

5.5.1 Local Boards, Commissions, and Departments

Most Connecticut communities are governed by a Board of Selectmen, Board of Aldermen, Town Council system, or City Council system. The chief elected official (for example, mayor or First Selectman) or his town/city manager oversees many of the municipal departments, commissions, and boards and are directly responsible for appointing members of many commissions and boards that are involved with hazard mitigation.

Within each municipality, appropriate municipal departments, commissions, and boards are involved with natural hazard mitigation. Table 212 describes general departmental responsibilities and duties related to natural hazard mitigation within communities.

Table 212. Local Boards, Commissions, and Departments

Board, Commission, or Department	Significance to Hazard Mitigation
Emergency Management Department, Office, or Agency	The typical mission of the local Emergency Management Department or Office (under an Emergency Management Director, or EMD) is to maximize survival of people, prevent and/or minimize injuries, and preserve property and resources in its jurisdiction by making use of all available manpower, equipment, and other resources in the event of natural or technological disasters or national security threats. In addition to coordinating activities during disasters, the Emergency Management Office typically coordinates all early warning activities and is involved in educating the public on how to react during emergency situations. The EMD is typically charged with developing and updating the community's Emergency Operations Plan (EOP). The Emergency Management Department is one of the primary agencies involved with hazard mitigation through the mitigation categories of "emergency services" and "public education." In some communities, the Fire Chief or Police Chief is the director of the Emergency Management Department, although this is not always the case. DEMHS recommends that the EMD not be a Fire Chief or Police Chief or other major public official because, during an emergency, a Fire Chief or Police Chief that is also the EMD may become overwhelmed. Some communities have an Emergency Management Agency that includes the EMD and members of other departments, and the agency meets as needed prior to hurricanes, tropical storms, snowstorms, etc.
Department of Fire/Rescue/EMS	Local communities may have either full-time or volunteer fire companies. Larger cities or towns generally have several fire houses in different areas of the city or town to assure rapid emergency response. The Fire Department is one of the primary agencies involved with hazard mitigation through the mitigation categories of "emergency services" and "public education." As noted above, the Fire Chief is the EMD in some communities, although this is not required.
Police Department	Police departments are found in most of the suburban and urban municipalities and tribes but not in all rural towns in Connecticut. Day-to-day duties of a Police Department include crime prevention, criminal investigations, traffic enforcement, motor vehicle accident investigations, and patrols. Duties related to natural hazard mitigation include planning and coordination of personnel, equipment, shelters, and other resources necessary during an emergency. Communication and coordination with the Fire Department is critical before, during, and after natural hazard emergencies. Many of the less-populated towns have resident state troopers in lieu of a municipal police department. As noted above, the Police Chief is the EMD in some communities, although this is less frequent than the Fire Chief serving as the EMD.

Board, Commission, or Department	Significance to Hazard Mitigation
Public Works and Highway Departments	Most Connecticut communities have a Public Works Department or Highway Department whose responsibilities include construction and maintenance of roadways, sidewalks, and drainage systems; maintenance of all parks and school properties; street sweeping, sanding, and snow removal; the preservation, care and removal of trees within the community's rights-of-way and/or public places; and maintenance of community vehicles and equipment. Larger communities will have a public works department while smaller communities will typically have a Highway department. As is common throughout Connecticut, the public works departments are often charged with implementing numerous structural projects that are related to hazard mitigation. Specifically, roadway/infrastructure maintenance and complaint logging/tracking are the two primary duties of the Public Works departments. For example, a public works department may track, plan, prepare for, and respond to flooding, inundation, and/or erosion of roads and infrastructure. The public works departments also conduct snow removal and deicing on roads; tree and tree limb maintenance; and the appropriate maintenance and upgrades of storm drainage systems to prevent flooding caused by rainfall. Because of the duties described above, the public works departments are often the "de facto" first responders during emergencies. The public works departments must maintain access for the Police and Fire Departments to respond to emergencies. In some communities, a Public Works Commission manages the department and will develop budgets, make recommendations to other boards, and establish regulations.

Board, Commission, or Department	Significance to Hazard Mitigation
Building Departments	Local Building Departments administer a building inspection program adhering to and enforcing all code requirements of the State of Connecticut relating to building construction. Tribal governments have building departments that utilize the international building code. Additional responsibilities include administering and enforcing all related codes for the safety, health, and welfare of persons and properties in the jurisdiction, supervising departmental policies and procedures, and providing technical assistance to local officials. The Building Official has a unique responsibility when it comes to hazard mitigation as he or she is responsible for overseeing a number of codes such as those related to wind damage prevention as well as those related to inland and coastal flood damage prevention. Although other departments and commissions may review development plans and develop or revise regulations, many important types of pre-disaster mitigation are funneled through and enforced by the Building Department. For example, the Building Department enforces A- and V-zone standards for flood proof construction and building elevations, maintains elevation certificates, and enforces building codes that protect against wind and fire damage. Thus, the types of mitigation that are administered by the Building Department include "prevention" and "property protection." Typically, the building department provides hazard mitigation assistance at the time of the building permit application. The primary role of the Building Department during disaster situations is to provide damage assessment, inspect damaged buildings and issue permits for temporary structures and actions necessary to maintain safety standards. In some communities, the Building Official is the administrator of the local flood regulations under the NFIP. This person also has access to map information showing the location and extent of SFHAs in the community. This mapping is important in raising the public's awareness of natural hazards in the community.
Fire Marshal	The local Fire Marshal administers a building inspection program adhering to and enforcing all code requirements of the State of Connecticut relating to Life Safety and Fire prevention. Tribal governments have fire marshal offices that utilize the international fire code. Additional responsibilities include administering and enforcing all related codes for the safety, health, and welfare of persons and properties in the jurisdiction, supervising departmental policies and procedures, and providing technical assistance to citizens and property owners. Typically, the fire marshal's office provides hazard mitigation assistance at the time of the building permit application and during the construction of a structure. The primary role of the fire marshal's office during disaster situations is to provide assistance with damage assessments and actions necessary to maintain safety standards.

Board, Commission, or Department	Significance to Hazard Mitigation
Engineering Department	Many communities have Engineering Departments and/or a Town or City Engineer who plans, directs, and coordinates engineering contracts and construction projects, including roadway, bridge, sanitary, and marine development. The Engineer provides technical consultation to municipal boards and commissions and serves as the municipal liaison with various state agencies. As such, the Engineer will often need to review issues related to drainage, flood conveyance, and flood mitigation and related elements of structural hazard mitigation. The Engineer usually works closely with Public Works and Highway personnel. Typically, the Engineer or the Public Works / Highway Superintendent will have a list of flood prone areas in the community.
Planning and Zoning / Land Use Department	The Planning and Zoning or Land Use Department of a jurisdiction enforces the local zoning and subdivision regulations, provides staff assistance to the Planning and Zoning Commission (or separate Planning Commission and Zoning Commission), and performs long term planning activities related to land use and community development. This department typically drafts, updates and implements the goals and objectives of the local Plan of Conservation and Development. The planning office provides assistance to local Health Departments and Building and Engineering Departments. In many communities, the local planning department includes the administrator of the local flood regulations under the NFIP, if it is not the Building Official as discussed above. This person also has access to map information showing the location and extent of SFHAs in the community. This mapping is important in raising the public's awareness of natural hazards in the community. Because the Planning Department typically directly assists the applicable commissions with administration of the Zoning Regulations, Subdivision Regulations, and Inland Wetland Regulations, the department is responsible for elements of almost all six facets of mitigation ("prevention," "property protection," "natural resource protection," "structural projects," "emergency services," and "public education"). For example, wetlands preservation is one of the purest forms of hazard mitigation due to the natural functions and values of wetlands including stream bank and shoreline stabilization and flood water storage. In coastal communities, the Planning and Zoning / Land Use Department typically assists the local Harbor Management Commission in administering any Waterway Protection Line Ordinances, as well as reviewing coastal site plan applications for certain development types within the coastal management area defined by the State.

Board, Commission, or Department	Significance to Hazard Mitigation
Tree Wardens	Most Connecticut communities have designated an individual as Tree Warden and administer a tree-trimming program. The tree warden is typically the public works director or a staff member from the planning or engineering departments. Tree-trimming on municipally-owned property is typically conducted on an as-needed basis or following complaints by residents. Most tree-trimming is conducted with clean-up activities following storms. In general, local governments maintain small trees and downed branches and contract with tree companies to deal with larger trees.
Flood and Erosion Control Boards	CGS Sections 25-85 through 25-98, inclusive, enable municipalities to form a municipal Flood and Erosion Control Board (FECB) with the power to plan, layout, acquire, construct, reconstruct, repair, maintain, supervise and manage flood and erosion control systems, flood control projects, and dam repair projects. These boards may also enter upon, take and hold by purchase, condemnation or otherwise, property which it determines necessary for use in connection with flood or erosion control systems; defray the cost of such systems by issuing bonds or other evidence debt, or from general taxation, special assessment or any combination thereof; and assess those properties benefiting from such project according to such rules as the FECB may adopt. The FECB is further empowered to negotiate, cooperate, and enter into agreement with: 1) The United States, 2) the United States and the State of Connecticut or 3) the State of Connecticut in order to satisfy the conditions imposed by the United States or the State of Connecticut in authorizing any system for the improvement of navigation of any harbor or river and for protection of property against damage by floods or by erosion, provided such system shall have been approved by DEEP Commissioner. These statutes listed above enable a municipality, which has recognized a particular flood or erosion hazards potential and is dedicated to reducing or eliminating the hazards, to work with, and receive assistance from, federal and state agencies. The municipality must make a financial commitment based on federal cost-sharing requirements for a federal project. For a state/local project, the cost-sharing ratio is based on the ownership of the benefited property. The State will provide two-thirds of the project cost if the property protected is municipally owned. When the project benefits private properties, the State will provide one-third and the municipality will provide two-thirds of the project costs. Although most of the municipalities in Connecticut possess the appropriate municipal code to enable the formation of FECBs, few FECBs are actively operating in Connecticut. In some communities, the existing Inland Wetland and Watercourse Commission or Agency or Board of Selectmen may act as the FECB.
Parks and Recreation Department	The Parks and Recreation Department typically oversees community open space and parks. This responsibility includes the properties acquired by the community for hazard mitigation purposes and converted to open space.

Board, Commission, or Department	Significance to Hazard Mitigation
Attorney	A community's Attorney's office plays a critical role in hazard mitigation. The office typically reviews and helps to administer grant applications and projects under the HMA programs such as HMGP and PDM.

Many commissions are involved with hazard mitigation. These may include:

- Conservation Commissions – Charged with the development, conservation, supervision, and regulation of natural resources and water resources (hazard mitigation through the category of "natural resource protection")
- Inland Wetlands and Watercourses Commissions – Charged with implementing and enforcing all provisions of the Connecticut General Statutes as regards the Inland Wetlands and Watercourses Act (hazard mitigation through "prevention," "natural resource protection," and "structural projects")
- Planning and Zoning Commissions – Charged with establishing, implementing, and overseeing planning and zoning regulations as provided by the Connecticut General Statutes (hazard mitigation through "prevention," "property protection," "natural resource protection," "structural projects," "emergency services," and "public education")
- Public Works Commission – Charged with managing the department and developing budgets (hazard mitigation through "prevention" and "structural projects").
- Land Acquisition Commission – Charged with determining and recommending to the Board of Selectmen or Council the feasibility of acquiring land, development rights, and conservation easements and prioritizing properties for acquisition by the Community (hazard mitigation through "natural resource protection")
- Harbor Management Commission – For coastal communities, charged with the duty and purpose of developing a Harbor and Waterways Management Plan (hazard mitigation through "prevention," "property protection," "structural projects," "emergency services," and "public education")
- Marina Commission – For coastal communities, charged with the control, development, management, operation, and maintenance of the municipal marina facilities (hazard mitigation through "property protection" and "emergency services")

Aside from the traditional hazard mitigation commissions listed above, some towns have developed unique committees to advance sustainability and adaptation actions. Establishing groups responsible for monitoring energy programs and other efforts may prove to be beneficial; examples of such commissions that were mentioned in Local Hazard

Mitigation Plans are a Clean Energy Task Force, an Energy Conservation Commission, or a general Energy Committee. Beyond energy focused committees, some communities have established Environmental Impact Commissions, Environmental Protection Boards, or Advisory Committees on Sustainability.

Grant Writers may help increase a community's ability to obtain funding and implement mitigation actions, specifically those outlined in planning documents like Local Hazard Mitigation Plans. Examples of towns that reported grant writers on municipal staff include East Hampton, Middlefield, Portland, and New Milford. Ridgefield stated that the town does not have a grant writer, but that a grants coordinator is needed to evaluate pursuing micro-grids at the high school or middle school complex. This is an example of the value added to municipal capabilities by an individual designated to grant funding.

Coastal communities may consider coordinating committees focused on addressing vulnerabilities due to sea level rise, storm surge, flooding, and other risks to coastal areas. Such councils include the Branford Coastal Vulnerability Working Group, which coordinates with municipal staff to research and recommend responses to environmental challenges facing the coastline. Other examples are the Local Sea Level Rise Committee reported in Old Saybrook and the Advisory Commission on Coastal Waters in Darien. Flooding is a natural hazard that does not only threaten coastal towns. It may impact inland communities as well due to urban or riverine flooding. The Greater Hartford Flood Commission is responsible for ensuring the maintenance and security of USACE levees along the Connecticut River, as well as public education and notification.

5.5.1.1 Summary of Land Use Controls

Every municipality within Connecticut has some form of flood zone protection authority authorized by one of several Connecticut General Statutes (C.G.S.). Section 7-148 of the CGS gives municipalities authority to pass ordinances, and many communities have done so under this authority. CGS. Section 8-2 (et. seq.) provides authority for municipal zoning including provisions to use zoning to "secure from flood." A zoning commission administers zoning and its actions in most municipalities and is independent of a municipality's legislative body. Some communities may have both a flood ordinance and flood zoning. Municipalities also have authorities, which allow them to purchase open space (7-13lb), to conduct comprehensive planning (8-18 et. seq.), to regulate inland wetlands (22a-36 et. seq.), to establish and maintain civil preparedness plans (28-7), and to regulate construction of buildings (29-260 et. seq.). As discussed above, coastal municipalities have additional authority and responsibility under the Connecticut Coastal Management Act including ensuring that development within coastal flood hazard areas are managed to minimize risks to life and property.

Although the State has a 100% participation rate of its municipalities in the NFIP, the real measure of success cannot be determined merely by participation in the program. The minimum regulations required for admission into the NFIP must be adequately understood and enforced at the local level. The Flood Management Section's CAP has enabled DEEP to

greatly expand its technical and general assistance capabilities to local officials, residents, banks, insurance agents and engineers.

Available qualitative information and ongoing communications between LWRD programs and local governments indicate that local governments' land use policies and the enforcement of these policies and local regulatory controls have been and continue to be effective with regards to the mitigation of natural hazards at the local level. Many communities have been proactive with regards to managing their local natural resources and in developing local strategies to mitigate and/or plan for post-disaster recovery. The majority of communities located within the state actively work with DEEP and DEMHS to develop and implement local hazard mitigation activities and enhance and exercise evacuation and post-disaster plans of action.

5.5.1.2 Dam Risk Reduction Capabilities

According to the most recent local hazard mitigation plans, 29 municipalities reported having complete EAP for all dams in the community. The majority of towns reported relying on contractors for conducting dam inspections and maintenance. There were several towns that identified high hazard dams located in neighboring municipalities as a risk to their communities. In these cases, hazard mitigation plans stated the threat and often had the relevant EAP on file. EAPs can provide critical information for municipalities when planning for dam failure and mitigation strategies, including inundation maps, areas subject to flooding, emergency evacuation routes, and monitoring responsibilities. Information provided by the Association of State Dam Safety Officials was cited as an important resource for increasing awareness around potential dam risk. The information can be shared with dam safety officials, dam owners, stakeholders, municipal staff, and the general public.

Beyond the state requirements around dam inspections and EAP maintenance, local inland wetlands and watercourse regulations can provide additional oversight on activities related to dam safety. This includes prevention capabilities like regular inspections by property owners and enforcement capabilities through nominating a Zoning Enforcement Officer or Land Use Inspector. Local emergency management directors are typically responsible for monitoring weather warnings, advising personnel, and working alongside dam owners to ensure there is time to respond to a dam failure and enact the EAP.

Opportunities to implement mitigation actions that reduce risks to and from high hazard potential dams would include identifying a Land Use Inspector, ensuring the Emergency Management Director is aware of dangerous dams, and incorporating language into Emergency Operations Plans (EOP) that addressing dam failure and evacuation procedures. Local hazard mitigation plans recognized the high financial and ecological cost of dam flood control projects, emphasizing prioritizing a combination of hard engineered structures and natural approaches to maintain ecosystem benefits while reducing flood risk.

Limitations that may exist regarding local capabilities to respond to dam failure is separation between hazard location and damage extent. There are many dams that pose a threat to neighboring communities if they were to fail. It is important to share these EAPs with affected municipalities, implement a strong communication system between towns, and share the dam failure risk with the public.

5.5.1.3 The Effectiveness of Local Hazard Mitigation Plans

Connecticut's local planning effort began in 2000. Once initially approved by FEMA, local hazard mitigation plans are required to be updated every five years. Through the year 2013, DEEP reviewed local plans and submitted them to FEMA for final review and comment. Through this review process, DEEP observed an evolution of the plans in that they are becoming more specific in nature as to the proposed hazard mitigation activities recommended for implementation on a local level.

Beginning in 2013, local plan review was transferred from DEEP to DEMHS. DEMHS evaluates effectiveness of the plans by the quality of the activities that result from the implementation of the adopted plans. Upon the submission of regular plan updates, the regulatory elements of the NHMP will continue to be analyzed as part of all future planning grants in those communities.

Connecticut has addressed barriers to local hazard mitigation plan effectiveness, implementation, and adoption through coordination with regional organizations and funding incentives. DEMHS works closely with COGs to facilitate timely, effective review of multi-jurisdictional plans, as well as coordinate with FEMA around grant opportunities and plan adoption. Other state funding entities and programs consider whether local communities have active hazard mitigation plans when evaluating state-level grant opportunities.

5.6 Capabilities of Other Connecticut Entities

5.6.1 Electricity Providers

As a result of Tropical Storm Irene in August 2011 and Winter Storm Alfred in October 2011, the state understands that communities now place a higher priority level on tree trimming and maintenance to protect utilities, roads, persons in transit, and structures as compared to its priority level several years ago. Planning has been vigorous, from the publication of James Lee Witt's report "Connecticut October 2011 Snowstorm Power Restoration" (December 2011) to meetings between utility companies and Connecticut municipalities that took place in 2011 and 2012 that resulted in the "Report of the Two Storm Panel" (January 2012). The Report of the Two Storm Panel included 82 individual recommendations that have been shaping legislative initiatives and inter-agency policies since 2012, helping

to increase capabilities in Connecticut. Some of these policies have already helped, as noted during Hurricane Sandy in October 2012.

5.6.1.1 Eversource

Eversource is the largest power utility company within Connecticut. Eversource has several short and long-term programs to reduce the impact of natural disasters on the general public. Eversource short-term programs include using power restoration crews to restore power after small-scale storms. Eversource also has agreements with other states and Canada to bring in additional crews of linesmen after major disasters to restore power.

Eversource maintains an annual proactive program of tree trimming across the State. Trees are identified and property owners are notified that their trees that overhang or threaten power lines will be trimmed. Tree trimming reportedly saves millions of dollars in yearly damage to the power grid.

Aside from tree trimming, Eversource maintains other policies that build capabilities statewide. During the peak summer usage months, Eversource maintains agreements with large companies to curtail power usage during peak periods to prevent the need for brownouts or rolling blackouts. Eversource also issues power watches and warnings when necessary to conserve energy. When a "power warning" is issued, Eversource asks customers to turn off all unnecessary electrical appliances, air conditioning, and lights during the peak hours of 11 a.m. to 4 p.m. This helps ensure that sufficient power will be available for all.

5.6.1.2 United Illuminating

United Illuminating (UI) is the second-largest electricity provider in Connecticut. Like Eversource, UI maintains a tree trimming program to protect its electricity transmission and distribution system. UI is also currently in the process of reinforcing its substations to withstand flooding in areas where the utility has infrastructure at risk.

5.6.2 CtWARN

CtWARN is a Water/Wastewater Agency Response Network (WARN) comprised of utilities providing voluntarily assistance to one other in the form of personnel and resources during emergencies by means of pre-arranged mutual aid agreements. The mission of CtWARN is to support and promote statewide emergency preparedness, disaster response, and mutual assistance matters for public and private water and wastewater utilities. CtWARN accomplishes this mission by providing increased planning, coordination, and enhanced access to specialized resources to enable rapid, short-term deployment of emergency services to restore critical operations of the affected water or wastewater utility. A total of

22 water and wastewater utilities and departments are members of CtWARN, covering more than half of Connecticut's geographic area.[276]

5.6.3 University of Connecticut

5.6.3.1 Center for Land Use Education and Research

The mission of the Center for Land Use Education and Research (CLEAR) is to provide information, education and assistance to land use decision makers, in support of balancing growth and natural resource protection. To achieve this goal, CLEAR conducts remote sensing research, develops landscape analysis tools and training, and conducts outreach education programs. CLEAR houses the following programs:

- NEMO (Nonpoint Education for Municipal Officials) provides information, education and assistance to local land use officials and other community groups on how they can accommodate growth while protecting their natural resources and community character.
- The Land Use Academy provides land use decision-makers with the knowledge and skills needed to serve effectively on a land use board through a series of workshops.
- The Climate Adaptation Academy is a partnership between Connecticut Sea Grant and UConn Center for Land Use Education and Research (CLEAR) to allow researchers, consultants, and others to work with municipalities and relevant professionals on climate adaptation.
- The Geospatial Training program provides hands-on training courses for land use decision-makers to introduce new users to geographic information systems (GIS), global positioning systems (GPS) and remote sensing technologies.
- Forestry program provides information and assistance to private landowners and local communities on how to better manage their forest lands.
- LERIS (Laboratory for Earth Resources Information Systems) is the main research program of CLEAR, and the principal place at the University of Connecticut for conducting remote sensing and GIS research focused on natural resources, landscape characterization and change, and the interaction of the two.

The Land Use Academy and the Climate Adaptation Academy are the primary vehicles for CLEAR's role in building capabilities in Connecticut for hazard mitigation. Most of the training sessions are geared toward local land use commissions and provide instructions on how to review land use proposals according to the regulations administered by the

[276] Connecticut Water Agency Response Network. http://ctwarn.org/Members-List

commission. Natural hazards such as flooding are routinely addressed by commissions, and the training helps commission members better understand these hazards.

These programs also provide specialized training. For example, a 2013 training session entitled "Climate Adaptation Training for Coastal Communities" provided local officials and other interested individuals in coastal communities with the latest information and skills necessary to proactively adapt to the impacts of changing climate such as coastal flooding and coastal storms. In 2017, workshops have focused on legal issues related to climate adaptation and creating living shorelines.

5.6.3.2 Connecticut Sea Grant

The Sea Grant College Program is a partnership between the nation's universities and its primary ocean agency, the National Oceanic and Atmospheric Administration (NOAA). The University of Connecticut is Connecticut's Sea Grant College. Connecticut Sea Grant (CTSG) collaborates with maritime industries and coastal communities to identify needs, and fund research, outreach, and educational activities that have special relevance to Connecticut and Long Island Sound. The mission is to work towards achieving healthy coastal and marine ecosystems and consequent public benefits by supporting integrated locally and nationally relevant research, outreach and education programs in partnership with stakeholders. Program activities are focused into the areas of marine aquaculture and biotechnology; use and conservation of marine resources, ecosystems, and habitats; coastal land use and community planning; habitat restoration and enhancement; aquatic invasive species; use and conservation of marine resources; and marine and aquatic science literacy.

The Sea Grant program helps build capabilities in Connecticut through several programs related to its area of coastal land use and community planning. For example, no-cost technical assistance was available in 2012 for communities impacted by Hurricane Sandy. In 2013, they released a report on Cost-efficient Climate Adaptation in the North Atlantic. The Sentinel Monitoring for Climate Change Program in Long Island Sound is a multi-disciplinary scientific approach to provide early warning of climate change impacts to Long Island Sound ecosystems and species to facilitate appropriate and timely management decisions and adaptation responses.[277] The Sea Grant program also coordinates with the CLEAR training described above.

5.6.3.3 Connecticut Institute for Resilience and Climate Adaptation

The Connecticut Institute for Resilience and Climate Adaptation (CIRCA) is a multi-disciplinary center of excellence that brings together experts in the natural sciences, engineering, economics, political science, finance, and law to provide practical solutions to

[277] UCONN. Climate Change and Adaptation in Connecticut. http://seagrant.uconn.edu/focus-areas/resilient-communities/

problems arising as a result of a changing climate. The Institute helps coastal and inland floodplain communities in Connecticut and throughout the Northeast better adapt to changes in climate and also make their human-built infrastructure more resilient while protecting valuable ecosystems and the services they offer to human society. Initiatives focus on living shorelines, critical infrastructure, inland flooding, coastal flooding, sea level rise, and policy and planning. CIRCA's mission is to increase the resilience and sustainability of communities vulnerable to the growing impacts of climate change to the built, natural, and human environments.

CIRCA used to run a research program, the Municipal and Matching Funds Grant Program. It has since been replaced by Resilient Connecticut which has conducted a number of statewide efforts that have been used to implement recent regional and municipal actions. CIRCA launched Resilient Connecticut in coordination with state agencies, regional councils of governments, and municipalities. Resilient Connecticut focuses on regional resilience and adaptation planning through engagement and risk assessments that inform municipal and regional scale initiatives and pilot projects. The guiding principle is to establish resilient communities through smart planning that incorporates economic development framed around transit-oriented development, conservation strategies, and critical infrastructure improvements.

Beginning in late 2018, CIRCA began creating a regional coastal resilience plan for Fairfield and New Haven Counties. The plan will help establish resilient coastal communities with healthy buffering ecosystems and critical infrastructure that's adapted to withstand occasional flooding; critical services, infrastructure and transport hubs should be resilient and have strong connections. Resilience Opportunity Areas (ROARs) were identified through a vulnerability assessment completed in 2020-2021.

Increasing investment in identified ROARs will provide an opportunity to increase economic resilience by strongly tying back to the regional transportation network and regional economic opportunities. Seven areas are proceeding to additional study and concept design, expanding the program to "Resilient 2.0". This phase of the process includes site and implementation plan development, funding strategies, and a synthesis report that will document all project activities along with recommendations for a Connecticut Statewide Resilience Roadmap. All these project development activities have been considered and incorporated into the NHMP update process as appropriate in the Mitigation Strategy, particularly as it relates to developing more refined scoping and/or conceptual designs and the pursuit of funding for project implementation.

CIRCA projects and products provided significant support to municipalities and the state for resilience planning. UConn and CIRCA published the Connecticut Physical Climate Assessment Report in 2019 to help the state and its municipalities plan for the effects of climate change. CIRCA developed the sea level rise planning thresholds adopted by the State of Connecticut and required for use in municipal planning and in the design of state-funded projects.

5.6.3.4 Stormwise Forest Management

Stormwise is a forest vegetation management program under UConn that was initiated by recent catastrophic storm events in the state. The goal of the program is to reduce the risk of tree-related storm damage to power lines. By implementing proper tree management practices along utility corridors, healthy and storm-resistant forests can be created in participating municipalities. The Stormwise website includes a story map to educate individuals on the relation between power outages and roadside forests in New England. Stormwise communicates and engages with stakeholders to increase knowledge around the subject. Groups that will likely participate in the initiative include conservation commissions, tree wardens, homeowners, and planning and zoning. One educational program piloted through Stormwise, in collaboration with CFPA and UConn Extension, will address the definition of a storm-wise community and it is intended to enhance understanding about tree health and management.[278]

5.6.3.5 Sustainable Connecticut

Sustainable CT seeks to help cities and towns across the state become more vibrant, healthy, resilient and thriving places for all of their residents. Sustainability actions, policies, and investments deliver multiple benefits and help towns make efficient use of scarce resources and engage a wide cross section of residents and businesses. Sustainable CT is a voluntary certification program created by the Connecticut Conference of Municipalities (CCM) to recognize thriving and resilient Connecticut communities. Municipal leaders and residents from across the state, the Connecticut Conference of Municipalities and people from key agencies, non-profits and businesses all partnered to help create the program. Sustainable CT is an independently funded, grassroots, municipal effort designed to support all state municipalities. Sustainable CT empowers high collective impact for current and future residents.

Sustainable CT's certification program includes two application cycles, spring and fall. Municipalities submit applications with completed actions, and if the certification criteria is met, municipalities will receive a certification designation of Bronze, Silver, or Gold. 2023 is the first year that the Gold certification has been available. It is possible that a municipality may receive points for an action but does not meet the full criteria for certification. In such cases, even if a municipality did not receive certification, the community successfully completed an action and is gaining the associated climate resilience benefits for the community.

Sustainable CT provides a wide-ranging menu of best practices for building sustainable municipalities. Municipalities choose Sustainable CT actions from this "Master Action List," implement them, and earn points towards certification. Many actions are consistent with the goals of hazard mitigation and, if accomplished, may demonstrate progress. For example, as of the completion of the Spring 2023 submissions to the Sustainable CT

[278] UCONN. Stormwise Forest Management. https://stormwise.uconn.edu/

program, 54 municipalities successfully completed the Action 5.4 Assess Climate Vulnerability, meaning these communities have completed a Community Resilience Building workshop. Table 213 is a list of Sustainable CT eligible actions that relate to hazard mitigation and are tagged by the program as providing climate resilience benefits, as well as the number of towns that have successfully completed each during the 2018-2023 time period.

Table 213. Sustainable CT eligible activities for certification

Action	Number of Submissions	Year Action Created
3.1 Provide Watershed Education	70	2018
3.2 Create a Watershed Management Plan	39	2018
3.3 Engage in Watershed Protection and Restoration	32	2018
3.4 Develop an Open Space Plan	81	2018
3.6 Manage for Drought and Municipal Water Usage	8	2018
3.7 Provide Education on Responsible Water Usage	14	2018
3.8 Implement Low Impact Development	76	2018
3.9 Manage Woodlands and Urban Forests	30	2018
3.12 Enhance Pollinator Pathways	51	2021
5.1 Integrate Sustainability into Plan of Conservation and Development	70	2018
5.3 Develop Agriculture-Friendly Practice	90	2018
5.4 Assess Climate Vulnerability	53	2018
5.5 Inventory and Assess Historic Resources	86	2018
5.7 Plan for Long Term Recovery	4	2020
5.8 Promote Cool Roofs	0	2023
6.1 Implement Complete Streets	85	2018
8.4 Support Community Match Fund (CMF) Project and Civic Engagement	13	2020
8.5 Engage in a Sustainable CT Mentorship with Other Municipalities	24	2021
8.6 Collaborate with Other Municipalities on Sustainability Actions	0	2023
8.7 Engage with Youth on Community Sustainability	1	2023
10.6 Plan and Prepare for Extreme Heat	0	2023

At the time of this plan update, there are 131 total registered communities and 61 certified under the Sustainable CT program, as well as 10 identified Climate Leaders and 3,328 actions completed. Many of the communities that are not registered or certified have mitigation actions relating to successfully achieving this status within their Local HMP.

5.6.4 Connecticut Association of Flood Managers

The mission of the Connecticut Association of Flood Managers (CAFM) is to promote education, policies, and activities that mitigate current and future flood losses, costs, and human suffering caused by flooding and to protect the natural and beneficial functions of floodplains – all without causing unreasonable adverse impacts.

CAFM strives to serve as a unifying force for its membership and their related disciplines within the state of Connecticut, providing both a forum and supportive framework. They solicit thoughts, ideas, concerns, and issues related to floodplain management from members to affect and integrate better management practices within public policy. Such pursuits are based on the collective experience of a diverse statewide membership and result in both environmental stewardship and better collaboration locally, statewide, and regionally among all partners and stakeholders who have are interested in minimizing future flood risk and damages in the state of Connecticut.

Specifically, CAFM focuses on the following:

- Providing educational opportunities and dissemination of general and technical information to individuals concerned with sound floodplain management as well as to the public.
- Promoting public awareness of sound floodplain management principles including mitigation, resiliency, preparedness, response, and recovery and the linkages between them.
- Encouraging the exchange of information, ideas, experiences, etc. among the practitioners of floodplain management at local, state, and regional scales.
- Promoting the professional status of floodplain managers and related disciplines.
- Informing and providing technical information relative to legislation pertinent and necessary to the effective implementation of sound floodplain management practices.
- Promoting environmentally-sound solutions to floodplain management problems.[279]

[279] Connecticut Association of Flood Managers. https://ctfloods.org/

5.6.5 The Nature Conservancy

The Nature Conservancy (TNC) is actively engaged with several Connecticut communities in the area of coastal resilience planning. Their Connecticut Coastal Resilience Program provides a decision support platform to better inform a process for decision-making and the implementation of socio-economic and natural infrastructure-based solutions. Through this program, TNC has helped the communities of Old Saybrook and Waterford conduct willingness to pay surveys for climate adaptation, collaborated to develop a coastal resilience plan for Guilford, and conducted resilience workshops in Stamford, Madison, Stratford, Fairfield, Bridgeport, and Eastern Connecticut. They have led a comprehensive assessment in 24 coastal communities for future salt marsh advancement, making it the first state in the nation to have this assessment for their entire coastline. Other projects have included the Connecticut Coastal Design Project, which defined the most environmentally friendly shoreline protection approaches for Connecticut, and the Adapting to the Rise report, which provides resources for a basic understanding of solutions for adapting to sea level rise.

According to TNC 2022 Annual Report, the organization led a coalition that helped secure $32.2 million in federal funding for conservation management of the Sound and received $106 million over five years from the Bipartisan Infrastructure Law. As of the 2022 report, the total number of completed Community Resilience Plans in Connecticut is 45 municipalities, representing 1.2 million state residents. TNC also worked with the City of New London, Town of Groton, City of Groton, and over 15 local organizations to identify and develop priorities for the design and engineering of resilience projects. Other initiatives mentioned in the Annual Report include a new trail system at Katherine Ordway Preserve in Weston to balance public access and conservation and help fund the Salt Marsh Stewards Program in Stratford, providing high school students the opportunity to gain experience in conservation. TNC, alongside the University of Connecticut and other stakeholders, created a National Estuarine Research Reserve (NERR) on the southeastern coast of the state, which is the first in Connecticut and will bring a new level of protection to the Sound.[280]

Early in 2012, The Nature Conservancy and Clean Air–Cool Planet, with local partners such as the Greater Bridgeport Regional Council and Regional Plan Association, held climate preparedness workshops in Bridgeport using NOAA's Roadmap for Adapting to Coastal Risk and The Nature Conservancy's Coastal Resilience Decision Support Tool. The goal was to advance a conversation on risk, choices, and actions the community could take to reduce risks and increase resilience. The workshops integrated maps showing potential flooding from extreme events and sea level rise into a community-driven process and dialogue through which the community identified top hazards and priorities for action. Through this process, Bridgeport was selected as a national case study for addressing climate impacts

[280] The Nature Conservancy. Connecticut Annual Report 2022. https://www.nature.org/content/dam/tnc/nature/en/documents/CT_2022_Annual_Report.pdf

and reducing risk to infrastructure, with representatives presenting at a White House GreenGov 2012 conference in Washington, D.C.[281]

5.6.6 Citizen Volunteer Organizations

Some communities have a Citizens Emergency Response Team (CERT). The members of these teams have received training in many areas involving disaster situations such as first aid, sheltering management, and traffic control and commodities distribution along with other related tasks. These groups fill voids that exist especially during large scale incidents where standard public safety staffing cannot fulfill all the necessary operations.

5.6.7 Additional Groups

In addition to municipal offices, the American Red Cross (ARC), the Salvation Army and the local health districts provide services related to mitigation and emergency management. The ARC and the Salvation Army help provide shelter and vital services during disasters and participate in public education activities. The local Health Districts become involved with water supply and sanitation issues that may arise during and after emergencies and natural disasters.

5.7 Summary of Challenges & Opportunities

The State of Connecticut has several hazard mitigation capabilities, a summary of obstacles, challenges, and proposed solutions are outlined below.

Challenge	Proposed Solution
Historically State Building Code has not accounted for the latest science related to natural hazard exposure.	The 2022 Connecticut State Building Code has acted on this and is facilitating local adoption across the state. Encourage the adoption of zoning regulations that address similar challenges and advance resilience.
Implementation and Enforcement of Building Codes	State provides funding to CIRCA to continue updating and enhancing buildings codes that promote resilience initiatives.
Promote, incentivize, and encourage State Policies and Guidelines at the Local Level	State has a number of tools that can be utilized and expanded upon in the future, including development of templates for local adoption of resilience regulations and ordinances. Support municipalities that are constrained by staffing and budget by decreasing the amount of work communities need to do in order to facilitate hazard mitigation activities. This includes templates, technical support, and best available data related to vulnerabilities and exposure.

[281] NOAA Office for Coastal Management Digital Coast. https://coast.noaa.gov/digitalcoast/stories/bridgeport

Challenge	Proposed Solution
Coordination Across State Departments, including goals, funding, problem-solving, and projects	Development of this plan involved bringing together state officials to discuss priorities. The State should continue to facilitate these discussions and collaborations to support hazard mitigation initiatives. Promote regional collaboration.
Equitable Distribution of Funds	State provides funding to the Climate Resilience Fund and other grant programs to support projects statewide, supporting municipalities that face financial barriers when implementing critical hazard mitigation actions. Development of statewide Environmental Justice community mapping, Climate Change Vulnerability Index, and the Equity and Environmental Justice Advisory Council within CT DEEP will aid in directing funding and resources where it will make the greatest impact.

6 | Mitigation Strategy

This chapter outlines Connecticut's hazard mitigation goals and actions that make up the mitigation strategy over the next 5 years and beyond.

6.1 Hazard Mitigation Goals

The State of Connecticut is committed to reducing future damage from natural disasters through mitigation. The mission of Connecticut's Hazard Mitigation Program and this plan is to mitigate the impacts of natural hazards by minimizing loss of life and property damage. This plan originated in 2007 and has been updated since then in 2010, 2014, and 2019. This 2023 update includes revised goal statements as shown in the shaded box below. To develop these goal statements, the Hazard Mitigation Planning Team (HMPT) considered the three previous goal statements and the need to add recent Executive Orders, current State Priorities, and FEMA requirements from the State Mitigation Planning Policy Guide.[282]

Goals

1. Physical Projects: Considering current and future conditions, protect human life and safety, public infrastructure, private property, and the environment by implementing physical hazard mitigation and climate adaptation projects that effectively and equitably reduce risk.

2. High Hazard Dams: Reduce vulnerabilities to and from high hazard potential dams.

3. Forward-Looking Policy and Planning: Adapt to climate change and natural hazards through forward-looking policies, plans, regulations, and programs that reduce risk and support long-term resilience.

4. Awareness and Education: Increase general awareness of Connecticut's natural and climate-related hazards and promote measures available to reduce risks through educational outreach.

5. Capability- and Capacity-Building: Enhance the capability and capacity of State agencies, regional entities, and local governments to identify vulnerabilities and risks, integrate risk reduction strategies, and implement resilience projects.

The SHMPT met on multiple occasions to discuss this mitigation strategy. The Mitigation Strategy Workshop held on August 7, 2023, included a ten-page handout (included in

[282] State Mitigation Planning Policy Guide, FP 302-094-2, Effective April 19, 2023.

Appendix 3) to facilitate discussion about the goal statements and the development of new mitigation actions. The previous plan's goal statements identified core themes of floodplain management, hazard mitigation, project implementation, and research and planning. Figure 164 below shows a slide used to facilitate discussion by the SHMPT, including the identification of new strategic categories for the SHMPT to consider for the 2023 plan update. While revisiting the previous plan's goal statements the SHMPT also considered what has changed since 2019 including but not limited to state priorities, recent Executive Orders, and new policy guidance from FEMA.

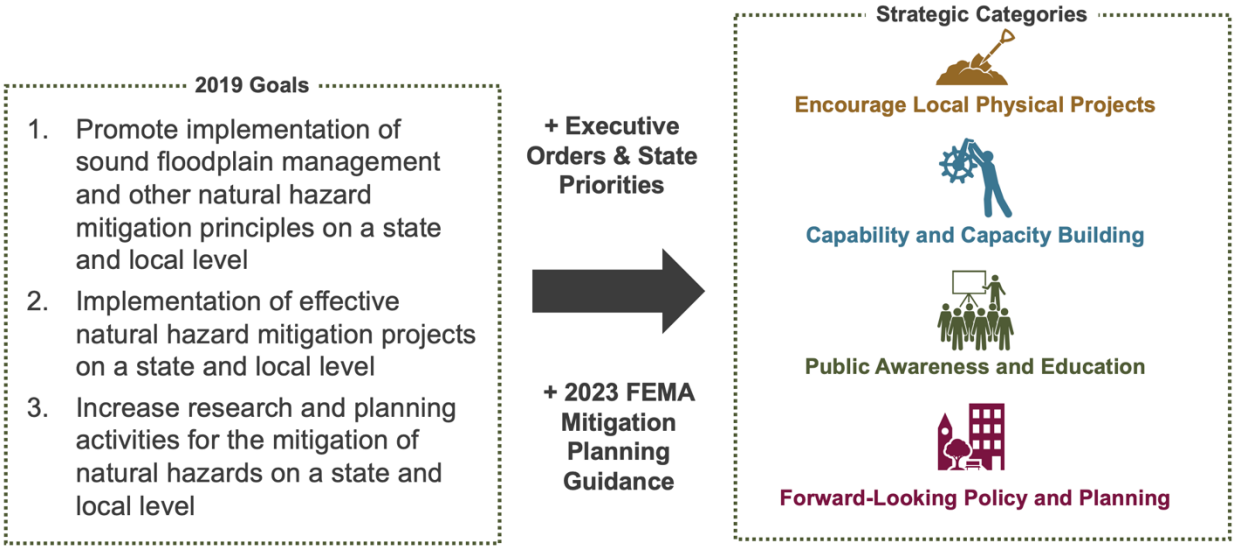


Figure 164. Goal Statement Development

In addition, the SHMPT considered the review of updated information from the risk assessment and results of the internet-based survey used for public participation. When the SHMPT considered all the above five strategic categories emerged, shown below:

1. Physical Projects
2. High Hazard Dams
3. Forward-Looking Policy and Planning
4. Awareness and Education
5. Capability and Capacity Building

Through SHMPT discussion the High Hazard Dams category was added. The 2023 goal statements will serve as a road map for Connecticut to focus its hazard mitigation activities through 2028. It is anticipated that by working towards the goals in this plan, effective natural hazard mitigation measures will be implemented to protect residents of Connecticut and will promote responsible natural hazard mitigation throughout the State on both a regional and local level.

The SHMPT removed the previous plan's objectives and strategies to facilitate plan implementation by directly linking mitigation actions to goal statements.

Local & State Mitigation Strategy Connection

The Local Hazard Mitigation planning process was evaluated as part of this statewide update. A few recommendations specifically targeting improvements to the local planning process are included in this document. Local hazard mitigation plans reference the NHMP, including exposure data and mitigation priorities; consequently, future local plans will consider and incorporate the 5 goals identified as part of the Mitigation Strategy in this planning document. Several local plans reviewed already included actions relating to public education of natural hazards and improving capacity to implement resilience projects and risk reduction activities.

Local government mitigation strategies link to the State mitigation strategy in that they build off each other to encourage establishment of resilient natural environments and communities in the face of a changing climate. The state initiatives identified in this document to enhance emergency preparedness and response across Connecticut are developed in response to local challenges and vulnerabilities pulled from the local plan review process.

6.2 Hazard Mitigation Actions

The hazard mitigation actions developed by the SHMPT to achieve the above goals include those activities which the State, including offices cutting across multiple departments and agencies, may implement as part of their ongoing work and contingent on available resources and/or funding. One of the first steps in this process was for SHMPT members to review the status and the applicability of mitigation activities as recommended in the previous plan, noting their progress made to date, but also identifying which activities should continue to be carried forward as mitigation actions for the 2023 plan (the status of these actions is shown in Appendix 5).

A Mitigation Strategy Workshop was held on August 7, 2023, for the purpose of gathering departments to discuss new mitigation actions. During the Workshop, breakout groups were formed by agency/organization. Representatives from Council of Governments agencies and local governments were grouped together and provided recommendations for mitigation actions they hoped a state department would assume. This breakout group developed fifteen suggested mitigation actions, four of them were adopted by a state department and some of them overlapped with actions already identified. The list of fifteen suggested actions is in Appendix 5.

This workshop included a "Developing Mitigation Actions" handout (Appendix 5) that detailed the following:

- Previous (2019) Recommended Mitigation Activities
- Updated Goal Statements
- Updated Risk Assessment (including final hazard rankings and hazard-specific problem statements)
- Updated Capability Assessment (including identified challenges/opportunities)
- Stakeholder Engagement and Public Participation
- Executive Order 21-3 (actions that reduce carbon emissions and adapt to the climate crisis)
- GC3 Recommendations

The SHMPT specifically included actions and recommendations from Executive Order 21-3 and the Governor's Council on Climate Change (GC3) as priority factors when developing mitigation actions due to the State's commitment to address climate change through long-term risk reduction and climate adaptation.

Each mitigation action identified for inclusion on the 2023 plan includes "essential details" as described in Table 214.

Table 214. Essential Details for Mitigation Actions

Essential Details	Description
Action #	Identifies the unique number for the action. Actions are sorted by priority and then in alphabetical order by lead entity.
Action Title	Each title is a statement indicating the focus of the action.
Action Description	The action description expands on the title to include details for what is included in the action. If the action was developed directly from Executive Order 21-3 or the Governor's Council on Climate Change this is indicated here.
Goal(s) Addressed	Identifies the specific Hazard Mitigation Goal(s) the action is designed to contribute to as established under section 6.1 of this chapter.
Hazard(s) Addressed	Identifies the specific natural hazard(s) the action is designed to mitigate against. This may include a single, multiple, or all natural hazards identified in the plan.
Lead Entity	Identifies the lead department and specific division/office assigned with primary responsibility for implementation of the activity. See list of abbreviations at the beginning of this chapter for full agency names.
Support Agencies/Partners	If the Lead Entity identified supporting partners, they are listed here.
Estimated Cost	A general estimate of total costs. In addition to dollar estimates, this may include "staff time" or "in-kind resources."

Essential Details	Description
Potential Funding Sources	Identifies potential funding sources if needed to support implementation of the action, including known Federal, State, or non-governmental sources.
Timeframe for Completion	Identifies the number of years anticipated to complete the action.

Additional information captured for action sorting purposes includes:

1. FEMA Mitigation Action Category
    a. Plans and Regulations
    b. Structure and Infrastructure Projects
    c. Natural Systems Protection
    d. Education & Awareness Programs
2. If State-owned Assets are addressed
3. If Vulnerable Populations are addressed
4. All the prioritization criteria listed below in Table 215

6.3 Assessment of Recommended Mitigation Activities

To evaluate and prioritize the list of mitigation actions, the SHMPT developed the following categories of criteria to determine if costs associated with an action were reasonable compared to the action's corresponding benefits.

In the 2019 NHMP the SHMPT used the STAPLE-E evaluation method (Social, Technical, Administrative, Political, Legal, Economic, and Environmental). For the 2023 update process, the SHMPT decided that the criteria to use in evaluating and prioritizing mitigation actions should include Hazard Ranking, Estimated Cost, Life/Safety, Equity, Critical Facility Protection, Protection of Natural Resources, Alignment with Executive Orders, Support of Local Mitigation Efforts, and Implementation Timeline. Each of these criteria are fully described with corresponding details in Table 215. Like STAPLE-E, a quantitative scoring method was used to help determine overall priority levels for each action. The highest score a mitigation action could receive was 26 points and the lowest possible score was 1. Details associated with each mitigation action are in Appendix 5.

It is important to recognize that mitigation actions addressing High Hazard Potential Dams (HHPDs) were not prioritized differently than other actions. Funding sources for mitigation actions related to HHPDs were not prioritized differently compared to other dam-related

mitigation actions. All actions were prioritized (or reprioritized, where applicable), in part, based on the 2023 Risk Assessment and 2023 Capability Assessment.

S12-b. Was the prioritization of mitigation actions and activities updated based on the updated analysis of risks, capabilities and progress?

Table 215. Mitigation Action Prioritization Criteria

Criteria Category	Description	Detailed Information
Hazard Ranking	What level of hazard(s) does the mitigation action provide protection against?	High = 4 Medium-High = 3 Medium = 2 Medium-Low = 1 Low = 0
Estimated Cost	How much will the mitigation action cost to implement?	No monetary cost = 4 Low = 3 Medium = 2 High = 1 Very High = 0
Life/Safety	How effective is the mitigation action at protecting lives and mitigating injuries resulting from the targeted hazard(s)?	Major Support = 3 Moderate Support = 2 Minor Support = 1 None = 0
Equity	Does the mitigation action support vulnerable populations?	Direct Support = 3 Indirect Support = 2 No Support = 0
Critical Facility Protection	Does the mitigation action protect critical facilities and infrastructure?	Yes = 3 No = 0
Protection of Natural Resources	Does the mitigation action protect natural resources?	Yes = 2 No = 0
Alignment with Executive Orders	Does the mitigation action align with Executive Orders?	Yes = 2 No = 0
Support of Local Mitigation Efforts	Does the mitigation action support local mitigation efforts?	Yes = 2 No = 0
Implementation Timeline		1-2 Years = 3 3-4 Years = 2 5 or More Years = 1

Of the 101 actions, 46 scored between 20 and 23 and were given the rank of high priority, 34 actions scored between 17 and 19 and were given the rank of medium priority, and 21 actions scored between 9 and 16 and were given the rank of low priority.

Nine (9) actions had a cost of Very High, 3 had a cost of High, 8 had a cost of Medium, 23 had a low cost, and 58 were identified to have no monetary cost and rely solely on staff time. Having just over half of the actions relying on staff time indicates that hazard

mitigation and climate adaptation are primary responsibilities of a couple of state departments, specifically DEEP and DESPP.

6.4 Implementation and Integration of Recommended Mitigation Actions

The mitigation actions outlined in this plan provide a guide to assist the State of Connecticut in working towards achieving its five identified hazard mitigation goals. The goals themselves are achievable, yet they require adequate resources such as financial and staff resources to achieve significant results. They also require planning, policy, and program integration across multiple state agencies.

All the mitigation actions listed in Table 216 have been deemed feasible with respect to their implementation on a state or local level. Each of the potential actions can be implemented independently of other proposed actions. In addition, each action will support the improvement of an increasingly effective and comprehensive Hazard Mitigation Plan.

However, the implementation of any proposed action is dependent upon availability of resources both monetary and other (e.g., staff, technical, supplies, etc.). This dependence on available resources will be a significant factor regarding their implementation over the next five years. More information on funding sources for mitigation projects is available in **section 5.2** of this plan.

The State has increased their focus on climate change and adaptation techniques and 14 of the mitigation actions relate directly to Executive Order 21-3, and 5 actions related directly to projects identified by the Governor's Council on Climate Change. Actions that specifically support either of these initiatives are identified in the Action Description.

The mitigation actions are shown below in Table 216 and sorted by priority and then alphabetically by Lead Entity.

Table 216. Recommended Hazard Mitigation Actions, 2023-2028

#	Action Title	Action Description	Goal(s) Addressed	Hazard(s) Addressed	Lead Entity	Support Agencies / Partners	Estimated Cost	Potential Funding Sources	Timeframe for Completion	Priority Level
1	Comprehensive Climate Action Plan	Develop a Comprehensive Climate Action Plan that addresses reduction of climate pollution (reducing greenhouse gas emissions and other harmful air pollution). [EO 21-3, Action #1]	3	Drought, Extreme Cold, Extreme Heat, Flood, Sea Level Rise, Thunderstorm, Tropical Cyclone, Wildland Fire	DEEP/BAM and DEEP/OCP		Very High (Over $1M)	EPA Climate Pollution Reduction Grant	1-5 Years	High
2	Zero-carbon Energy Supply by 2040 and Integrated Resources Plan	Facilitate the transition to a zero-carbon electric sector; ready the grid with modernized transmission systems, reform the regional wholesale market, and implement and synchronize policies and programs that promote affordability, equity and resilience through the Integrated Resources Plan. [GC3 Recommendation]	3, 5	Drought, Extreme Cold, Extreme Heat, Flood, Sea Level Rise, Thunderstorm, Tropical Cyclone, Wildland Fire	DEEP/BETP		High ($500k - $1M)	State general fund, federal grants	1-5 Years	High

#	Action Title	Action Description	Goal(s) Addressed	Hazard(s) Addressed	Lead Entity	Support Agencies / Partners	Estimated Cost	Potential Funding Sources	Timeframe for Completion	Priority Level
3	Comprehensive Energy Strategy (CES)	Report on future energy needs in the state, set policy for statewide energy planning, identify opportunities to reduce costs for ratepayers, ensure reliable energy availability, and mitigate public health and environmental impacts of Connecticut's energy use, such as greenhouse gas (GHG) emissions and emissions of criteria air pollutants through the Comprehensive Energy Strategy. [EO 21-3, Action #1)	3	Drought, Extreme Cold, Extreme Heat, Flood, Sea Level Rise, Thunderstorm, Tropical Cyclone, Wildland Fire	DEEP/BETP		No monetary cost (staff time or in-kind resources)	Agency Operating Budgets	1-5 Years	High
4	Resilience and Reliability Standards and Programs	More comprehensively and effectively evaluate the effectiveness of Electric Distribution Companies' reliability and resilience programs, including establishing specific reliability and resilience targets and metrics will improve the effectiveness of these programs. [GC3 Recommendation]	3	Drought, Extreme Cold, Extreme Heat, Flood, Sea Level Rise, Thunderstorm, Tropical Cyclone, Wildland Fire	DEEP/BETP	PURA	No monetary cost (staff time or in-kind resources)	Agency Operating Budgets	1-5 Years	High
5	Grid Resilience Funding	Utilize federal grid resilience funding authorized under the Bipartisan Infrastructure Law - Section 40101(d) Preventing Outages and Enhancing the Resilience of the Electric Grid.	3, 5	Thunderstorm, Tropical Cyclone, Winter Weather	DEEP/BETP		High ($500k - $1M)	BIL - Grid Resilience Funding	1-5 Years	High

#	Action Title	Action Description	Goal(s) Addressed	Hazard(s) Addressed	Lead Entity	Support Agencies / Partners	Estimated Cost	Potential Funding Sources	Timeframe for Completion	Priority Level
6	Enhance Dam Safety Regulatory Program	Continue to identify and implement enhancements to DEEP's Dam Safety Regulatory Program through capability improvements and increased funding to address high hazard potential dams.	2	Dam Failure, Flood	DEEP/Dam Safety		No monetary cost (staff time or in-kind resources)	Agency Operating Budgets	1-5 Years	High
7	Dam Breach Inundation Mapping and Emergency Action Planning	Continue and expand enforcement of DEEP's requirements for dam breach inundation mapping and development of Emergency Action Plans (EAPs). Not all dam inundation areas have been mapped for high-hazard dams within the state. There are 249 high-hazard dams in Connecticut, and 19 do not have their inundation areas mapped or EAPs. Five of these dams are owned by DEEP.	2	Dam Failure, Flood	DEEP/Dam Safety		No monetary cost (staff time or in-kind resources)	Agency Operating Budgets	1-5 Years	High
8	Address high hazard potential dams with "poor" condition assessments	Coordinate with dam owners and operators to assess and mitigate the risks associated with high hazard potential dams that have concerning condition assessment ratings (18 HHPDs currently have "poor" condition assessments.	2	Dam Failure, Flood	DEEP/Dam Safety		No monetary cost (staff time or in-kind resources)	Agency Operating Budgets	1-5 Years	High

#	Action Title	Action Description	Goal(s) Addressed	Hazard(s) Addressed	Lead Entity	Support Agencies / Partners	Estimated Cost	Potential Funding Sources	Timeframe for Completion	Priority Level
9	Engagement for forest	Engage stakeholders on resources and programs to ensure Connecticut's forests continue to be resilient to the impacts of climate change and to maximize forests' potential to sequester and store carbon in support of state's emissions reduction goals. [EO 21-3, Action #10)	3, 5	Drought, Extreme Heat, Flood, Sea Level Rise, Thunderstorm, Tropical Cyclone, Wildland Fire	DEEP/ Forestry		No monetary cost (staff time or in-kind resources)	Agency Operating Budgets	1-5 Years	High
10	21% Open Space Goal	Protect 673,210 acres or 21% of Connecticut's land as open space by the year 2023. [CT Green Plan]	3	Extreme Heat, Flood, Sea Level Rise	DEEP/Land Office		Very High (Over $1M)	State bonds funds (ongoing authorizations)	1 Year	High
11	New Haven Long Wharf Flood Resilience	Support the installation of a floodwall and flood gates along Long Wharf and along I-95 easements to protect infrastructures from flooding . Currently in engineering design and permitting phase.	1	Flood, Sea Level Rise	DEEP/LWRD	USACE, City of New Haven (leading the project)	Very High (Over $1M)	17.5% State; 17.5% New Haven; USACE 65%	3 Years	High
12	Promote CRS participation	Promote FEMA's Community Rating System (CRS) as a means for local communities to soften the likely increase in many flood insurance policy rates resulting from new reforms to the National Flood Insurance Program (NFIP) enacted by Federal Legislation.	4	Flood	DEEP/LWRD	USACE - Silver Jackets	No monetary cost (staff time or in-kind resources)	Agency Operating Budgets	1 Year	High

#	Action Title	Action Description	Goal(s) Addressed	Hazard(s) Addressed	Lead Entity	Support Agencies / Partners	Estimated Cost	Potential Funding Sources	Timeframe for Completion	Priority Level
13	Promote addressing RL and SRL properties and climate resilience in NHMPs	Encourage communities to pursue funding opportunities to develop FEMA approved Natural Hazards Mitigation Plans which promote addressing RL and SRL properties as well as the integration of climate adaptation strategies with conventional hazard mitigation techniques.	3	All	DEEP/LWRD	DESPP/DEMHS (lead agency for administering grant funding for mitigating RLPs)	No monetary cost (staff time or in-kind resources)	Agency Operating Budgets	1-5 Years (as plan updates	
14	Nature-based Adaptation Strategies	Prioritize nature-based adaptation strategies that will ameliorate the effects of water inundation, including natural habitat conservation, Low Impact Development Best Management Practices (BMPs) and agriculture water BMPs. [GC3 Recommendation]	1, 3	Drought, Extreme Cold, Extreme Heat, Flood, Sea Level Rise, Thunderstorm, Tropical Cyclone, Wildland Fire	DEEP/OCP		No monetary cost (staff time or in-kind resources)	Agency Operating Budgets	1-5 Years	High
15	Partnership for Climate Resilience Actions	Work with partners, including UConn, to help municipalities and Councils of Government implement climate resilience actions, including establishing stormwater authorities and municipal climate resilience boards enabled under Governor's bill AAC Climate Change Adaptation signed into law as P.A.21-115. [EO 21-3, Action #10)	5	Drought, Extreme Cold, Extreme Heat, Flood, Sea Level Rise, Thunderstorm, Tropical Cyclone, Wildland Fire	DEEP/OCP	UConn/CIRCA	No monetary cost (staff time or in-kind resources)	Agency Operating Budgets	1-5 Years	High

#	Action Title	Action Description	Goal(s) Addressed	Hazard(s) Addressed	Lead Entity	Support Agencies / Partners	Estimated Cost	Potential Funding Sources	Timeframe for Completion	Priority Level
16	Improve coordination on the Connecticut Community Climate Resilience program	As DEEP moves forward with establishing the Connecticut Community Climate Resilience program as called for under Executive Order 21-3, develop a coordination process and procedures for identifying the "pipeline of projects" for funding. The process and procedures should be developed to provide clarity on how proposed projects are identified, prioritized, monitored, and reported on moving forward through an open, participatory, and equitable public engagement process under the authority of one state agency or established council, similar to the process used for the Water Planning Council. [EO 21-3, Action #11]	1, 5	All	DEEP/OCP	OPM, UConn/CIRCA	No monetary cost (staff time or in-kind resources)	Agency Operating Budgets	1-5 Years	High
17	Extreme Heat Working Group	Create a multi-agency Extreme Heat Working Group (including DEEP, DEMHS, DPH, CIRCA, etc.) to address statewide response and planning for extreme heat events.	3, 4, 5	Extreme Heat	DEEP/OCP	DEMHS, DPH, UConn/CIRCA	No monetary cost (staff time or in-kind resources)	Agency Operating Budgets	1-3 Years	High
18	Resilient Bridgeport Project Support	In coordination with CIRCA, support the development and implementation of projects identified from the Resilient Bridgeport Initiative.	1	All	DEEP/OCP	UConn/CIRCA	Very High (Over $1M)	Legislative Appropriation, FEMA HMA (HMGP, FMA, BRIC)	1-5 Years	High

#	Action Title	Action Description	Goal(s) Addressed	Hazard(s) Addressed	Lead Entity	Support Agencies / Partners	Estimated Cost	Potential Funding Sources	Timeframe for Completion	Priority Level
19	Matching Funds Program	Launch a matching funds program for federal grants	1, 5	All	DEEP/OCP	DESPP/DEMHS, UConn, CIRCA, DPH	Very High (Over $1M)	Legislative Appropriation	1-5 Years	High
20	DEEP Climate Resilience Fund Project Support	Support the development and implementation of projects identified from the Climate Resilience Fund.	1	All	DEEP/OCP	UConn/CIRCA	Very High (Over $1M)	Microgrid and resilience grant and loan program per CGS Sec. 16-243y	1-5 Years	High
21	State Agency Vulnerability Assessment Project Support	Support the development and implementation of projects identified from the State Agency Vulnerability Assessment	1	All	DEEP/OCP	DESPP/DEMHS	Very High (Over $1M)	FEMA and other federal funding	1-5 Years	High
22	Governor's Council on Climate Change (GC3)	Continue GC3's work on supporting the implementation of projects that contribute to GHG reduction targets and increase climate resilience, while integrating equity and environmental across all actions.	1, 3, 5	Drought, Extreme Cold, Extreme Heat, Flood, Sea Level Rise, Thunderstorm, Tropical Cyclone, Wildland Fire	DEEP/OCP		No monetary cost (staff time or in-kind resources)	Agency Operating Budgets	1-5 Years	High
23	Use CCVI in Planning	Incorporate CCVI results into state planning and agency actions: - Utilize CCVI results for project prioritization, grant funding prioritization, and other activities - Develop CCVI 3.0 within the next five years with new projections, improved data, improved methodology based on feedback from initial rollout.	3	All	DEEP/OCP	DEEP/LWRD, UConn/CIRCA	No monetary cost (staff time or in-kind resources)	Agency Operating Budgets	1-5 Years	High

#	Action Title	Action Description	Goal(s) Addressed	Hazard(s) Addressed	Lead Entity	Support Agencies / Partners	Estimated Cost	Potential Funding Sources	Timeframe for Completion	Priority Level
24	State-Level Guidance on Nature-based Solutions	Develop guidance for state agencies to use nature-based solutions for flood and erosion control and stormwater management, integrate coastal marsh migration in state projects in coastal areas, and utilize low impact development and green infrastructure in new state construction and state-funded construction or redevelopment. EO 21-3 directs agencies to utilize this guidance for capital project planning and design. All capital projects following this guidance will report on their progress to the EO1 Steering Committee on State Sustainability. [EO 21-3, Action #22)	3, 5	Flood, Sea Level Rise	DEEP/OCP	DEEP/LWRD, MMCA, DAS	Low (under $250k)	State general funds and bond funds	1-5 Years	High

#	Action Title	Action Description	Goal(s) Addressed	Hazard(s) Addressed	Lead Entity	Support Agencies / Partners	Estimated Cost	Potential Funding Sources	Timeframe for Completion	Priority Level
25	CT Clean Economy Council	Establish a Connecticut Clean Economy Council to advise the Governor on strategies and policies to strengthen the state's climate mitigation, clean energy, resilience, and sustainability programs by leveraging state and federal funding and maximize local economic development in clean energy, climate and sustainability; training the workforce in these areas; and supporting a diverse and equitable economic development and employment. [EO 21-3, Action #1)	3, 5	Drought, Extreme Cold, Extreme Heat, Flood, Sea Level Rise, Thunderstorm, Tropical Cyclone, Wildland Fire	DEEP/OCP		No monetary cost (staff time or in-kind resources)	Federal, state, energy efficiency, and RGGI funds	1-5 Years	High
26	Municipal Training and Technical Assistance for Nature-based Solutions	Expand Connecticut's nature-based resilience capacity by providing training, education and technical assistance to municipalities engaged in project design, permitting and partnerships to lead project to implementation. [GC3 Recommendation]	5	Drought, Extreme Cold, Extreme Heat, Flood, Sea Level Rise, Thunderstorm, Tropical Cyclone, Wildland Fire	DEEP/OCP		Low (under $250k)	State general fund, federal grants	1-5 Years	High

#	Action Title	Action Description	Goal(s) Addressed	Hazard(s) Addressed	Lead Entity	Support Agencies / Partners	Estimated Cost	Potential Funding Sources	Timeframe for Completion	Priority Level
27	Connecticut GreenerGov and Lead by Example	The state will implement targets for organics/food waste diversion, purchasing 100% zero carbon electricity, leasing zero emission light-duty vehicles, planning for retrofit and new construction zero carbon heating and cooling, divesting buildings, deploying solar, and reducing greenhouse gas emissions from state buildings, in order to meet its 45% GHG emissions reduction goal. [EO 21-3, Action #3)	3	Drought, Extreme Cold, Extreme Heat, Flood, Sea Level Rise, Thunderstorm, Tropical Cyclone, Wildland Fire	DEEP/OCP (via GC3/SAFR Council)		No monetary cost (staff time or in-kind resources)	Agency Operating Budgets	1-5 Years	High
28	Integrate mitigation across plans	Create a framework and process to integrate mitigation plan requirements and actions into other appropriate planning mechanisms including but not limited to such as the State/regional/local Plan of Conservation and Development, capital improvement plans, transportation plans, etc.	3	All	DEEP/OCP (via GC3/SAFR Council)	DESPP/DEMHS	No monetary cost (staff time or in-kind resources)	Agency Operating Budgets	Annually	High

#	Action Title	Action Description	Goal(s) Addressed	Hazard(s) Addressed	Lead Entity	Support Agencies / Partners	Estimated Cost	Potential Funding Sources	Timeframe for Completion	Priority Level
29	Develop coordinated heat mitigation approach	Utilizing the Extreme Heat Working Group (established through Action #17), conduct a thorough heat vulnerability analysis, with potential activities to include evaluation of high heat, social determinants of health related to heat risk, event damage to property and infrastructure, as well as indirect costs from health care expenses, loss of productivity, and strain on emergency services. Research and develop funding mechanisms that leverage federal grants, private-sector partnerships, and state budgets to support heat mitigation strategies. Collaborate with these entities to allocate funding specifically for heat resilience projects that align with their missions. Explore partnerships that enable leveraging state funds to attract private investment in heat mitigation initiatives.	3, 4, 5	Extreme Heat	DEEP/OCP (via GC3/SAFR Council)	DPH, DESPP/DEMHS, DEEP, DSS, DCF, OPM	No monetary cost (staff time or in-kind resources)	Agency Operating Budgets	1-5 Years	High
30	Resilient stormwater and drainage systems	Update the design criteria for stormwater management system. CDOT to identify culverts that need to be repaired or replaced to guide application for federal funding for this work. [EO 21-3, Action #12)	3, 5	Flood	DEEP/ Stormwater Program		No monetary cost (staff time or in-kind resources)	Agency Operating Budgets	1-5 Years	High

#	Action Title	Action Description	Goal(s) Addressed	Hazard(s) Addressed	Lead Entity	Support Agencies / Partners	Estimated Cost	Potential Funding Sources	Timeframe for Completion	Priority Level
31	Watershed-based planning	Expand water quality focus of watershed-based planning to also consider related flooding and climate resilience issues and solutions.	3	Drought, Extreme Cold, Extreme Heat, Flood, Sea Level Rise, Thunderstorm, Tropical Cyclone, Wildland Fire	DEEP/WPLR		Medium ($250k-$500k)	State and federal funds	1-5 Years	High
32	Conduct stakeholder outreach on the system for how the State prioritizes mitigation projects	Provide education and guidance to local governments and stakeholders so they are aware of not only types of mitigation projects but how projects are prioritized based on criteria such as vulnerable populations, stormwater or roadway infrastructure, and critical facilities. CRS and Flood Mitigation Assistance Program - this can be added.	1, 3, 5	All	DESPP/ DEMHS		Low (under $250k)	Agency Operating Budgets	1-5 Years	High

#	Action Title	Action Description	Goal(s) Addressed	Hazard(s) Addressed	Lead Entity	Support Agencies / Partners	Estimated Cost	Potential Funding Sources	Timeframe for Completion	Priority Level
33	Maintain lists of state and local critical facilities for use in capital and climate resilience planning	Maintain central repository of state and local critical facilities and direct state agencies to consider these lists in their capital and climate resilience planning, especially in floodplains or flood-prone areas. While DEMHS in consultation with other state agencies will maintain lists, they will not provide access to lists indiscriminately to other agencies or private institutions due to the issue of public protection and the security risk behind sharing these lists publicly. [EO 21-3, Action 13]	3, 5	All	DESPP/ DEMHS		No monetary cost (staff time or in-kind resources)	Agency Operating Budgets	1-5 Years	High
34	Provide guidance and education to local governments and Council of Governments regarding FEMA's BRIC program priorities	Program priorities may include Planning, Acquisition, Infrastructure, Generators for Critical Facilities, Utility Elevations Nature-Based Solutions, etc.	1, 4	All	DESPP/ DEMHS		No monetary cost (staff time or in-kind resources)	Agency Operating Budgets	1-5 Years	High
35	Benefit-Cost Analysis Training	Collaborate with FEMA to promote the use of best-available data and alternative methodologies to FEMA's BCA program. Continue yearly BCA training offerings	5	All	DESPP/ DEMHS		No monetary cost (staff time or in-kind resources)	Agency Operating Budgets	1-5 Years	High

#	Action Title	Action Description	Goal(s) Addressed	Hazard(s) Addressed	Lead Entity	Support Agencies / Partners	Estimated Cost	Potential Funding Sources	Timeframe for Completion	Priority Level
36	Develop a system for how the State prioritizes projects	Develop project category priorities for hazard mitigation funding administered by the State regardless of funding source, and then design consistent evaluation criteria to be used during application reviews for various programs as required (i.e., HMGP Administrative Plan), recognizing there will be differences in program eligibility, etc.	1, 3, 5	All	DESPP/ DEMHS		No monetary cost (staff time or in-kind resources)	Agency Operating Budgets	1-5 Years	High

#	Action Title	Action Description	Goal(s) Addressed	Hazard(s) Addressed	Lead Entity	Support Agencies / Partners	Estimated Cost	Potential Funding Sources	Timeframe for Completion	Priority Level
37	Support mitigation projects across the state	Support mitigation projects that will result in protection of public or private property from natural hazards. Eligible projects include but are not limited to: 1. Acquisition of flood prone property 2. Elevation of flood prone structures 3. Minor structural flood control projects 4. Relocation of structures from hazard prone areas 5. Retrofitting of existing buildings, facilities, and infrastructure 6. Retrofitting of existing building and facilities for shelter 7. Critical infrastructure protection measures 8. Stormwater management improvements 9. Advanced warning systems and hazard gauging systems (weather radios, reverse-911, stream gauges, I-flows) 10. Targeted hazard education 11. Wastewater and water supply system hardening and mitigation.	1	All	DESPP/ DEMHS	CT Interagency Hazard Mitigation Committee - DESPP/DEMHS/DEEP	No monetary cost (staff time or in-kind resources)	Agency Operating Budgets	1-5 Years	High

#	Action Title	Action Description	Goal(s) Addressed	Hazard(s) Addressed	Lead Entity	Support Agencies / Partners	Estimated Cost	Potential Funding Sources	Timeframe for Completion	Priority Level
38	Promote the use of best-available data, related to hazards, climate change, land use, and the built environment in State plans	Update all state and local plans relating to hazard mitigation planning and resilience. Incorporate the latest data on hazards, climate change, land use, built environment, etc. Includes plans such as the CT Climate Preparedness Plan and the State Data Plan.	3	All	DESPP/ DEMHS		No monetary cost (staff time or in-kind resources)	Agency Operating Budgets	1-5 Years	High
39	Develop an Extreme Heat Response Plan	Develop an Extreme Heat Response Plan for the state, including tailored actions for vulnerable populations. Utilize the Extreme Heat Working Group (established under Action #17) to write the plan. DEMHS will add an extreme temperature annex to the State Response Framework. [EO 21-3, Action #16]	3, 4, 5	Extreme Heat	DESPP/ DEMHS	DPH, DEEP, UConn/CIRCA, CT Green Bank, DPH, DEEP, DSS, DOH, Federal HUD, UW211, Red Cross, Connecticut Conference to End Homelessness	No monetary cost (staff time or in-kind resources)	Agency Operating Budgets	Within 1 year	High
40	Incentivize CRS participation through Sustainable CT	Add participation in FEMA's Community Rating System (CRS) as a creditable action for communities complete and receive points for certification under the Sustainable CT program.	3, 5	Flood	Sustainable CT	DEEP	No monetary cost (staff time or in-kind resources)	Operating Budget	1 Year	High

#	Action Title	Action Description	Goal(s) Addressed	Hazard(s) Addressed	Lead Entity	Support Agencies / Partners	Estimated Cost	Potential Funding Sources	Timeframe for Completion	Priority Level
41	Increase hydrologic monitoring across the state	Increase hydrologic monitoring in the state relative to precipitation, surface groundwater, and tidal gauges to enhance the statewide data collection effort and improve long term trend analysis for climate change assessments, predictive modeling and hazard mitigation. Communicate with USGS to maintain monitoring stations.	3, 5	Drought, Flood	UConn/CIRCA	USGS, USACE	Medium ($250k-$500k)	Legislative Appropriation	July 2024 - June 2027	High
42	Update the CT-PCSAR	Update the Connecticut Physical Climate Science Assessment Report (CT-PCSAR). Latest version is from 2019.	3, 5	Dam Failure, Drought, Flood, Sea Level Rise, Thunderstorm, Tropical Cyclone, Winter Weather, Extreme Cold, Extreme Heat, Tornado	UConn/CIRCA	UConn Departments	Low (under $250k)	Legislative Appropriation	July 2024 - June 2025	High
43	Update SLR guidance	Update the sea level rise planning guidance (planning threshold) as required by Public Act 18-82.	3, 5		UConn/CIRCA	NOAA, DEEP	Low (under $250k)	Legislative Appropriation	January 2024 - December 2024	High
44	Advance Resilient Connecticut 1.0 Phase III Projects	Advance the Resilient Connecticut 1.0 Phase III projects from “study & concepts” to federal funding sources.	1	Flood, Sea Level Rise, Extreme Heat	UConn/CIRCA	Municipalities, DEMHS, DEEP	Medium ($250k-$500k)	Legislative Appropriation, combination of State funds and FEMA funds already secured	January 2024 - December 2024	High
45	Advance Resilient Connecticut 2.0 Phase III Projects	Advance the Resilient Connecticut 2.0 Phase III projects from "ROARs" to “study & concepts.”	1	Flood, Sea Level Rise, Extreme Heat	UConn/CIRCA	Municipalities	Medium ($250k-$500k)	Legislative Appropriation, FEMA HMA (HMGP, FMA, BRIC)	January 2024 - December 2024	High

#	Action Title	Action Description	Goal(s) Addressed	Hazard(s) Addressed	Lead Entity	Support Agencies / Partners	Estimated Cost	Potential Funding Sources	Timeframe for Completion	Priority Level
46	Develop policy guidance for home elevation priorities and funding	Work with State Agencies to develop a more holistic strategy and detailed policy guidance for home elevation priorities and funding. The strategy must take into account the large number of homes located in flood hazard areas where acquisition, retreat, or structural defenses are not a viable long-term option, and the need for accelerated solutions for climate adaptation.	3	Flood, Sea Level Rise	UConn/CIRCA	DEMHS, DEEP	No monetary cost (staff time or in-kind resources)	Legislative Appropriation	July 2024 - June 2026	High
47	Statewide Transportation Resilience Improvement Plan	Create a Statewide Transportation Resilience Improvement Plan.	3, 5	All	CTDOT	COGs, MPOs	Medium ($250k-$500k)	FHWA	2 Years	Medium
48	Resilient State Facilities Initiative	Assess the vulnerability of state government assets and operations to the impacts of climate change and create a list of priority assets and infrastructure for climate resilience projects for each agency. Develop specific mitigation strategies for each structure/facility utilizing existing hazard data, identify timeframe for implementing the strategies, and include estimated mitigation costs. Identify long-term climate change adaptation strategies for each structure/facility. [EO 21-3, Action #11]	3, 5	All	DAS		No monetary cost (staff time or in-kind resources)	Agency Operating Budgets	Risk Assessment study will be done in year 1. The adaptation strategy development for each facility will be done in years 3,4,5.	Medium

#	Action Title	Action Description	Goal(s) Addressed	Hazard(s) Addressed	Lead Entity	Support Agencies / Partners	Estimated Cost	Potential Funding Sources	Timeframe for Completion	Priority Level
49	Backup power for state-owned facilities and state-owned gas stations	Acquire and install emergency backup generators and/or renewables and alternate energy sources at state-owned critical facilities and state-owned gas stations.	1	All	DAS/ Construction Services	DEEP, OPM, DCP, CTDOT	Very High (Over $1M)	FEMA (HMGP) at <$75k/generator	5 Years	Medium

#	Action Title	Action Description	Goal(s) Addressed	Hazard(s) Addressed	Lead Entity	Support Agencies / Partners	Estimated Cost	Potential Funding Sources	Timeframe for Completion	Priority Level
50	Local School Construction Grant Program and School Safety Infrastructure Council	Local School Construction Grant Program and School Safety Infrastructure Council: • Identify and assess existing public school facilities that could be impacted by natural hazards (including climate change). Correlate identified schools with the School Building Project Priority Lists; identify mitigation strategies for these projects early on in the grant process. • For new grants involving siting a new school, provide and encourage the use of an interactive web based mapping portal for local school districts to use during site selection. Encourage early coordination with DAS Environmental Planning and GIS Services Unit. • Should facilities be located within natural hazard areas, request an assessment of "no feasible or prudent alternative;" encourage higher design standards above minimum criteria for new schools or "renovated as new." • Identify long-term climate change adaptation strategies for each structure/ facility	1, 3	All	DAS/ Office of School Facilities	DEEP/LWRD/Flood Management Section, OPM Bond Commission	No monetary cost (staff time or in-kind resources)	Agency Operating Budgets	1-5 Years	Medium

#	Action Title	Action Description	Goal(s) Addressed	Hazard(s) Addressed	Lead Entity	Support Agencies / Partners	Estimated Cost	Potential Funding Sources	Timeframe for Completion	Priority Level
51	Increase understanding of historic resource vulnerability	Conduct new or updated surveys of historic resources to better understand their vulnerability to natural hazards.	3, 5	All	DECD/SHPO		No monetary cost (staff time or in-kind resources)	Agency Operating Budgets	3 Years	Medium
52	Increase support for state-level cultural and natural resources initiatives	Increase support for state-level cultural and natural resources initiatives to increase resiliency of cultural and natural resources from disasters. Expand SHPO resiliency-focused technical assistance project completed in 2018 to northern four counties.	5	All	DECD/SHPO		No monetary cost (staff time or in-kind resources)	Agency Operating Budgets	3 Years	Medium
53	Climate change adaptation training for public works directors	Train local public works directors on climate change impacts and how to evaluate local infrastructure for risk, identify risk mitigation measures, and incorporate climate change risk into the maintenance/replacement cycle.	3, 4	Drought, Extreme Cold, Extreme Heat, Flood, Sea Level Rise, Thunderstorm, Tropical Cyclone, Wildland Fire	DEEP	OPM, UConn/CIRCA, CT Green Bank	No monetary cost (staff time or in-kind resources)	Agency Operating Budgets	1-5 Years	Medium
54	Invasive Species Impact Assessment	Evaluate the impact of invasive species on natural hazard exposure (such as increased risk of treefall due to invasive insects, increased risk of flooding due to invasive plants) as well as invasive species as a natural hazard in of themselves (for examples, invasive insects carrying disease) to better guide mitigation activities.	3, 5	Drought, Flood, Thunderstorm, Tropical Cyclone, Wildland Fire	DEEP in coordination with Agricultural Experiment Station/ UConn Stormwise Forest Management	DPH, DEEP Forestry, APHIS, USDA	No monetary cost (staff time or in-kind resources)	Agency Operating Budgets (DEEP)	1-5 Years	Medium

#	Action Title	Action Description	Goal(s) Addressed	Hazard(s) Addressed	Lead Entity	Support Agencies / Partners	Estimated Cost	Potential Funding Sources	Timeframe for Completion	Priority Level
55	Invasive Species PSAs	Implement a targeted public service announcement (PSA) campaign to raise awareness and promote responsible aquatic and wood transport practices. This action aims to prevent the spread of invasive species, protecting the state's ecosystems, water bodies, and forests from potential threats.	4	Focus is on invasive species but with applicability to most natural hazards	DEEP/ Communications	Other DEEP Divisions (Forestry, Water, Boating)	Low (under $250k)	Agency Operating Budgets, Legislative Appropriation	1-5 Years	Medium
56	Native American Tribes Wildfire Outreach	Provide educational materials and outreach around wildfire hazards to the Native American tribes in Colchester, North Stonington and Kent who are in or near the Wildland-Urban Interface (WUI).	4	Wildland Fire	DEEP/ Forestry	DEMHS	Medium ($250k-$500k)	USDA Forest Service, ARPA, RGGI	5 Years	Medium
57	Wildfire Smoke Alert System	Develop preparedness and early warning and alert systems for Wildfire Smoke.	5	Wildland Fire	DEEP/ Forestry	DPH; DEEP for modeling; DESPP/DEMHS for communication	No monetary cost (staff time or in-kind resources)	USDA Forest Service, ARPA, RGGI	5 Years	Medium
58	Conduct geophysical research in support of mitigation planning efforts	Conduct geophysical research to investigate, classify, and map soil stability and susceptibility to liquefaction during seismic events to assist with future hazard mitigation planning efforts.	3, 5	Earthquake	DEEP/ Geological Survey	USGS	Low (under $250k)	FEMA (NEHRP)	3 Years (from support received, with annual progress reporting)	Medium

#	Action Title	Action Description	Goal(s) Addressed	Hazard(s) Addressed	Lead Entity	Support Agencies / Partners	Estimated Cost	Potential Funding Sources	Timeframe for Completion	Priority Level
59	Enhance landslide and fluvial erosion assessments	Improve identification of escarpments susceptible to landslide and fluvial erosion risk, utilizing geologic, soils, and elevation data. This activity will provide improved landslide and mass wasting risk estimates, to produce a more comprehensive view of landscape stability during extreme weather events and subsequent impacts.	3, 5	Earthquake, Flood	DEEP/ Geological Survey	USDA, NRCS	Low (under $250k)	USDA, FEMA	2 Years (from support	59
60	Enhance integrated mapping for geologic hazards	Evaluate slope failure, soil erosion potential, and escarpment identification hazards in Connecticut through integrated mapping.	3, 5	Earthquake, Flood	DEEP/ Geological Survey		Low (under $250k)	Agency Operating Budgets	1 Year	Medium

#	Action Title	Action Description	Goal(s) Addressed	Hazard(s) Addressed	Lead Entity	Support Agencies / Partners	Estimated Cost	Potential Funding Sources	Timeframe for Completion	Priority Level
61	Invasive Species Management and Mitigation	Compile a comprehensive list of both terrestrial and aquatic invasive species that pose threats to the state's ecosystems, economy, and public health. Develop protocols for early detection, rapid response, and long-term management of these species. Collaborate with relevant agencies, organizations, and experts to establish monitoring programs and implement control measures. Integrate invasive species management into the overall hazard mitigation strategy to safeguard the environment and its resilience to future threats.	3, 5	Focus is on invasive species but with applicability to most natural hazards	DEEP/ Invasive Plants Council and CT Invasive Plant Working Group		No monetary cost (staff time or in-kind resources)	Agency Operating Budgets	1-5 Years	Medium
62	Implementation Strategy for Public Act 13-15	Develop implementation strategy for Public Act 13-15, which requires consideration of the ways in which a water pollution control project mitigates the effects of sea level rise. The Act also requires that the list of priority water quality projects include the necessity and feasibility of implementing measures designed to mitigate the impact of a rise in sea level over the projected life span of such project.	3	Sea Level Rise	DEEP/ Municipal Water Pollution Control	DEEP/LWRD, OPM, DAS	No monetary cost (staff time or in-kind resources)	Agency Operating Budgets, Clean Water Fund	1-2 Years	Medium

#	Action Title	Action Description	Goal(s) Addressed	Hazard(s) Addressed	Lead Entity	Support Agencies / Partners	Estimated Cost	Potential Funding Sources	Timeframe for Completion	Priority Level
63	Improve climate-related data and policies	Convene a forum of state agencies to coordinate and evaluate gaps in policies and in climatological data, to establish priorities, and to identify strategies to secure funding for necessary enhancements.	3, 5	Drought, Extreme Cold, Extreme Heat, Flood, Sea Level Rise, Thunderstorm, Tropical Cyclone, Wildland Fire	DEEP/OCP (via GC3/SAFR Council)	DEEP/LWRD, WPC	No monetary cost (staff time or in-kind resources)	Agency Operating Budgets	1-5 Years	Medium
64	Support evacuation route planning conducted by local governments	In conjunction with Department of Transportation Formula Funding, the DESPP will support evacuation route planning.	5	All	DESPP/ DEMHS		Low (under $250k)	FHWA	1-5 Years	Medium
65	Microgrid Project Development	In partnership with FEMA develop a webinar or virtual workshop aimed at educating local governments and COGs on how to develop microgrid projects including structuring the project, permitting, and applying for grant funds.	4	Earthquake, Flood, Thunderstorm, Tornado, Tropical Cyclone, Wildland Fire, Winter Weather	DESPP/ DEMHS	FEMA	No monetary cost (staff time or in-kind resources)	Agency Operating Budgets	1-4 Years	Medium
66	Expand the offerings at the CT Conference of Municipalities	The CT Conference of Municipalities is an opportunity to reach over 300 people representing local governments and COGs. The modules offered will include: identifying a neighboring community to develop a multi-jurisdiction mitigation project with.	4	All	DESPP/ DEMHS		Low (under $250k)	Agency Operating Budgets	2-5 Years	Medium

#	Action Title	Action Description	Goal(s) Addressed	Hazard(s) Addressed	Lead Entity	Support Agencies / Partners	Estimated Cost	Potential Funding Sources	Timeframe for Completion	Priority Level
67	Workshops and Education in Neighborhood Revitalization Zones	Building on workshops previously conducted, expand the outreach and engagement of Neighborhood Revitalization Zones.	4	All	DESPP/ DEMHS		Low (under $250k)	Agency Operating Budgets	1-5 Years	Medium
68	Potential funding sources for projects that address RL and SRL properties	Through working with the CT IHMP Planning Team, develop a list of potential funding sources available on a state and federal level for natural hazards mitigation planning activities and projects with emphasis on RL and SRL properties.	5	All	DESPP/ DEMHS		No monetary cost (staff time or in-kind resources)	Agency Operating Budgets	1-5 Years	Medium

#	Action Title	Action Description	Goal(s) Addressed	Hazard(s) Addressed	Lead Entity	Support Agencies / Partners	Estimated Cost	Potential Funding Sources	Timeframe for Completion	Priority Level
69	Advanced research funding opportunities	Assist communities and state agencies to pursue funding opportunities to develop advanced research and plans in the area of natural hazards mitigation. Planning activities included under this section would be: standalone plans which can assist in enhancing existing Natural Hazards Mitigation Plans (e.g., debris management plans, evacuation and sheltering plans, hazards studies and evaluations (including recommendations) which are not part of existing approved plans). Promote comprehensive inclusion and connectivity of state, regional, and local hazard mitigation planning, to help strengthen coordination and incorporation of ideas and BMPs and avoid conflicts between various planning efforts.	3	All	DESPP/ DEMHS		No monetary cost (staff time or in-kind resources)	Agency Operating Budgets	1-5 Years	Medium

#	Action Title	Action Description	Goal(s) Addressed	Hazard(s) Addressed	Lead Entity	Support Agencies / Partners	Estimated Cost	Potential Funding Sources	Timeframe for Completion	Priority Level
70	Implement Crisis Tracker statewide	Develop a system to facilitate the rapid capture, delivery, and documentation of post-storm impacts to coastal areas by local teams and citizens in the field and develop an interactive webpage or other medium for collecting flood information from the general public or other entities. This would include photos and other types of information which would be a valuable asset in documenting impacts from natural hazards, collected through various means such as social networking. Use the latest technology, such as iPads and community GIS, to support these initiatives.	5	All	DESPP/ DEMHS		Low (under $250k)	EMPG	1-5 Years	Medium
71	Identify annual programs for funding	Through the institutionalized Silver Jackets initiative, identify at least one to two projects for funding annually in coordination with all members.	1	Flood	DESPP/ DEMHS	USACE - Silver Jackets	No monetary cost (staff time or in-kind resources)	Agency Operating Budgets	1-5 Years	Medium
72	Promote the mitigation program and the project types the program supports	This may include Zoom-based information sessions, visits to each of the 5 regions, etc.	1, 4	All	DESPP/ DEMHS/ Strategic Planning and Community Preparedness		No monetary cost (staff time or in-kind resources)	Agency Operating Budgets	1-5 Years	Medium

#	Action Title	Action Description	Goal(s) Addressed	Hazard(s) Addressed	Lead Entity	Support Agencies / Partners	Estimated Cost	Potential Funding Sources	Timeframe for Completion	Priority Level
73	Information sharing with unhoused population on natural hazards	Provide assistance to municipalities to share information about natural hazard warnings and shelter locations with the unhoused population.	4	All	DOH		No monetary cost (staff time or in-kind resources)	Agency Operating Budgets	1-5 Years	Medium
74	Annual infectious disease preparedness report	Complete annual report on infectious disease pandemic preparedness. The initial report will use the DPH COVID After Action report to examine statewide response to COVID and determine better alternatives to better ensure the protection of the state.	4, 5	Infectious Disease but with applicability to other natural hazards	DPH	DEMHS	No monetary cost (staff time or in-kind resources)	Agency Operating Budgets, Legislative Appropriation	Annually	Medium
75	Integrate public health into resilience planning and emergency response	Integrate considerations of public health into all resilience planning and emergency response. Examples of considerations include drinking water access, widespread contamination and pollution post-natural hazard event, and debris management by municipalities.	3, 5	Focus is on human health but with applicability to most natural hazards	DPH/ Drinking Water Section		No monetary cost (staff time or in-kind resources)	Agency Operating Budgets	Annually	Medium
76	Provide assistance to residents without air conditioning	Expand the State Energy Assistance program to assist individuals in paying electric bills for air conditioning during the summer.	5	Extreme Heat	DSS	DEEP	Medium ($250k-$500k)	Agency Operating Budgets	1-5 Years	Medium

#	Action Title	Action Description	Goal(s) Addressed	Hazard(s) Addressed	Lead Entity	Support Agencies / Partners	Estimated Cost	Potential Funding Sources	Timeframe for Completion	Priority Level
77	Standardize local evacuation route planning	Standardize and monitor local evacuation route planning and route vulnerability assessment throughout the state. [GC3 Recommendation]	5	All	OPM	DESPP/DEMHS, CDOT, OPM, COGs	No monetary cost (staff time or in-kind resources)	Agency Operating Budgets		Medium
78	Municipal Capacity Support	Review existing financial opportunities and develop mechanisms to build municipal capacity. Support initiatives may include: - Grant-writing support for state and federal grants - Grant management support - Support for municipal staff recruitment - Coordination for shared positions between municipalities	5	All	OPM	COGs	No monetary cost (staff time or in-kind resources)	Agency Operating Budgets	1 - 5 Years	Medium
79	Integrate CIRCA tools into local POCD updates	Develop procedure for ensuring that municipalities use CIRCA tools (CCVI, ROARs) into updates of local Plans of Conservation and Development (POCDs).	3	Extreme Heat, Flood, Sea Level Rise	UConn/CIRCA	OPM	No monetary cost (staff time or in-kind resources)	Legislative Appropriation	January 2024 - December 2028	Medium
80	Establish a resilience hub / resilience center network	Pursue funding opportunities to establish a "resilience hub"/"resilience center" network in Connecticut. Develop proposal for project implementation.	5	Dam Failure, Flood, Sea Level Rise, Thunderstorm, Tornado, Tropical Cyclone, Winter Weather, Extreme Cold, Extreme Heat, Earthquake	UConn/CIRCA	Municipalities	Low (under $250k)	NOAA Grants	January 2024 - December 2028	Medium

#	Action Title	Action Description	Goal(s) Addressed	Hazard(s) Addressed	Lead Entity	Support Agencies / Partners	Estimated Cost	Potential Funding Sources	Timeframe for Completion	Priority Level
81	Connecticut Conference on Climate Change and Insurance (C4I)	Host an annual Connecticut Conference on Climate Change and Insurance (C4I). This event focuses on forward-looking discussion of critical topics relevant to Section 312 (Conn. Gen. Stat. § 38a-23), including insurance industry investment exposure to climate change, insurer transactions with fossil fuel investors and industries contributing to large amounts of greenhouse gas emissions, local resilience finance, insurtech, climate finance, and social justice.	3, 4, 5	Drought, Extreme Cold, Extreme Heat, Flood, Sea Level Rise, Thunderstorm, Tropical Cyclone, Wildland Fire	CID		Low (under $250k)	Agency Operating Budgets, Legislative Appropriation, Private Sector Contributions/Sponsorships	1-5 Years	Low
82	Provide code enforcement assistance to municipalities	Provide monetary assistance and trainings to construction services and building inspectors in municipalities to increase awareness and compliance with state roofing requirements.	4, 5	All	CID	DAS State Building Inspector	Medium ($250k-$500k)	BRIC grant	1-5 Years	Low
83	Provide backup power to vulnerable communities during power outages	Identify and provide assistance to vulnerable and underserved communities that would benefit from backup solar power to keep medical devices running during power outages.	1	Earthquake, Flood, Thunderstorm, Tornado, Tropical Cyclone, Wildland Fire, Winter Weather	CID	CT Green Bank	Very High (Over $1M)	Pre-existing grant funding for the project?	1-5 Years	Low

#	Action Title	Action Description	Goal(s) Addressed	Hazard(s) Addressed	Lead Entity	Support Agencies / Partners	Estimated Cost	Potential Funding Sources	Timeframe for Completion	Priority Level
84	Resilience codes and standards assistance	Provide assistance for codes and standards resilience initiatives at the local level, such as enforcing energy-related codes for residential units.	5	All	CT Green Bank		Low (under $250k)	Grant money received through the Department of Energy	1-5 Years	Low
85	Outreach for historic properties	Undertake a targeted outreach of owners and stewards of historic properties to reduce the vulnerability of these assets to natural hazards.	4	All	DECD/SHPO		No monetary cost (staff time or in-kind resources)	Agency Operating Budgets	3 Years	Low
86	Energy Efficient Appliances	Promote energy conservation and efficiency for appliances such that they remain cost-effective for consumers who purchase and use them. [EO 21-3, Action #4)	4	Drought, Extreme Cold, Extreme Heat, Flood, Sea Level Rise, Thunderstorm, Tropical Cyclone, Wildland Fire	DEEP/BETP		No monetary cost (staff time or in-kind resources)	Agency Operating Budgets	1-5 Years	Low
87	Enhance identification and mapping of historic underground mining operations	Identify and map extent of historic underground mining operations in the State; assess reclamation and current land use relative to risk of land subsidence and mine collapse for the estimated 23 historic underground mining operations in Connecticut. Project deliverables will include georeferenced site maps and assessment reports, as well as a summary of current conditions and potential ground collapse hazards in these areas.	3, 5	Earthquake, Flood	DEEP/ Geological Survey	Office of the State Archeologist, SHPO	Low (under $250k)	Agency Operating Budgets	12-18 months, contingent on funding and resource	

#	Action Title	Action Description	Goal(s) Addressed	Hazard(s) Addressed	Lead Entity	Support Agencies / Partners	Estimated Cost	Potential Funding Sources	Timeframe for Completion	Priority Level
88	Support the New England Seismic Network	Support New England Seismic Network with a new technical assistance and maintenance agreement with Weston Observatory of Boston College. This will provide local expertise and rapid response to seismic events in CT.	5	Earthquake	DEEP/ Geological Survey		Low (under $250k)	NESEC	5 Years	Low
89	Bedrock fracture mapping	Bedrock fracture mapping in the Plainfield and Danielson area to better characterize the subsurface nature of the geology in the area of recent Eastern CT seismic swarm.	3, 5	Earthquake	DEEP/ Geological Survey		Low (under $250k)	USGS National Cooperative, Geologic Mapping Program, NEHRP	1 Year (from onset of funding)	Low
90	Depth of unconsolidated materials mapping	Depth of unconsolidated materials mapping from LIDAR digital elevation models (depth to bedrock)	3, 5	Earthquake	DEEP/ Geological Survey		Low (under $250k)	FEMA, USGS, NESEC	3 Years (from onset of funding)	Low
91	Update links to FEMA publications on CT DEEP's flood management webpage	Create a literature review of various FEMA publications to be placed on CT DEEP's flood management webpage. Include a short description of the publication and a direct link for convenient downloading of the document.	4	Flood, Sea Level Rise	DEEP/LWRD	FEMA, DESPP/DEMHS	No monetary cost (staff time or in-kind resources)	Agency Operating Budgets	3-5 Years	Low
92	Increase number of energy audits	Increase the number of energy audits provided to residential homes in the state and provide funding to address issues found during the audit.	1, 3	Extreme Cold, Extreme Heat	DEEP/OCP	CT Green Bank	Low (under $250k)	Pre-existing grant funding for DEEP	1-5 Years	Low

#	Action Title	Action Description	Goal(s) Addressed	Hazard(s) Addressed	Lead Entity	Support Agencies / Partners	Estimated Cost	Potential Funding Sources	Timeframe for Completion	Priority Level
93	Compile and combine plans that included independent climate change assessments	Compile recent plans that include independent climate change assessments (State Water Plan [Water Planning Council] and Drinking Water Vulnerability Assessment and Resiliency Plan [CIRCA/UConn/CT DPH/CT Green Bank/DEEP] and then use the combined resources to support the action items within those plans.	3, 5	Drought, Extreme Cold, Extreme Heat, Flood, Sea Level Rise, Thunderstorm, Tropical Cyclone, Wildland Fire	DEEP/OCP (via GC3/SAFR Council)	DPH/Drinking Water Section	No monetary cost (staff time or in-kind resources)	Agency Operating Budgets	1-2 Years	Low
94	Funding source repository	Populate a framework and process for identifying and procuring funding for hazard mitigation and recovery funding from state and federal sources for local, regional, or state actions.	5	All	DEEP/OCP (via GC3/SAFR Council)	LTR Committee	No monetary cost (staff time or in-kind resources)	Agency Operating Budgets	1 Year	Low
95	Earthquake education and awareness campaign	Develop an awareness campaign targeting elected officials, COGs, and local governments about the history of earthquakes in the state and ways to mitigate the risk beyond safe building practices. The campaign will include a map detailing historical earthquake locations. Mitigation measures to convey include drop, cover, hold drills and securing heavy objects.	4	Earthquake	DESPP/ DEMHS		No monetary cost (staff time or in-kind resources)	Agency Operating Budgets	1-5 Years	Low

#	Action Title	Action Description	Goal(s) Addressed	Hazard(s) Addressed	Lead Entity	Support Agencies / Partners	Estimated Cost	Potential Funding Sources	Timeframe for Completion	Priority Level
96	Grant Development	Education regarding collecting data for a grant application and assembling the application. Outreach to local government staff including planners. Include information about data collection post disaster for future BCA analysis.	1, 4, 5	All	DESPP/ DEMHS		No monetary cost (staff time or in-kind resources)	Agency Operating Budgets	1-5 Years	Low
97	Coastal flooding awareness for municipal officials	Develop and implement a Silver Jackets Project to address coastal flooding awareness for Municipal Officials, residents, and business owners.	4	Flood	DESPP/ DEMHS		Low (under $250k)	USACE Silver Jackets	1-5 Years	Low
98	Replace hurricane evacuation signage	Replace hurricane evacuation signage along the coast. The current signs were installed in 1994 and are almost 30 years old.	1	Tropical Cyclone	DESPP/ DEMHS	USGS	Low (under $250k)	Agency Operating Budgets	1-5 Years	Low
99	Integrate agricultural operations into local risk assessments and hazard mitigation plans	Encourage local hazard mitigation plans to consider continuity of agricultural operations during and following hazard events.	3	Drought, Extreme Cold, Extreme Heat, Flood, Winter Storm,	DESPP/ DEMHS		No monetary cost (staff time or in-kind resources)	Agency Operating Budgets	1-5 Years	Low

#	Action Title	Action Description	Goal(s) Addressed	Hazard(s) Addressed	Lead Entity	Support Agencies / Partners	Estimated Cost	Potential Funding Sources	Timeframe for Completion	Priority Level
100	Engagement on agricultural resiliency	Engage stakeholders on what is needed to ensure working lands and soils in Connecticut continue to be resilient to the impacts of climate change and to maximize their potential to sequester and store carbon in support of state's emissions reduction goals. The engagement will include streamlining protection of working lands, enhancing renewable energy and energy efficiency programs available to farms, and partnering with state and federal agencies to improve soil health. [EO 21-3, Action #21)	3, 5	Drought, Extreme Cold, Extreme Heat, Flood, Winter Storm,	DoAg/ADRP	COGs, Working Lands Alliance	No monetary cost (staff time or in-kind resources)	Agency Operating Budgets	6 months, then annually thereafter	Low
101	Extend Resilient Connecticut 2.0	Extend Resilient Connecticut 2.0 to the NECCOG and NHCOG planning regions, with scope TBD.	1, 3, 5	Flood, Extreme Heat	UConn/CIRCA	Municipalities	High ($500k - $1M)	Legislative Appropriation, FEMA HMA Grants (HMGP, FMA, BRIC)	July 2024 - June 2026	Low

7 | Plan Implementation

This chapter describes the implementation plan, identifies available programs and resources to support implementation, and outlines procedures for maintaining the NHMP as a living document.

7.1 Distribution

After the 2023 NHMP's adoption, it will be posted on the Connecticut Division of Emergency Management and Homeland Security (DEMHS) website (Hazard Mitigation (ct.gov)) and announced on the state's social media pages. Notices of its availability will be distributed to the following groups:

- State agencies and stakeholder groups
- SHMPT, and
- Citizens who participated in surveys and provided contact information.

7.2 Plan Implementation

Plan implementation will be accomplished by designing strategies for implementation, establishing timelines for priority mitigation actions, and by continuing to monitor, evaluate, update, and develop actions as new information becomes available. The most essential outcome of this plan is the effective implementation of the specific mitigation actions that will ensure the State can achieve the plan's strategic goals and overall purpose. The Connecticut DEMHS mitigation program staff will be tasked with general monitoring and reporting on plan implementation, with other state lead agencies and stakeholder groups assigned to proposed mitigation actions taking responsibility for carrying out and tracking progress on mitigation actions.

The **Mitigation Strategy Chapter** has specific implementation details for each action proposed in the plan. The actions outlined in the NHMP have been assigned to specific State or stakeholder groups, whose responsibility is to determine additional implementation needs beyond what it listed in the plan. Each action is measurable and has been created with a timeline in mind, making these actions the most useful indicators for tracking plan implementation progress.

7.2.1 Monitoring Implementation

A Mitigation Action Tracker spreadsheet was created for tracking implementation of all new and "carry over" mitigation actions. This tool provides all participants involved in implementation with a simple and easy-to-use tracking and reporting mechanism. The tool also assists with maintaining organization as staff changes inevitably occur. Specific annual reporting and update targets have been established with due dates in the maintenance schedule which follows in **section 7.3.1.4**.

The mitigation staff, or action leads, will maintain the Mitigation Actions Tracker spreadsheet that has been developed in accordance with this plan. Primary responsibility for this task will reside with the State Hazard Mitigation Officer (SHMO), within DEMHS. Actions will be tracked and updated twice per year as outlined in Table 217.

In addition to tracking progress on mitigation actions, other major aspects of tracking during the five-year plan implementation cycle following plan approval will include:

- Continued development of protocol for local data input.
- Inclusion of local mitigation plan databases from local Risk Assessments, capability assessments, and local priority mitigation strategies.
- Expansion of state hazard historical data.
- Refinement of state agency facility inventories and critical facilities data.

These items will be addressed annually, and data stored for easy access and use during subsequent updates.

7.2.2 Plan Integration

The Connecticut NHMP serves as the State's primary risk assessment and risk reduction strategy document for natural hazards. This document is used as a reference document for state agencies and stakeholders to integrate into their own plans, policies, assessments, and strategies. Plan integration will be encouraged by the Office of the Governor, CT DEEP, CT DEMHS, and other members of the SHMPT as applicable. Plan integration will also be a discussion topic during regularly scheduled plan reviews.

7.3 Plan Maintenance

The State Hazard Mitigation Planning Team (SHMPT) was expanded and enhanced since the 2018 plan update to support development of the NHMP due to changes in disaster-related activity throughout the state and capabilities as outlined in the **Capability Assessment Chapter**. While planning committees are generally limited to twenty participants or less, the State broadened the number of stakeholders to include all who

participated by attending SHMPT meetings, sponsoring projects, providing information, and reviewing the NHMP draft. State staff emphasized participation in the manner that was appropriate for each agency and organization.

To develop the 2023 plan mitigation strategies, a sub-group structure was used to encourage departments and other entities not traditionally engaged in implementation to develop actions for their specific organizations.

Standing, ad-hoc Mitigation Sub-Committees will be convened, surveyed, or engaged periodically as necessary during the 2023–2028 plan implementation cycle. These sub-committees will be responsible for:

- Mitigation of structures.
- Planning, policy, legislation, and funding.
- Education and outreach.
- Risk assessment and data.

The Connecticut DEMHS mitigation program staff, in consultation with key state agencies, federal partners, and organizations will direct implementation of the plan. DEMHS serves as the lead coordinating agency for emergency management in Connecticut, and thus will lead the mitigation planning effort, including plan maintenance. DEMHS will track projects identified in both the State Hazard Mitigation plan and in local plans.

The planning process timeline will be revised continually during the next five years to ensure that the next plan revision will be prepared and submitted to FEMA within the required five-year period. Special emphasis will be given to increased participation by businesses and special interest groups. State or federal legislative, regulatory, or rule changes or additions that occur during the period following approval of the 2023 plan will be integrated into the 2028 plan update.

Should a specific plan element or section require revision or amendment prior to the subsequent plan revision due to state or federal legislation, policy change, or a declaration of major disaster, DEMHS staff will meet with all appropriate stakeholders and propose the change or addendum to FEMA as quickly as practicable.

7.3.1 Method and Schedule

7.3.1.1 Annual Plan Review

The Connecticut DEMHS will coordinate an annual meeting of the SHMPT to complete an annual plan review. This annual review will evaluate progress made on actions included in the hazard mitigation strategy, and review and potentially amend the NHMP to reflect significant changes that took place during the preceding year. This annual review will occur in September and will be attended by the SHMPT. At the meeting, the SHMO, or

responsible designee, will be responsible for leading the annual review meeting, including evaluating implementation or mitigation projects and activities, and plan effectiveness. Each member of the SHMPT responsible for actions in the NHMP will report on progress at the meetings. In addition to monitoring projects, the following five measures of plan success will be reviewed at each of the meetings:

1. Number of activities underway.
2. Number of activities complete.
3. Does recent disaster activity reflect accuracy of the Hazard Identification Risk Assessment?
4. Have there been losses avoided because of implementation measures?
5. Have other state level plans or programs used, reference, or integrated the state mitigation plan?

The SHMO will prepare a summary report, in addition to the updated action tracker addressing each of the five measures following each meeting. The reports will be "rolled up" into the annual progress reports to FEMA.

If determined necessary, the SHMPT may amend the NHMP to reflect significant changes in information. Revisions may include updates to available data or conclusions made in the **Risk Assessment**, **Capability Assessment**, or this chapter. If changes are not urgent, they may be documented and recommended for the next 5-year plan update process.

7.3.1.2 Post-Disaster Review

The SHMPT and other stakeholders will review the NHMP after every Presidential Disaster Declaration that impacts Connecticut. The review will focus on specific hazard mitigation needs and opportunities related to the disaster-impacted area. This review will be important for assessing new hazard mitigation actions for the State that may change in priority level following the damage from the disaster. This post-disaster review may replace an annual plan review in any year that a major disaster occurs if so determined by the State.

7.3.1.3 Five-Year Plan Review and Update

At least once every 5 years, the NHMP will undergo a comprehensive review and update process and be re-adopted as required by federal regulations for state hazard mitigation plans. The plan update process will be led by CT DEMHS. CT DEMHS will manage the administrative details of the NHMP update process, including contracting with outside consultants, coordination with FEMA, and plan submission.

The plan will be revised in 2028 to reflect changes in development, progress in statewide mitigation actions, and new Executive Orders that may relate to the plan. The plan update will also incorporate information learned from implementing the 2023 plan and

experiences of the state agencies and stakeholders involved in assessing and responding to natural hazard vulnerability.

The 2023 NHMP hazard mitigation goals will be evaluated by determining how many actions were listed as being in support of each goal, followed by the number of each goals' actions that were "completed" or "started." This will allow for a percentage of action achievement to be determined for each goal.

7.3.1.4 Schedule for Plan Maintenance, Implementation, and Revision

The monitoring, maintenance and implementation approach outlined above will be conducted in accordance with the schedule in Table 217. The 60-month timeline serves as the framework to ensure that the 2028 plan revision can be prepared and submitted to FEMA within the required five-year period. Funding sources for the update process will be investigated and secured six months prior to the scheduled start of the process to allow for ample data collection and interagency coordination.

As highlighted in the table, the SHMPT will meet semi-annually to discuss plan implementation, changes in the plan, and progress on strategies and projects. The SHMPT meeting will also be used as a forum to discuss changes to the update process, committee members, what works well, what should be changed, and to assess the system (FEMA state plan review tool) used to evaluate the NHMP for FEMA compliance. At the start of the update, and throughout the implementation, ample time will be needed and allowed for the continued data collection for the vulnerability assessment, relying on information from local plans and new ongoing research (such as climate changes and sea level rise analysis).

Table 217. Schedule for Plan Monitoring, Maintenance, Implementation, and Revision

Task	Responsibility	Time Frame
Refine Planning Process and timeline for 2028 plan development	DEMHS Mitigation Staff	Ongoing
Collect and store expanded facilities, local plan risk data, and historical disaster data	Risk Assessment Sub-Committee	Ongoing with Quarterly Summaries beginning March 2024
Update Mitigation Action Tracker	Project Leads	Quarterly beginning March 2024
Review Action Tracker as a Team	SHMPT	Twice annually
Report Progress to FEMA Region I	SHMO	Annually

Task	Responsibility	Time Frame
Consolidate list of known local plan implementation actions	DEMHS Mitigation Staff	Annually beginning
Convene the SHMPT or discuss plan implementation, the submittal of additional mitigation activities, and to lay the groundwork for future Risk Assessment, Vulnerability Assessment and strategy changes to the State Plan	DEMHS Mitigation Staff	Twice annually
Evaluate progress on mitigation strategies and actions	DEMHS Mitigation Staff Strategy & Project Sponsors	Twice annually
Upload Local Plan Updates	DEMHS Mitigation Staff	Annually
Provide brief implementation progress report to FEMA Region I	DEMHS Mitigation Staff	Annually
Initiate Revision Process for 2023 Plan	DEMHS Mitigation Staff	September 1, 2024
Review current regulatory requirements for plan revision	DEMHS Mitigation Staff	September 1, 2024
Submit new Revised All-Hazard Mitigation Plan to FEMA	SHMO	6-12 months prior to NHMP's expiration date

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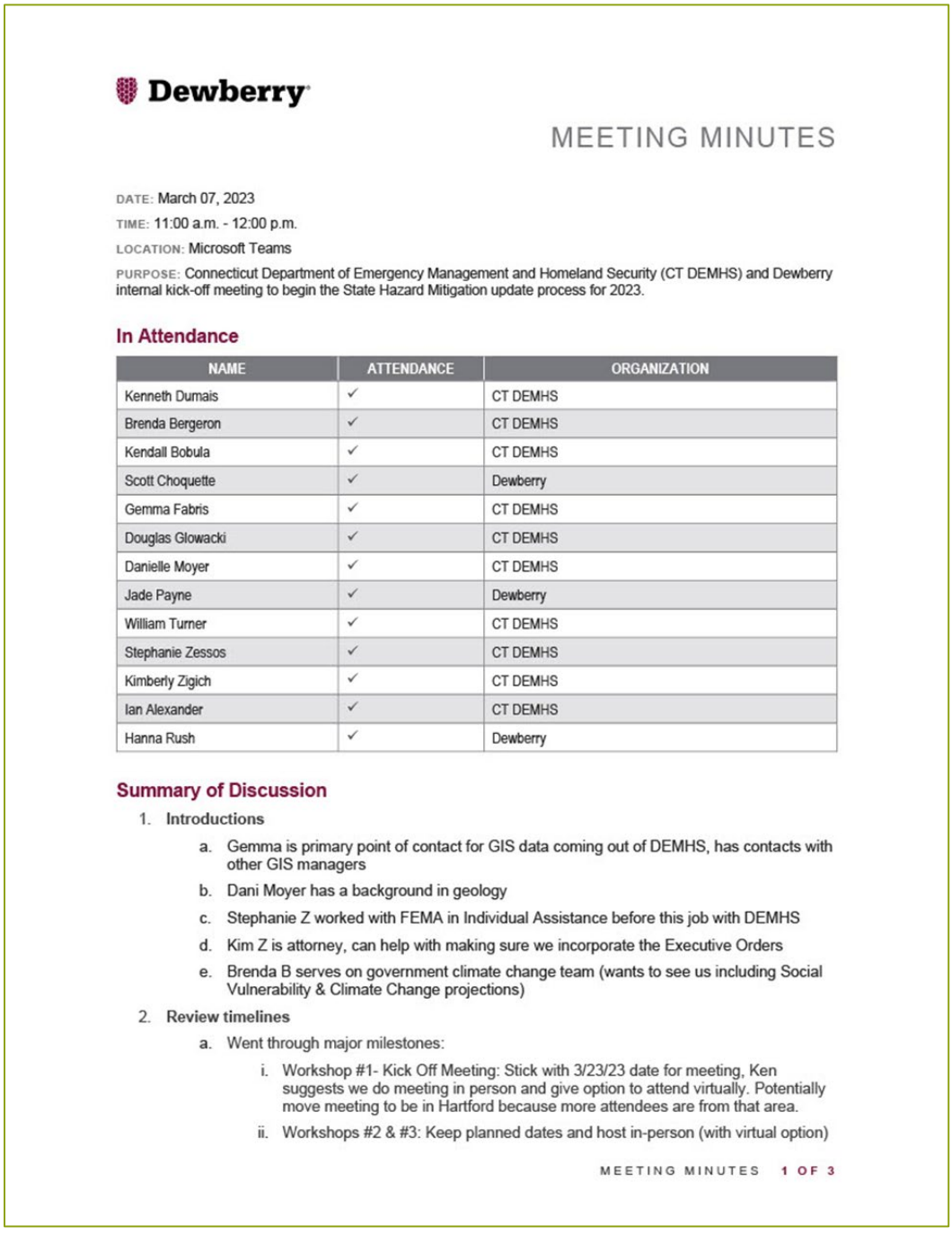
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1 | Planning Process Appendix

1.1 Core Planning Team Kickoff

1.1.1 Notes & Attendance



Dewberry

MEETING MINUTES

DATE: March 07, 2023

TIME: 11:00 a.m. - 12:00 p.m.

LOCATION: Microsoft Teams

PURPOSE: Connecticut Department of Emergency Management and Homeland Security (CT DEMHS) and Dewberry internal kick-off meeting to begin the State Hazard Mitigation update process for 2023.

In Attendance

NAME	ATTENDANCE	ORGANIZATION
Kenneth Dumais	✓	CT DEMHS
Brenda Bergeron	✓	CT DEMHS
Kendall Bobula	✓	CT DEMHS
Scott Choquette	✓	Dewberry
Gemma Fabris	✓	CT DEMHS
Douglas Glowacki	✓	CT DEMHS
Danielle Moyer	✓	CT DEMHS
Jade Payne	✓	Dewberry
William Turner	✓	CT DEMHS
Stephanie Zessos	✓	CT DEMHS
Kimberly Zigich	✓	CT DEMHS
Ian Alexander	✓	CT DEMHS
Hanna Rush	✓	Dewberry

Summary of Discussion

1. **Introductions**
    a. Gemma is primary point of contact for GIS data coming out of DEMHS, has contacts with other GIS managers
    b. Dani Moyer has a background in geology
    c. Stephanie Z worked with FEMA in Individual Assistance before this job with DEMHS
    d. Kim Z is attorney, can help with making sure we incorporate the Executive Orders
    e. Brenda B serves on government climate change team (wants to see us including Social Vulnerability & Climate Change projections)
2. **Review timelines**
    a. Went through major milestones:
        i. Workshop #1- Kick Off Meeting: Stick with 3/23/23 date for meeting, Ken suggests we do meeting in person and give option to attend virtually. Potentially move meeting to be in Hartford because more attendees are from that area.
        ii. Workshops #2 & #3: Keep planned dates and host in-person (with virtual option)

MEETING MINUTES 1 OF 3

iii. Ken will confirm the December 10th deadline for submitting to FEMA. The date may actually be December 18th.

b. Ken: The FEMA Mitigation Planner is onboard with this schedule. The team at FEMA may be able to do some reviews of sections as they are written to make the review process go quicker.

c. Dewberry will give monthly progress report with the invoices to help with CT's quarterly updates to FEMA for grant funding.

3. **Revise previous plan participant lists**
   a. Scott: Make sure Emily Pisch & her staff are invited to meetings
   b. Ken's suggestions for additional invites to workshops: Graham Stephens from DEEP, Rebecca French is now with DEEP, Eric Lindquist is now with DPH, John Trazinski at CIRCA, Dave at CIRCA
   c. Brenda's suggestion: Laurie Matthew, Drought Working Group (Martin Heft)
   d. Jade will send all 3 workshop attendee/invite lists over to Ken for review and add any more people they want to include
   e. Additional names (from meeting chat) to include on workshop invite list:
      i. Scott Gaul
      ii. Alfredo GIS Lead
      iii. Bryan Gran
      iv. CISA (critical infrastructure data, both private and governmental), could help with EO 10,11,13
      v. OPM GIS office
      vi. SHPO
      vii. Lori Mathieu at DPH
      viii. Martin Heft OPM for Drought Working Group Lead
      ix. The current REPT ESF 14 recovery working group leads (that's why Bill Richards for example was on there)

4. **Review data needs list**
   a. Ken: FEMA Repetitive Loss properties have been very difficult to get so far, should loop Diane into that conversation when asking for properties
   b. State-owned buildings/facilities GIS data is owned by OPM
      i. Kendall: Lists of state real property and state-owned buildings are posted here: https://data.ct.gov/Government/State-Real-Property/meyk-xprb and here: https://data.ct.gov/Government/State-Owned-Buildings/6htq-gj2r.
         1. Both are maintained by OPM but are not geocoded based on how they are collected (OPM manually coded many of them last year but it's not an official layer).
      ii. Gemma: will have internal discussion about how to handle state-owned buildings because some of that information can't be shared publicly
         1. Need to know what we're considering as "critical" for critical state-owned facilities

c. Ken: Not all critical facilities may not be able to be shared with the general public, need to decide what we don't want to share/how to present the data in a way that will keep details private

d. For statistical purposes, COGs have been counted as county equivalents, so aggregation may need to happen at COG boundaries and not county boundaries

e. Jade will send over updated data request form with workshop invitee lists

5. **Anticipated major changes to HMP**

   a. Ken: agrees with adding extreme temperature hazard

   b. Ken: In house, will be integrating human caused hazards into their HIRA for accreditation

   c. New FEMA tool to potentially use for HIRA, RAPT: Resilience Adaptation Planning Tool

   d. CIRCA has done climate change vulnerability index for the whole state, which provides a ton of data to use

      i. Kendall: Couldn't ascertain exactly what was included/ how it was weighted for CIRCA SVI mapping, but hopefully you can work with Yaprack to parse that out as much as you need for this project.

   e. Ken's notes on Executive Orders:

      i. 5: Resilient state buildings

      ii. 9: CT resilience

      iii. 10: Stormwater resilience & resilience boards

   f. Brenda: DEMHS has a requirement from the EO to create a list of statewide critical infrastructure, Kim Z can talk with us about that requirement

   g. Ken: These Plans are so big, is there any way to make sure there's easier access to specific sections?

      i. Scott: We can create a dashboard to track mitigation actions

      ii. Doug: Potentially create a dashboard for the entire plan (did this for a statewide floodplain plan)

      iii. Ian: Took mitigation actions tables in mitigation plan and turned it into an excel workbook and was able to update as time went on

   h. Ken: Should we create a Teams site where we can share data and communicate?

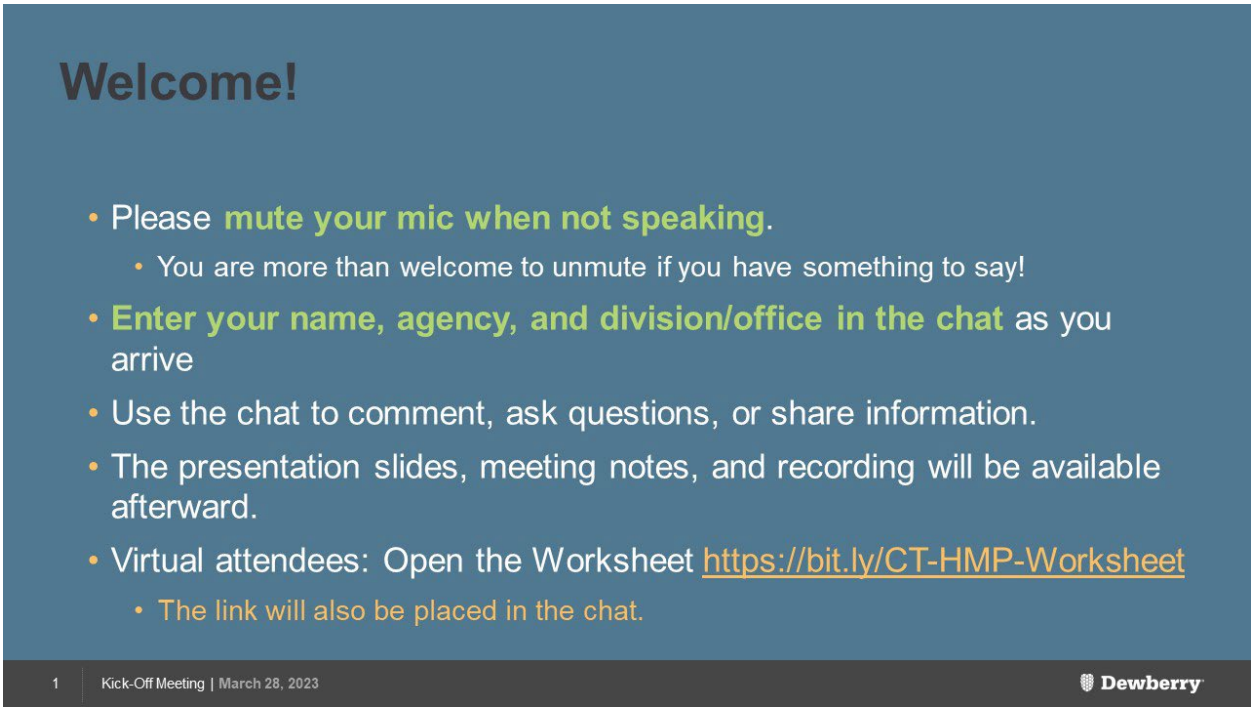
Action Items

ACTION ITEM	ASSIGNED TO	DATE DUE	STATUS
Send previous plan participants list to CT DEMHS for verification/updates to create current plan participants list	Jade Payne	3/8/23	Open
Send Workshop #1 invitations	Jade Payne	3/13/23	Open
Create Microsoft Teams shared channel for CT DEMHS and Dewberry communications & data sharing	Jade Payne	3/13/23	Open

We believe the foregoing record to be an accurate summary of the meeting and related decisions. We would appreciate notification of exceptions or corrections to these Minutes within five (5) days of receipt. Without notification, we will consider these minutes to be a record of fact.

1.2 Hazard Mitigation Planning Team Kickoff

1.2.1 Presentation



Dewberry

Connecticut Natural Hazard Mitigation Plan 2023 Update

Kick-Off Meeting

March 28, 2023 | 1:00 – 3:00 PM

Introductions

Core Planning Team - DEMHS

- Ken Dumais, State Hazard Mitigation Officer
- Gemma Fabris, DESPP/DEMHS
- Ian Alexander, DESPP/DEMHS
- Danielle Moyer, DESPP/DEMHS
- Kendall Bobula, DESPP/DEMHS
- Brenda Bergeron, DESPP/DEMHS
- William Turner, DESPP/DEMHS
- Stephanie Zessos, DESPP/DEMHS
- Douglas Glowacki, DESPP/DEMHS
- Kimberly Zigich, DESPP/DEMHS
- Diane Ifkovic, NFIP State Coordinator
- Karen Michaels, DEEP

Dewberry Team

- Scott Choquette, Project Manager
- Jade Payne, Deputy Project Manager & Resilience Planner
- Hanna Rush, Plan Development Lead & GIS Analyst
- Ashley Gordon, HIRA Lead & Resilience Planner
- Emily Mills, Resilience Planner
- Jamie Caplan, Jamie Caplan Consulting
- & others

Hazard Mitigation Planning Team (HMPT)

- Everyone on the call!

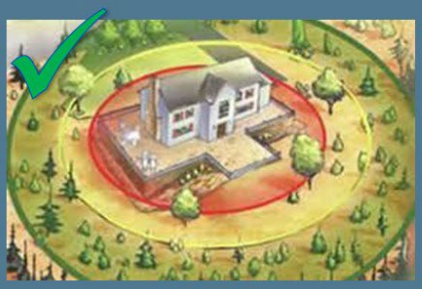
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AGENDA
• Plan Update Process Overview
• Updating the HIRA
• Evaluating 2019 HMP
• Breakout groups
• Next Steps
4
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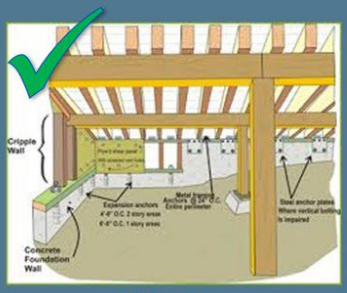

Hazard Mitigation Plan Update
Overview
5
Kick-Off Meeting | March 28, 2023
Dewberry

What is hazard mitigation?

Any **sustained action** taken to reduce or eliminate long-term risk to human life, infrastructure, and the environment from hazards.



Mitigation
Defensible Space for Wildfire Mitigation



Mitigation
Earthquake Retrofit



Preparedness & Response
purchase of a police command vehicle

A Hazard Mitigation Plan…



- Identifies risks and solutions in a pre-disaster environment
- Reduces the need to respond (lessens resource burden)
- Supports decision-making
- Makes the state more disaster resilient
- Promotes data sharing between different levels of government and academia.
- Creates eligibility for pre- and post-disaster mitigation funds from FEMA.
- Should be incorporated into other existing planning mechanisms.

A Hazard Mitigation Plan is Not…

A regulatory document

It does not create new steadfast "rules"

A binding commitment

Not everything in it will get done

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Planning Process

Integrating Best Practices



Coordinate & Collect Data

State Critical Facilities
CCVI 2.0 Data
Social Vulnerability



Analyze Capabilities

Policies & Programs
Executive Order
Local HMP Integration



Assess Risks

Climate & Hazard Data
Social Vulnerability
Local HMP Integration



Develop Mitigation Strategy

Mitigation Actions
Plan Integration
Equity



Decide Implementation Procedures

Public Involvement
Plan Integration
Priority Actions



Review & Adopt Plan

Public Involvement
FEMA Review



Public & Stakeholder Outreach

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Outreach Strategy



Project Milestones

We are here

Pre-Planning	Kickoff Meeting	Risk & Capability Assessments	Results & Strategy Workshop	Draft Review	Final Review
• 2019 plan review • Initial research and online data collection	• Data collection • Outreach website • Compile stakeholder list	• Public survey • Capability assessment • Hazard ID & risk assessment	• Goals & objectives • Mitigation strategy • 1st public meeting	• Plan maintenance procedures • Draft HMP • 2nd public meeting	• FEMA review • State adoption

Planning Process
Participant Expectations



Dewberry Team	Core Planning Team	HMPT	Stakeholders
• Facilitate the process • Provide technical expertise and consultation • Do the heavy lifting	• Key decision-makers • Participate in Hazard Mitigation Planning Team (HMPT)	• Choose actions • Provide input, information, and feedback • Attend 3 HMPT meetings & 1-2 virtual agency meetings	• Respond to surveys, review HMP, attend public meetings, provide input • Ex: FEMA Region 1, COGs, other state/federal agencies

Guiding Regulations & Documents

- **Disaster Mitigation Act of 2000** – requirements and procedures to implement hazard mitigation planning to receive certain types of non-emergency disaster assistance
  - Grants with HMP eligibility requirements: BRIC, HMGP, HMGP Post Fire, FMA, PDM, PA, FMAG, Rehabilitation of HHPD program
- **FEMA State Mitigation Planning Policy Guide** (April 19, 2023)
- HMA Program & Policy Guide (March 2023)
- CT Executive Orders (No. 3, No. 21-3) & Public Act No. 21-115 – An Act Concerning Climate Change Adaptation
- Other CT plans, policies, & programs

Plan Update Requirements

Per 2022 FEMA State Mitigation Planning Policy Guide

Reflect changes in development:

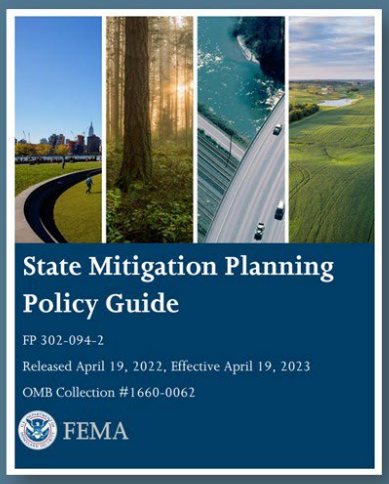
- Increases or decreases in hazard vulnerability, changes in social vulnerability, changes in capabilities
- New construction, planned development
- Climate change, population changes, policy/regulatory changes

Reflect changes in participants in the planning process:

- Involves a broad range of state and other partners
- Includes community lifelines, climate change experts, & agencies that support underserved communities

Include & describe related program requirements:

- Building codes, land use, NFIP/flood risk mapping
- HHPD grant program & FMAG program



Executive Order 21-3

Worksheet Q1



*Document updates on **Participant Worksheet***

- Action 1 – Improve the resilience of the state's energy sector to extreme weather events (**DEEP**)
- Action 2: – Consider impacts of climate change in building codes, consult resilience experts, consider best-available resilience standards, train code officials, etc. (**DAS**)
- Action 5 – Ensure state buildings are capable of withstanding wind and flood risks (**DAS**)
- Action 9 – Establish a Connecticut Community Climate Resilience program (**DEEP**)
- Action 10 – Work with partners, including UConn, to help municipalities and COGs implement climate resilience actions (**DEEP**)

Executive Order 21-3

Worksheet Q1



*Document updates on **Participant Worksheet***

- Action 11 – Assess the vulnerability of state government assets and operations to the impacts of climate change and create a list of priority assets and infrastructure for climate resilience projects for each agency (**OPM, DAS, DEEP, DESPP**)
- Action 12 -- Update the design criteria for stormwater management systems (DEEP) and identify culverts that need to be repaired or replaced (**DOT**)
- Action 13 – Maintain a list of state and local critical facilities (**OPM, DAS, DEEP, DESPP**)
- Action 14 – Ensure working lands and soils in Connecticut continue to be resilient to the impacts of climate change (**DAG**)
- Action 22 – Develop guidance for state agencies to use nature-based solutions (**DEEP**) and utilize this guidance for capital project planning and design (**all agencies**)

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Hazard ID & Risk Assessment

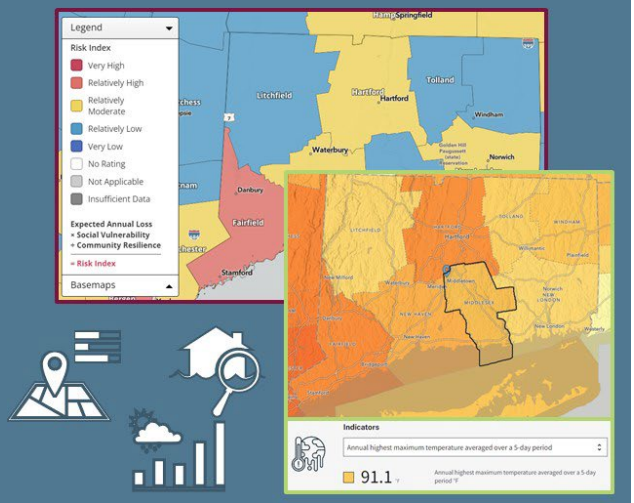
Overview

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Hazard ID & Risk Assessment

Overview

- **Purpose:** Provides a factual basis for prioritizing hazard mitigation activities
- **Steps:**
  1. Identify and describe hazards
  2. Identify assets
  3. Assess risk
  4. Summarize vulnerability



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Hazard ID & Risk Assessment
Components

- Hazard Ranking
- Hazard Profiles
- Climate Change Impacts
- Hazard History (Locations, Extents, Occurrences)
- Vulnerability, Exposure, and Loss Estimations
- Probability of Future Events
- Potential Impacts
- Integration of Local Hazard Mitigation Plans

Hazard ID & Risk Assessment
Data Highlights



- Hazus MH v6.0 (just released!)
- State owned/operated facilities & assets
- CIRCA CCVI
- CDC SVI 2020
- NCEI Storm Events Database
- IPCC 6th Assessment Report
- U.S. Climate Mapping for Resilience & Adaptation (CMRA)
- FEMA National Risk Index
- EPA Environmental Justice Tool

Hazard ID & Risk Assessment

Data Needs — Worksheet Q2 & Q3

- **State-owned or -operated critical facilities/assets**
- **Repetitive Loss/Severe Repetitive Loss Properties data**
- State-Owned dam inundation zones
- Hazard-specific data – areas at risk from natural hazards
- Data discrepancies from previous HMP – what can be improved?
- Hazard history – costs & impacts
  - e.g., repairs, NFIP claims, grants issued
- Pictures & videos of hazards, damages, and mitigation projects

https://bit.ly/CT-HMP-Worksheet

2019 Natural Hazard Rankings

County	Dam Failure Hazard Ranking	Drought Hazard Ranking	Earthquake Hazard Ranking	Flood Hazard Ranking	Sea Level Rise Hazard Ranking	Thunderstorm Hazard Ranking	Tornado Hazard Ranking	Tropical Cyclone Hazard Ranking	Wildland Fire Hazard Ranking	Winter Weather Hazard Ranking
Fairfield	Medium	Medium-Low	Medium	High	Medium-High	High	High	Medium-High	Medium-Low	High
Hartford	Medium-Low	Medium	Medium	High	Medium-Low	High	High	Medium-High	Low	High
Litchfield	Low	Medium	Medium-Low	Medium-High	Low	High	Medium-High	Medium	Medium-Low	Medium-High
Middlesex	Low	Medium-Low	Medium-Low	Medium	Medium-High	Medium	Medium	Medium-High	Medium-Low	Medium
New Haven	Medium-Low	Medium-Low	Medium	Medium-High	High	High	Medium-High	Medium-High	Medium-Low	High
New London	Low	Medium-Low	Medium-Low	Medium-High	Medium-High	Medium-High	Low	Medium-High	Medium-Low	Medium
Tolland	Low	Medium	Medium-Low	Medium	Low	Medium	Medium-Low	Medium	Medium-Low	High
Windham	Low	Medium	Low	Medium	Low	Medium	Medium-Low	Medium	Medium-Low	Medium-High

Changes in hazard concern rating or new hazard additions?

Discussion

Hazard Ranking Priority

Local Hazard Mitigation Plan Incorporation

- Survey of plans
  - Hazard identification terminology
  - Vulnerability and risk assessment methodologies & results
  - Types of mitigation actions
- Incorporate ranking and loss estimates into state HMP hazard risk rankings
- Include actions in state mitigation strategy based on local needs

Evaluating 2019 HMP

& Mitigation Strategy Discussion

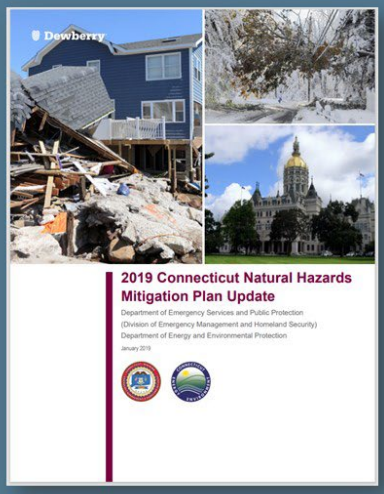
2019 HMP Improvements

Worksheet Q4, Q5, & Q6

Discussion

*Document comments on **Participant Worksheet***

- What do you like about the current HMP?
- What do you want to see changed?
- What are your current priorities?
- How can we make the HMP more useful?
- Notable out-of-date information?
- What plans/programs/funding opportunities should we integrate?



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Mitigation Goals & Objective Development

Potential Changes

2019 Goals

1. Promote implementation of sound floodplain management and other natural hazard mitigation principles on a state and local level
2. Implementation of effective natural hazard mitigation projects on a state and local level
3. Increase research and planning activities for the mitigation of natural hazards on a state and local level

+ Executive Orders & State Priorities

+ 2023 FEMA Mitigation Planning Guidance

Strategic Categories

- Encourage Local Physical Projects
- Capability and Capacity Building
- Public Awareness and Education
- Forward-Looking Policy and Planning

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Mitigation Strategy

What do you want CT to focus on?

- Integrate actions from related state plans, studies, and reports
- Emphasize future conditions in the STAPLE/E activity prioritization method
  - Climate projections, social vulnerability, community lifelines, and future development
- **Start thinking about what actions you want to see happen over the next 5 years**



Break

Please return in 10 minutes

Agency Breakout Groups Activity!

- **Task**: Review 2019 mitigation activities & provide status updates
- If the status is unknown, provide contact information for who can provide update.

Table 5-1: Recommended Hazard Mitigation Activities, 2019-2024

Activity #	Goal/Strategy	Activity Description	Lead Agency	Support Agencies	Estimated Cost*	Potential Funding Sources	Timeframe for Completion	Hazard(s) to be Addressed											Priority Level
								Tropical Cyclone	Tornado	Thunderstorm	Winter Storm	Flood	Dam Failure	Wildland Fire	Drought	Earthquake	Climate Change		
1	1.1	Review model ordinances and samples of higher standards language that communities can adopt into existing floodplain ordinances and building codes.	DEEP - Land and Water Resources Division / DCS	COGs	Staff time	Agency Operating Budgets	Evaluate annually					X					X		High
2	1.1	Conduct technical transfer and training associated with current extreme rainfall data.	USDA / Natural Resources Conservation Service		Staff time	Agency Operating Budgets	1-2 years					X	X				X		Low
3	1.1	Conduct technical transfer and training associated with available LiDAR data.	USDA / Natural Resources Conservation Service	DEEP / LWRD	Staff time	Agency Operating Budgets	1-2 years					X							Low
4	1.1	Encourage municipalities to adopt local water use restriction ordinances to ensure that proper water conservation measures are implemented during periods of severe to extreme drought and other water emergencies, in line with the Connecticut Drought Preparedness and Response Plan. Expand the local focus on drinking water vulnerability, with a particular emphasis on private wells.	DPH / Drinking Water Section	Water Planning Council / COGs	Staff time; minimal expense for outreach materials	Agency Operating Budgets	During onset of drought conditions								X				High
5	1.1	Launch an outreach campaign to promote FEMA's Community Rating System (CRS) as a means for local communities to soften the likely increase in many flood insurance policy rates resulting from new reforms to the National Flood Insurance Program (NFIP) enacted by Federal Legislation.	DEEP - Land and Water Resources Division	USACE / Silver Jackets	Staff time; minimal expense for outreach materials	Agency Operating Budgets	1 Year					X							High

Status Update Options:

- **Not Started**: Work has not begun
- **In Progress**: Work has begun but is not completed
- **Annual Implementation**: Ongoing with no end date
- **Completed**: Activity finished
- **Cancelled**: No longer relevant/circumstances have changed

Submit new mitigation activity: https://bit.ly/CT-HMP-Ideas

Next Steps

Schedule & Action Items

	March	April	May	June	July	August	September	October	November
HM Plan Milestone	Kick-Off			Workshop		Review Mtg	Send to FEMA		Adoption
Review 2019 HMP									
Data Collection									
Risk Assessment									
Capability Assessment									
Revise Goals + Objectives									
Mitigation Strategy Development									
Public Engagement									
HMP Writing/Revising									
DESPP/DEMHS Review									
FEMA Review/ Approval									
Plan Adoption									

Project Schedule

Dewberry

Action Items & Next Meeting

- Share data, plans, & reports: https://bit.ly/CT-HMP-Data
- Submit mitigation activity ideas: https://bit.ly/CT-HMP-Ideas
- Next Meeting:
  - Review initial HIRA results
  - Finalize mitigation goals & objectives
  - Brainstorm mitigation action ideas
  - Prioritize actions for Mitigation Strategy

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Dewberry

Questions?



Jade Payne
jpayne@dewberry.com

1.2.2 Agenda



Meeting Agenda

Title:	Connecticut State Natural Hazard Mitigation Plan Update Kick-Off	Location:	1111 Country Club Road, Middletown, CT 06457, Room 349 (*preferred*) or Microsoft Teams
Date:	Tuesday, March 28th, 2023	Time:	1:00 – 3:00 pm ET
Purpose:	Introduce update process, review roles and responsibilities, and begin collecting information & input on hazards, mitigation strategies, etc.		

Agenda Items

Topic	Presenter	Time
Welcome & Introductions	Ken Dumais, DEMHS	1:00 – 1:10
Plan update process overview: - Expectations o Hazard Mitigation Planning Team (HMPT), Stakeholders, Core Team, FEMA Region I, Dewberry Team - New FEMA guidance/update requirements - Executive orders - Improvements to 2019 HMP - Planning purpose and process	Jade Payne, Dewberry	1:10 – 1:20

Updating the hazard identification and risk assessment (HIRA):
- Overview of HIRA planning process
- Hazard analysis consistent with state hazards
- Hazard rankings & new hazards
- Data needs
  o Data discrepancies from previous plan – what can be improved?
  o Critical facilities and assets
  o Hazard-specific data sources
- Local hazard mitigation plan incorporation
	Scott Choquette, Dewberry	1:20 – 1:55

Dewberry 1

Topic	Presenter	Time
BREAK		1:55 – 2:05
Evaluating 2019 HMP: - Program capacity & capabilities - Mitigation goals & actions - State-level plan integration	Jamie Caplan, Dewberry Team (Caplan Consulting)	2:05 – 2:50
Next Steps: - Project Schedule – Milestones - Next HMPT Meeting - Action Items - Questions	Scott Choquette, Dewberry	2:50 – 3:00

2

1.2.3 Notes

State of Connecticut
Department of Emergency Services & Public Protection
Division of Emergency Management & Homeland Security

Meeting Notes

Title:	Connecticut State Natural Hazard Mitigation Plan Update Kick-Off	Location:	1111 Country Club Road, Middletown, CT 06457, Room 349 (*preferred*) or Microsoft Teams
Date:	Tuesday, March 28th, 2023	Time:	1:00 – 3:00 pm ET
Purpose:	Introduce the update process, review roles and responsibilities, and begin collecting information & input on hazards, mitigation strategies, and improvements		

Attendance

- Alfredo Herrera
- Ashley Benitez
- Ashley Gordon
- Brenda Bergeron
- Bruce Wittchen
- Charles "Chuck" Lee
- Danielle (Dani) Moyer
- Emily Pysh
- Eric Runowicz
- Francesca Provenzano
- George Bradner
- Hanna Rush
- Henry Paszczuk
- Ian Alexander
- Jade Payne
- James "Jim" O'Donnell
- Jamie Caplan
- Jeff Semancik
- Joanna Wozniak Brown
- John "Jack" Betkoski
- John Truscinski
- Jonathan Kinney
- Karen Michaels
- Kenneth (Ken) Dumais
- Louise Zakrzweski
- Meghan M Seremet, PG
- Nisha Patel
- Sarah Watson
- Scott Choquette
- Sean Loughlin
- Stephanie Zessos
- Zachary (Zach) Giron

Meeting Summary

Scott Choquette (Project Manager, Dewberry), Jade Payne (Deputy Project Manager, Dewberry), and Jamie Caplan (Dewberry Team - Jamie Caplan Consulting) met with the Connecticut Hazard Mitigation Planning Team (HMPT) on March 28, 2023, to provide an overview of the mitigation plan update process, begin discussions on the risk assessment, and collect feedback on how the plan can be improved compared to the 2019 version.

A PowerPoint presentation was used to review the project purpose, schedule, requirements, and planned improvements. Discussions were held throughout the presentation to gather feedback from the HMPT on how the plan update should proceed and result in an effective plan. Discussion and presentation topics are grouped below with input and questions from the HMPT. The meeting chat log is included at the end.

Dewberry 1

Meeting Notes

Plan Update Overview
- *No comments/notes (see presentation slide for information covered)*
Hazard ID & Risk Assessment Overview

- CIRCA is helping to customize the EPA EJ tool
- Critical facilities:
  o The State Public Health Laboratory would be considered a Critical State Facility. They have a generator
  o Definition of critical facilities & assets should be consistent with state statute, the executive orders (EO 21-3 had some specifics), and agency-identified critical facilities/assets (EO 21-3 kind of said this)
- 2019 Natural Hazard Ranking
  o Would the plan also include inundation zones for privately owned dams?
  ▪ Potentially if that information was available
  o Add extreme heat and cold
  ▪ Referenced Texas storm as a case study
  o Add solar storms (see Lloyd's report, which quantified by transformer type in CT to variations in currents)
  o Question from Francesca: how do we weight the impacts of hazards (ex., poverty rates)?
  ▪ Past plans have not addressed social vulnerability, but this new plan will
  ▪ The CIRCA climate change vulnerability index considers socioeconomic factors in the assessment of vulnerability.
  ▪ The County level economic status is probably too coarse to enhance equity. The CIRCA maps are more refined.

Evaluating 2019 HMP

- Feedback: it's far too long, we need a condensed version with a way to navigate through the full document if needed
  o A smaller base plan (maybe a few hundred pages) would be great, with more in the annexes.
- A more condensed version that's more graphically oriented would be useful. Maybe use more appendixes on the longer sections.
- A GIS package to be able to integrate the info into other state plans, risk assessments, local/regional plans would be helpful
  o A project dashboard will be created and be a usable tool for CT to display progress on projects
  o We can likely add a special component to this

Dewberry 2

- State projects: is it a good idea to add in localized, shovel-ready projects in these plans? Should this be looked at on the state side?
    - Yes, prioritizing these projects are important for if there is a state emergency or grants become available, there is a clear pathway forward
    - Also important to note where else these projects are identified beyond the HMP
- Does this planning tie into the Governor's Climate Change workgroup (GC3)? That seems like an area for integration and input.
- Helpful to include what kind of permitting process (at the federal level) is required for projects, this could also help to prioritize projects
    - We rank via STAPLEE but we may want to go beyond this
- Joanna Wozniak-Brown is working on prioritization & process for resiliency projects with her team
- Including plans like long rang transportation plans
- CT saw a lot of urban flash flooding with Hurricane Ida

- Culverts are designed for 25yr return frequencies but the storms are becoming more frequent
- Is there some way to identify how CT dealt with past events and how we can learn from what was done/not done?
    - There will be a "backwards look" into what happened and "looking forward" to outline what the future may look like
    - Plans should be looked at and shifted after a disaster event to reprioritize
    - Joanna Wozniak-Brown: The historical look-back (I think required by FEMA) should be condensed or improved with reflection process on what has changed since then either we are similarly vulnerable, more vulnerable, or maybe not vulnerable in the same way. How would the 1938 hurricane impact us today is more useful than the exact numbers from 1938 conditions.
        - The HAZUS description of 1938 on today could be more well rounded beyond numbers such as describing new capacities, newer impacts especially vulnerable populations, or actions still needed to address some of it.
- Any lessons learned from Tropical Storm Isaias, e.g. electrical grid would be helpful to integrate
- MA's 2018 Plan had each dept determine priorities because they felt they would not be completed otherwise. Perhaps CT might want to think about whether this model may work

Questions

- Have flood maps changed in the last 5 years?
    - They don't change all at once, Scott estimates most of them have had updates in the last 10 years but we will confirm and include in the plan.

Next Steps

- Send Old Action 2-week deadline with the resources email
- Other mitigation action updates from previous HMP should also be submitted in 2-weeks
- New actions do not yet have a deadline
- We should send deadlines to anyone we tag
- Jade to send out the spreadsheet in the next few days
- The next HMPT meeting will be to review the risk assessment results, finalize goals/objectives, and decide on mitigation activities.

Meeting Chat Log

[3/28 1:31 PM] Rush, Hanna R.
Worksheet: HMPT Kick-Off Participant Worksheet (airtable.com)

Airtable | Everyone's app platform
Airtable is a low-code platform for building collaborative apps. Customize your workflow, collaborate, and achieve ambitious outcomes. Get started for free.

[3/28 1:37 PM] Herrera, Alfredo
Alfredo Herrera - OPM

[3/28 1:37 PM] Provenzano, Francesca
Francesca Provenzano, Public Health Section Chief, Office of Public Health Preparedness and Response, CT DPH.

I would recommend inviting Lori Mathieu, Public Health Branch Chief, Env Health and Drinking Water Branch. CT DPH

[3/28 1:39 PM] Michaels, Karen
Karen Michaels, EA III, Planning Section, Land and Water Resources Division, CT DEEP

[3/28 1:49 PM] Provenzano, Francesca
The State Public Health Laboratory would be considered a Critical State Facility. They have a generator.

[3/28 1:50 PM] Lee, Charles
Would the plan also include inundation zones for privately owned dams?

[3/28 1:51 PM] Wozniak-Brown, Joanna
Yes - on extreme heat/cold

like 3

[3/28 1:52 PM] Patel, Nisha
Thanks for this kick off and my apologies - I need to drop off for another call

like 1

[3/28 1:54 PM] Provenzano, Francesca
Do the hazard rankings consider or have weighting for poverty rates or anything like that?

[3/28 1:57 PM] Wozniak-Brown, Joanna
definition of critical facilities & assets should be consistent with state statute, the executive orders (EO 21-3 had some specifics), and agency identified critical facilities/assets (EO 21-3 kind of said this)

like 1

[3/28 1:58 PM] Provenzano, Francesca
Do you have a list of individuals from each of the state agencies who supplied that information?

[3/28 1:58 PM] Truscinski, John
The CIRCA climate change vulnerability index considers socioeconomic factors in the assessment of vulnerability.

like 2

[3/28 2:02 PM] O'Donnell, James
The County level economic status is is probably too coarse to enhance equity. The CIRCA maps are more refined.

[3/28 2:02 PM] Wittchen, Bruce
No one uses a 1500-pg plan

[3/28 2:03 PM] Loughlin, Sean
A smaller base plan (maybe a few hundred pages) would be great, with more in the annexes.

[3/28 2:03 PM] Truscinski, John
A more condensed version that's more graphically oriented would be useful. Maybe use more appendixes on the longer sections.

[3/28 2:04 PM] Wozniak-Brown, Joanna
a GIS package to be able to integrate the info into other state plans, risk assessments, local/regional plans would be helpful

[3/28 2:04 PM] Provenzano, Francesca
Does this planning tie into the Governor's Climate Change workgroup (GC3)? That seems like an area for integration and input.

[3/28 2:05 PM] Truscinski, John
Wozniak-Brown, Joanna (External)

a GIS package to be able to integrate the info into other state plans, risk assessments, local/regional plans would be helpful

a spatial database of actions and projects from the plan would be really useful.

[3/28 2:11 PM] Wozniak-Brown, Joanna
another thing - identifying the similarities across local HMPs that would require state input/info - several COG HMPs mention working with SHPO on vulnerable historical sites/practices

[3/28 2:14 PM] Loughlin, Sean
Any lessons learned from Tropical Storm Isaias, e.g. electrical grid would be helpful to integrate

like 1

[3/28 2:16 PM] Wozniak-Brown, Joanna
The historical look-back (I think required by FEMA) should be condensed or improved with reflection process on what has changed since then either we are similarly vulnerbale, more vulnerable, or maybe not vulnerable in the same way. How would the 1938 hurricane impact us today is more useful than the exact numbers from 1938 conditions.

[3/28 2:25 PM] Wozniak-Brown, Joanna
The HAZUS description of 1938 on today could be more well rounded beyond numbers such as describing new capacities, newer impacts especially vulnerable populations, or actions still needed to address some of it.

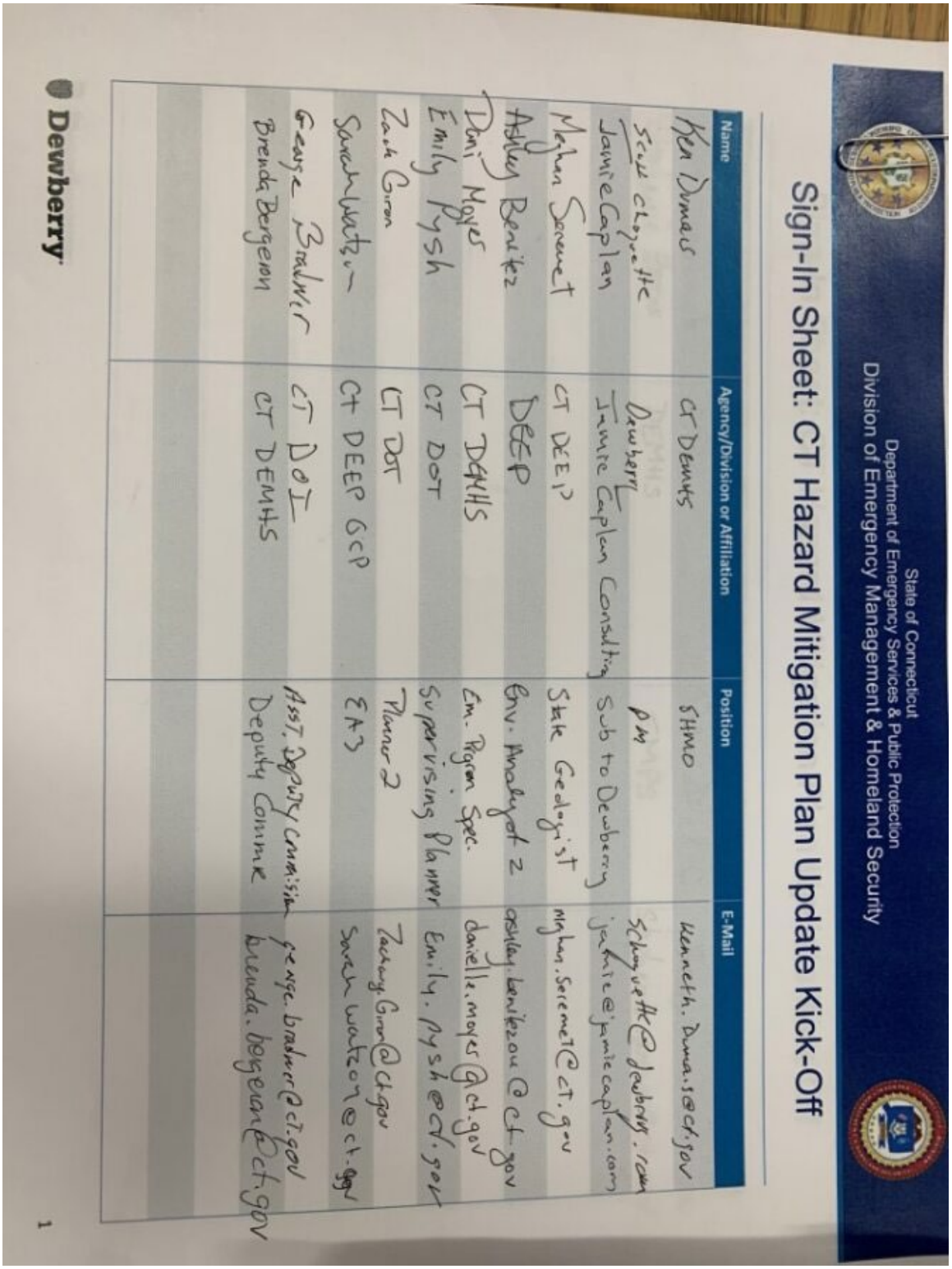
[3/28 2:41 PM] Payne, Jade
Suggest a Mitigation Activity (airtable.com)

[3/28 2:42 PM] Wozniak-Brown, Joanna
are you sharing the agency spreadsheet document?

[3/28 2:44 PM] Wozniak-Brown, Joanna
i.e. will you send out the spreadsheet for agencies to update past actions?

1.2.4 Attendance

1.2.4.1 In Person Attendance (Sign-in Sheet)



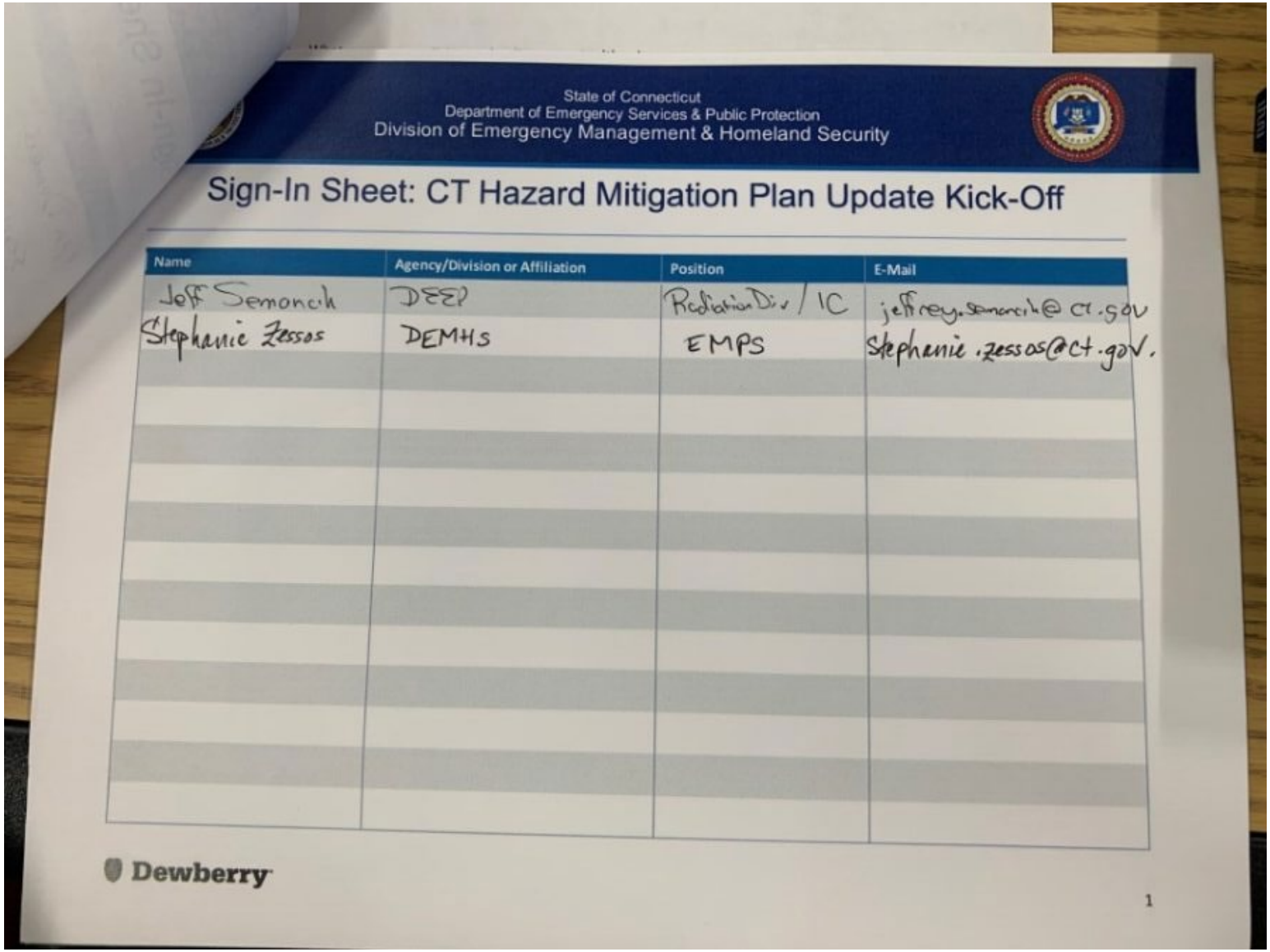
State of Connecticut
Department of Emergency Services & Public Protection
Division of Emergency Management & Homeland Security

Sign-In Sheet: CT Hazard Mitigation Plan Update Kick-Off

Name	Agency/Division or Affiliation	Position	E-Mail
Ken Dumas	CT DEMHS	SHMO	Kenneth.Dumas@ct.gov
Scott Choquette	Dewberry	PM	SChoquette@dewberry.com
Jamie Caplan	Jamie Caplan Consulting	Sub to Dewberry	jcaplan@jamiecaplan.com
Meghan Sarramet	CT DEEP	State Geologist	Meghan.Sarramet@ct.gov
Ashley Benitez	DEEP	Env. Analyst 2	ashley.benitez@ct.gov
Dani Moyes	CT DEMHS	Em. Prgm. Spec.	danielle.moyes@ct.gov
Emily Pysh	CT DOT	Supervising Planner	Emily.Pysh@ct.gov
Zach Green	CT DOT	Planner 2	Zachary.Green@ct.gov
Sarah Watzke	CT DEEP OSP	EA3	Sarah.watzke@ct.gov
George Brahler	CT DOT	Asst. Deputy Commissioner	george.brahler@ct.gov
Brenda Bergeron	CT DEMHS	Deputy Commr	brenda.bergeron@ct.gov

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1



State of Connecticut
Department of Emergency Services & Public Protection
Division of Emergency Management & Homeland Security

Sign-In Sheet: CT Hazard Mitigation Plan Update Kick-Off

Name	Agency/Division or Affiliation	Position	E-Mail
Jeff Semonch	DEEP	Radiation Div / IC	jeffrey.semonch@ct.gov
Stephanie Zessos	DEMHS	EMPS	stephanie.zessos@ct.gov.

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1

1.2.4.2 Virtual Attendance

1. Summary

Meeting title	Connecticut State Natural Hazard Mitigation Plan Update Kick-Off
Attended participants	22
Start time	3/28/23, 12:20:55 PM
End time	3/28/23, 2:55:15 PM
Meeting duration	2h 34m 20s
Average attendance time	1h 34m 39s

2. Virtual Participants

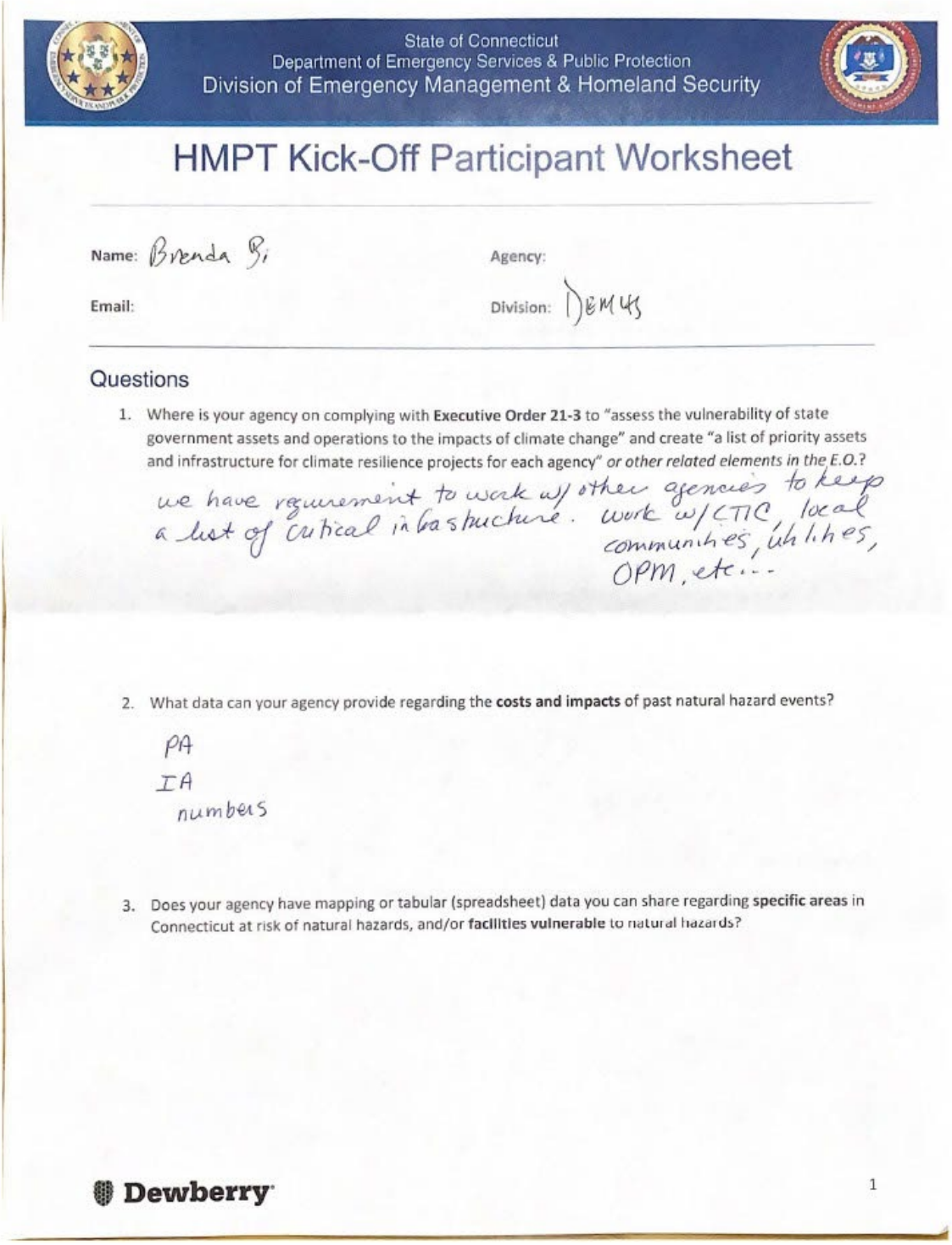
Name	First Join	In-Meeting Duration	Role
Payne, Jade	3/28/23, 12:21:03 PM	2h 34m 12s	Organizer
Mills, Emily	3/28/23, 12:29:52 PM	34m 30s	Organizer
Gordon, Ashley	3/28/23, 12:50:27 PM	2h 3m 31s	Organizer
Rush, Hanna R.	3/28/23, 12:52:58 PM	2h 53s	Organizer
Ken Dumais	3/28/23, 12:34:33 PM	29m 44s	Attendee
Paszczuk, Henry	3/28/23, 12:57:54 PM	1h 56m 10s	Attendee
Wozniak-Brown, Joanna	3/28/23, 12:59:01 PM	1h 54m 42s	Attendee
Loughlin, Sean	3/28/23, 12:59:48 PM	1h 54m 3s	Attendee
Truscinski, John	3/28/23, 1:00:03 PM	1h 53m 42s	Attendee
Lee, Charles	3/28/23, 1:00:25 PM	1h 52m 30s	Attendee
Wittchen, Bruce	3/28/23, 1:02:01 PM	1h 51m 45s	Attendee
Kinney, Jonathan	3/28/23, 1:02:04 PM	55m 24s	Attendee
Runowicz, Eric T.	3/28/23, 1:02:46 PM	1h 25m 59s	Attendee
Provenzano, Francesca	3/28/23, 1:03:10 PM	1h 52m 4s	Attendee
Michaels, Karen	3/28/23, 1:04:24 PM	1h 17m 13s	Attendee
Zakrzewski, Louise	3/28/23, 1:04:47 PM	1h 49m 1s	Attendee
Choquette, Scott	3/28/23, 1:05:00 PM	1h 50m 14s	Attendee
Herrera, Alfredo	3/28/23, 1:08:26 PM	1h 45m 26s	Attendee
O'Donnell, James	3/28/23, 1:12:14 PM	58m 52s	Attendee
Patel, Nisha	3/28/23, 1:12:26 PM	40m 19s	Attendee
Ian Alexander	3/28/23, 1:13:23 PM	1h 41m 51s	Attendee
Betkoski, John	3/28/23, 1:18:04 PM	1h 20m 14s	Attendee

3. All Participants

Alfredo Herrera
Ashley Benitez
Ashley Gordon
Brenda Bergeron
Bruce Wittchen
Charles "Chuck" Lee
Danielle (Dani) Moyer
Emily Pysh
Eric Runowicz
Francesca Provenzano
George Bradner
Hanna Rush
Henry Paszczuk

Ian Alexander
Jade Payne
James "Jim" O'Donnell
Jamie Caplan
Jeff Semancik
Joanna Wozniak Brown
John "Jack" Betkoski
John Truscinski
Jonathan Kinney
Karen Michaels
Kenneth (Ken) Dumais
Louise Zakrzweski
Meghan M Seremet, PG
Nisha Patel
Sarah Watson
Scott Choquette
Sean Loughlin
Stephanie Zessos
Zachary (Zach) Giron

1.2.5 Participant Worksheets



State of Connecticut
Department of Emergency Services & Public Protection
Division of Emergency Management & Homeland Security

HMPT Kick-Off Participant Worksheet

Name: Brenda B. Agency:

Email: Division: DEMHS

Questions

1. Where is your agency on complying with **Executive Order 21-3** to "assess the vulnerability of state government assets and operations to the impacts of climate change" and create "a list of priority assets and infrastructure for climate resilience projects for each agency" *or other related elements in the E.O.*?

   we have requirement to work w/ other agencies to keep a list of critical infrastructure. work w/ CTIC, local communities, utilities, OPM, etc...

2. What data can your agency provide regarding the **costs and impacts** of past natural hazard events?

   PA
   IA
   numbers

3. Does your agency have mapping or tabular (spreadsheet) data you can share regarding **specific areas** in Connecticut at risk of natural hazards, and/or **facilities vulnerable** to natural hazards?

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State of Connecticut
Department of Emergency Services & Public Protection
Division of Emergency Management & Homeland Security

HMPT Kick-Off Participant Worksheet

Name: Sarah Watson **Agency:** CT DEEP

Email: Sarah.watson@ct.gov **Division:** Office of Climate Planning

Questions

1. Where is your agency on complying with **Executive Order 21-3** to "assess the vulnerability of state government assets and operations to the impacts of climate change" and create "a list of priority assets and infrastructure for climate resilience projects for each agency" *or other related elements in the E.O.*?

update on #1- Deep launched the Deep Climate Resilience Fund in Sept 2022 and received 58 applications totaling 22 mil in requests.

Contact me for more info. once we make announcements we can coordinate on any projects that should be included in the State HMP.

2. What data can your agency provide regarding the **costs and impacts** of past natural hazard events?

3. Does your agency have mapping or tabular (spreadsheet) data you can share regarding **specific areas** in Connecticut at risk of natural hazards, and/or **facilities vulnerable** to natural hazards?

we have ~~8~~ 36+ applications for projects ~~on~~ that could be mined for data, along with $22 plan applications.

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1

4. What **improvements** would you like to see in the updated Natural Hazard Mitigation Plan?

5. What **inclusions (plans, reports, studies)** would you like to see in the updated Natural Hazard Mitigation Plan?

6. What **programs, policies, or funding opportunities** does your agency offer that support climate adaptation, community resilience, sustainability, or hazard mitigation activities?

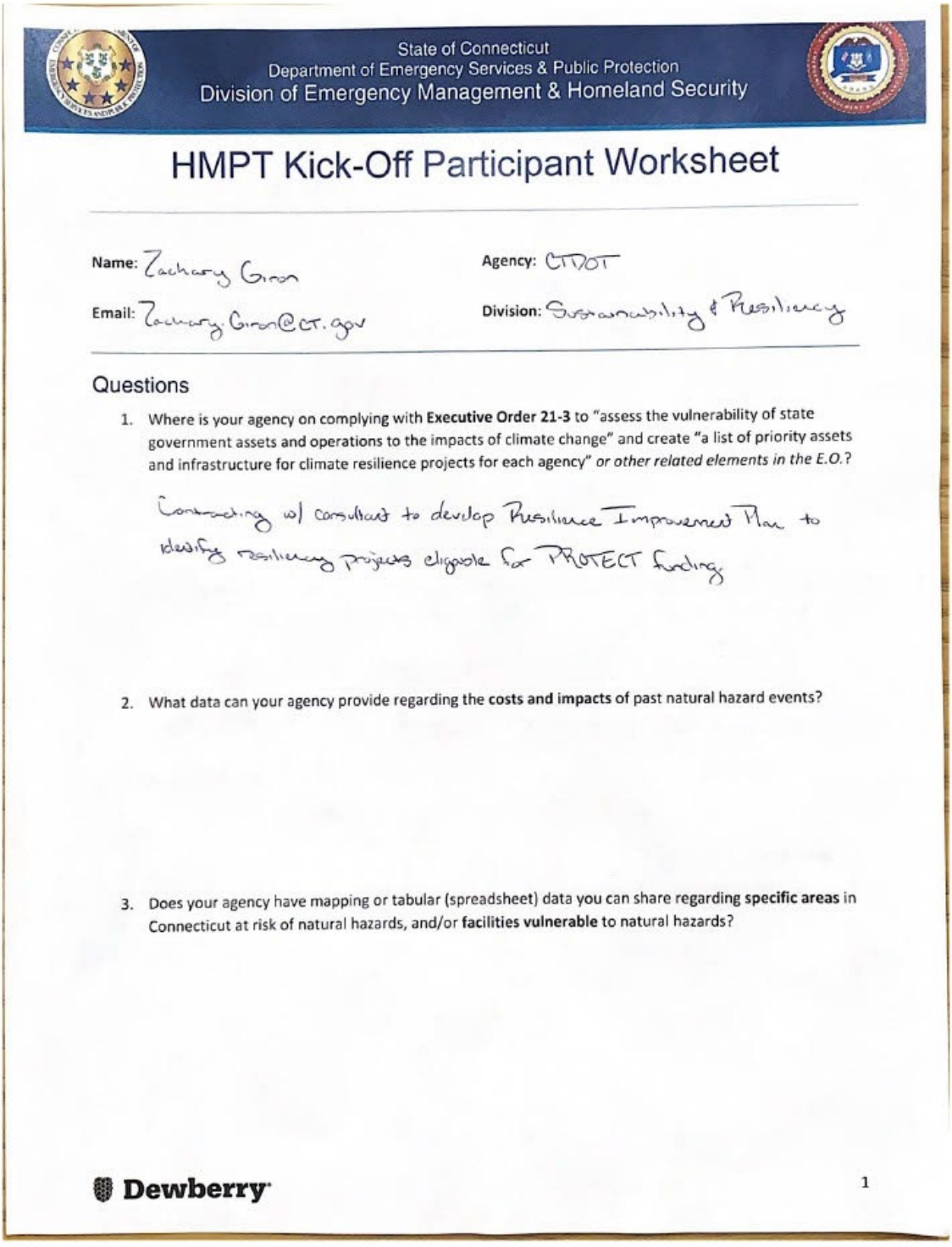
Deep fund, the Deep Climate resilience fund, which Provides grants to municipalities etc for Climate resience Planning and Proget development. with a core goal of developers Competive appr. to federal resiance fuding.

Other Notes

Please use the remaining space to share any other thoughts or information.

happy to set up a call to discuss.

2



State of Connecticut
Department of Emergency Services & Public Protection
Division of Emergency Management & Homeland Security

HMPT Kick-Off Participant Worksheet

Name: Zachary Green **Agency:** CTDOT

Email: Zachary.Green@CT.gov **Division:** Sustainability & Resiliency

Questions

1. Where is your agency on complying with **Executive Order 21-3** to "assess the vulnerability of state government assets and operations to the impacts of climate change" and create "a list of priority assets and infrastructure for climate resilience projects for each agency" *or other related elements in the E.O.*?

   Contracting w/ consultant to develop Resilience Improvement Plan to identify resiliency projects eligible for PROTECT funding

2. What data can your agency provide regarding the **costs and impacts** of past natural hazard events?

3. Does your agency have mapping or tabular (spreadsheet) data you can share regarding **specific areas** in Connecticut at risk of natural hazards, and/or **facilities vulnerable** to natural hazards?

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4. What **improvements** would you like to see in the updated Natural Hazard Mitigation Plan?

The recommended improvements seem good
more focus on climate change, env. justice, community
reduce size of document or either prepare a
summary of findings

5. What **inclusions (plans, reports, studies)** would you like to see in the updated Natural Hazard Mitigation Plan?

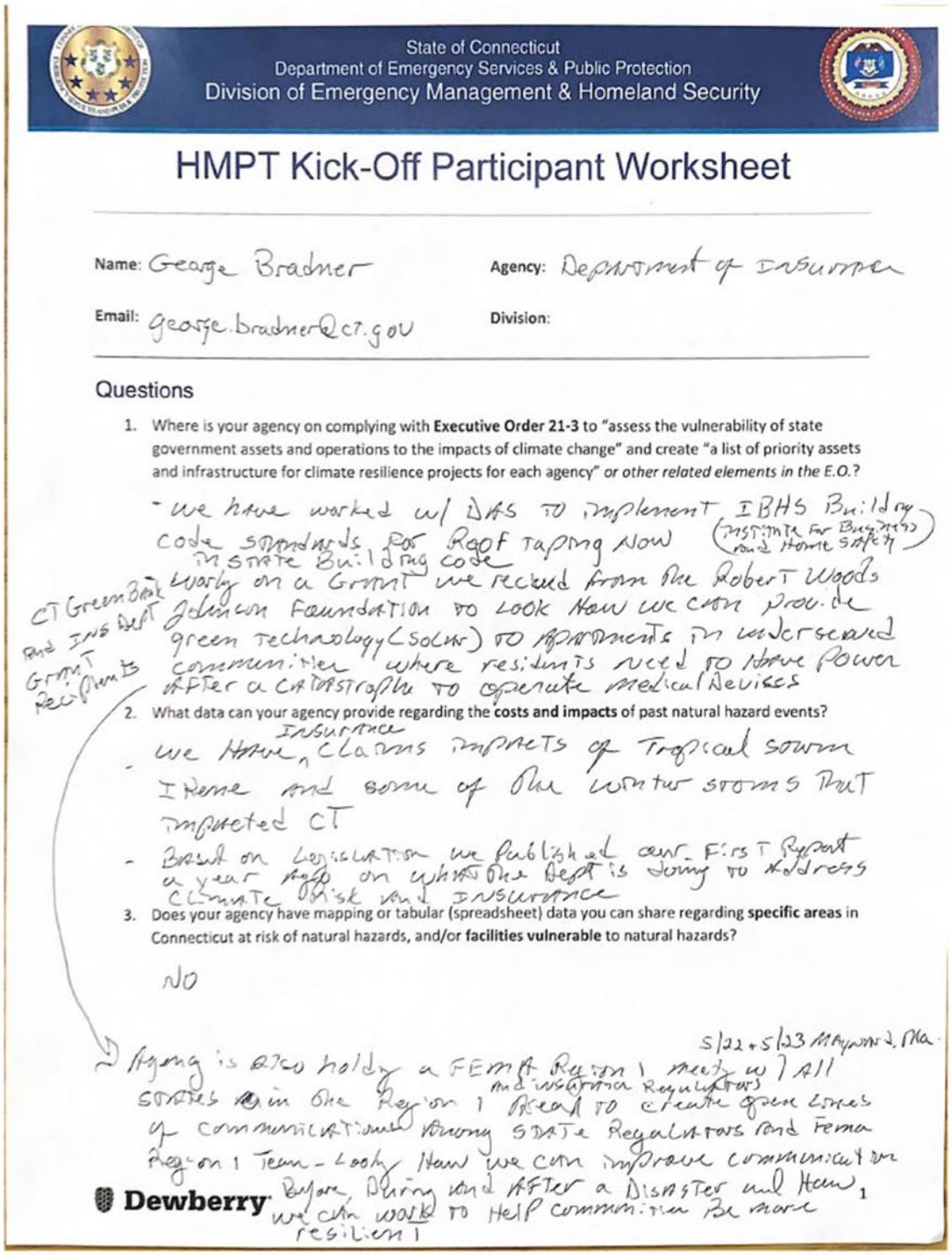
6. What **programs, policies, or funding opportunities** does your agency offer that support climate adaptation, community resilience, sustainability, or hazard mitigation activities?

DEEP Climate Resilience Fund (contact: Sarah. Watson)

Other Notes

Please use the remaining space to share any other thoughts or information.

2



State of Connecticut
Department of Emergency Services & Public Protection
Division of Emergency Management & Homeland Security

HMPT Kick-Off Participant Worksheet

Name: George Bradner Agency: Department of Insurance

Email: george.bradner@ct.gov Division:

Questions

1. Where is your agency on complying with **Executive Order 21-3** to "assess the vulnerability of state government assets and operations to the impacts of climate change" and create "a list of priority assets and infrastructure for climate resilience projects for each agency" *or other related elements in the E.O.?*

- we have worked w/ DAS to implement IBHS Building code standards for Roof taping now in State Building code (Institute for Business and Home Safety)
- early on a Grant we recieved from the Robert Woods Johnson Foundation to look how we can provide green technology (solar) to apartments in underserved communities where residents need to have power after a catastrophe to operate medical devices

CT Green Bank and DEEP Grant Recipients

2. What data can your agency provide regarding the **costs and impacts** of past natural hazard events?

- we have, Insurance claims impacts of Tropical Storm Irene and some of the winter storms that impacted CT
- Based on Legislation we published our First Report a year ago on what the dept is doing to address climate risk and insurance

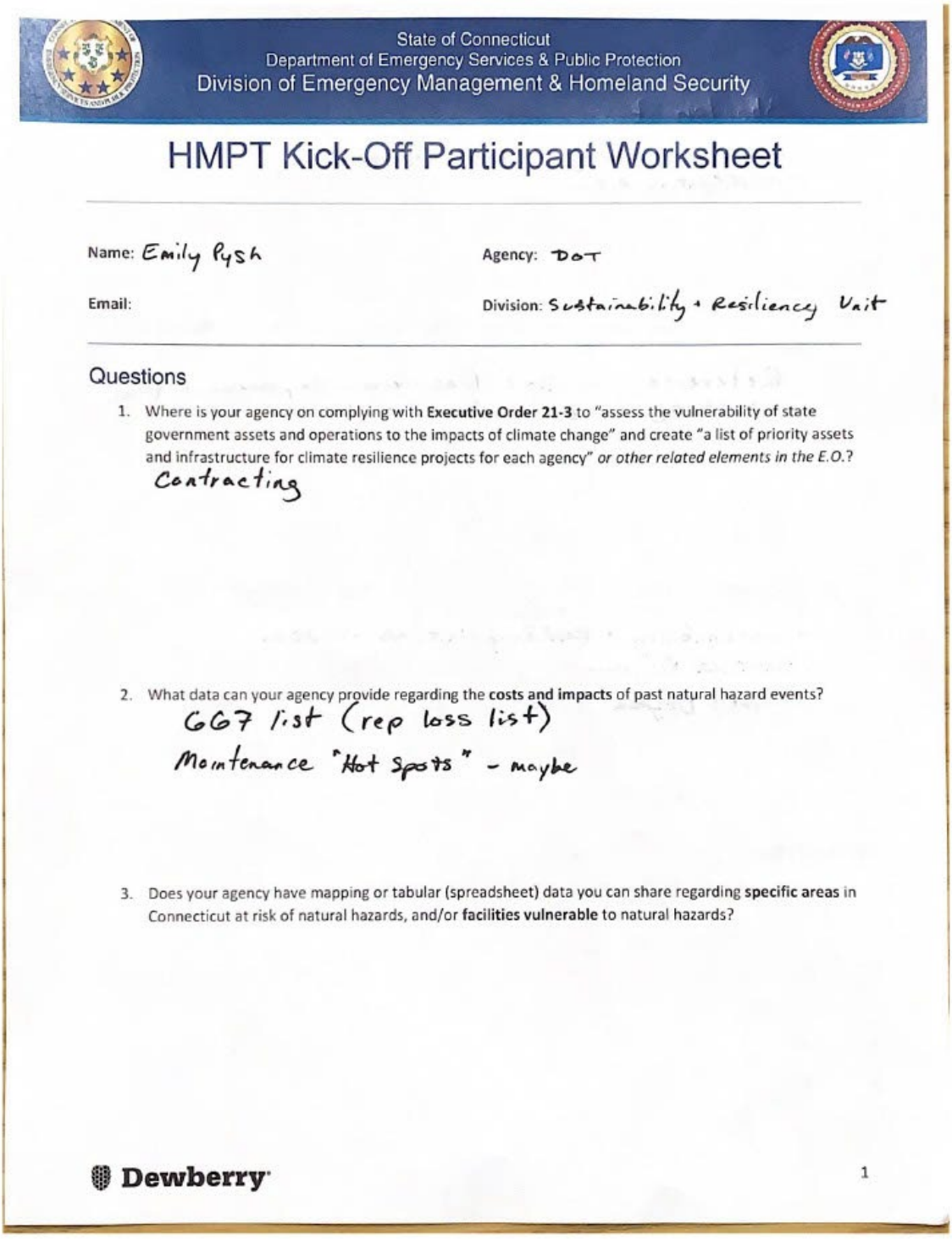
3. Does your agency have mapping or tabular (spreadsheet) data you can share regarding **specific areas** in Connecticut at risk of natural hazards, and/or **facilities vulnerable** to natural hazards?

NO

5/22+5/23 Maynard, MA

Agency is also holding a FEMA Region 1 meeting w/ All States in the Region 1 Area to create open lines of communication among State Regulators and Federal Insurance Regulators
Region 1 Team - Looking How we can improve communication Before, During and After a Disaster and How we can work to help communities be more resilient

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State of Connecticut
Department of Emergency Services & Public Protection
Division of Emergency Management & Homeland Security

HMPT Kick-Off Participant Worksheet

Name: Emily Pysh

Agency: DOT

Email:

Division: Sustainability + Resiliency Unit

Questions

1. Where is your agency on complying with **Executive Order 21-3** to "assess the vulnerability of state government assets and operations to the impacts of climate change" and create "a list of priority assets and infrastructure for climate resilience projects for each agency" *or other related elements in the E.O.*?

   Contracting

2. What data can your agency provide regarding the **costs and impacts** of past natural hazard events?

   GG7 list (rep loss list)

   Maintenance "Hot Spots" - maybe

3. Does your agency have mapping or tabular (spreadsheet) data you can share regarding **specific areas** in Connecticut at risk of natural hazards, and/or **facilities vulnerable** to natural hazards?

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4. What **improvements** would you like to see in the updated Natural Hazard Mitigation Plan?

Shorten it

Carry over headings in tables for multi-page
ie, Mitigation Actions

5. What **inclusions (plans, reports, studies)** would you like to see in the updated Natural Hazard Mitigation Plan?

Reference to DOT Resilience Improvement Plan
→ starting soon but won't be done before SHMP.

6. What **programs, policies, or funding opportunities** does your agency offer that support climate adaptation, community resilience, sustainability, or hazard mitigation activities?

- Sustainability + Resiliency Unit as of 2021
- PROTECT Program
- [illegible] Program

Other Notes

Please use the remaining space to share any other thoughts or information.

2

State of Connecticut
Department of Emergency Services & Public Protection
Division of Emergency Management & Homeland Security

HMPT Kick-Off Participant Worksheet

Name: Ashley G. Benitez Ou **Agency:** CT · DEEP

Email: ashley.benitezou@ct.gov **Division:** Office of Climate Planning

Questions

1. Where is your agency on complying with **Executive Order 21-3** to "assess the vulnerability of state government assets and operations to the impacts of climate change" and create "a list of priority assets and infrastructure for climate resilience projects for each agency" *or other related elements in the E.O.*?

Action 11 The Office of Climate Planning in coordination with OPM, (Scott Gaul, Joanna Wozniak-Brown and Alfredo Herrera), have worked in developing the scope of work for the State Vulnerability Assessment for ALL agencies statewide which includes a survey that was developed by the GC3 State Vuln. Assessment Framework WG.

2. What data can your agency provide regarding the **costs and impacts** of past natural hazard events?

I'll be in contact for this

ashley.benitezou@ct.gov

3. Does your agency have mapping or tabular (spreadsheet) data you can share regarding **specific areas** in Connecticut at risk of natural hazards, and/or **facilities vulnerable** to natural hazards?

same ↑

Dewberry 1

4. What **improvements** would you like to see in the updated Natural Hazard Mitigation Plan?

Condensed Version

GIS Data made readily available - OPM's Geodata Portal

5. What **inclusions (plans, reports, studies)** would you like to see in the updated Natural Hazard Mitigation Plan?

6. What **programs, policies, or funding opportunities** does your agency offer that support climate adaptation, community resilience, sustainability, or hazard mitigation activities?

- National Electric Vehicle Infrastructure (NEVI)
- Promoting Resilient Operations for Transformative, Efficient, and Cost-Saving Transportation (PROTECT)
- Carbon Reduction Program

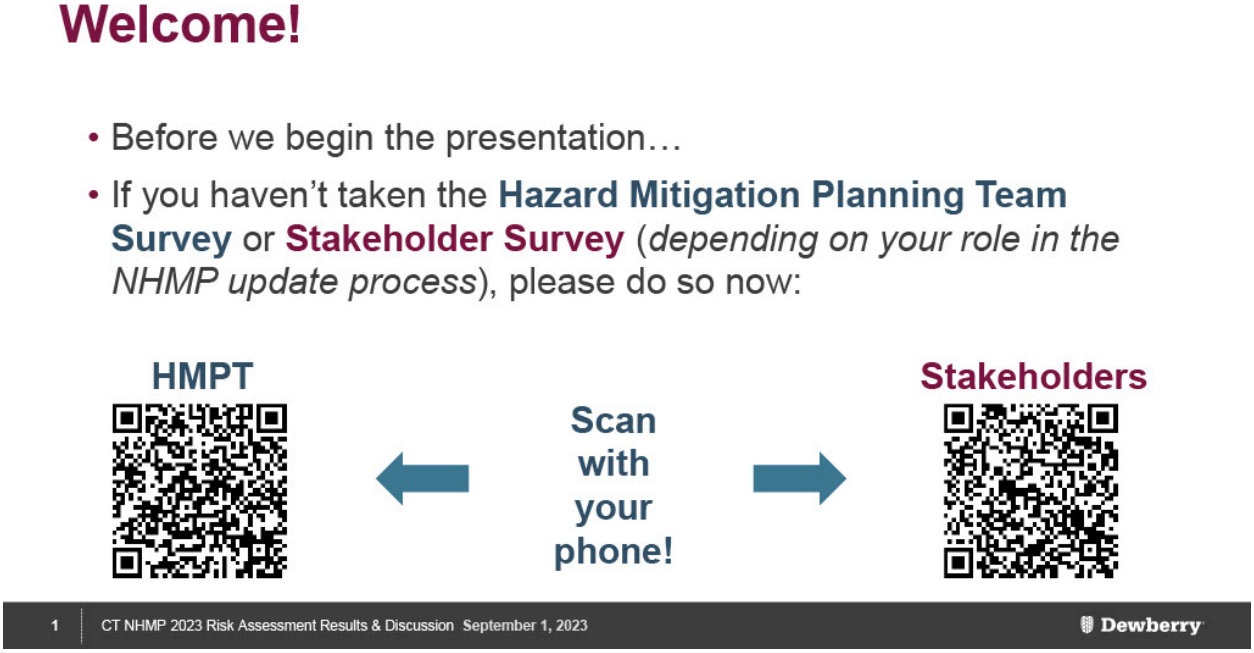
Other Notes

Please use the remaining space to share any other thoughts or information.

2

1.3 HIRA Results

1.3.1 Presentation



Dewberry



Connecticut Natural Hazard Mitigation Plan

2023 Update

Risk Assessment Results & Discussion

Friday, September 1, 2023 | Microsoft Teams (Virtual)

Meet Today's Presenters!



Scott Choquette
Project Manager
Dewberry



Jade Payne
Deputy Project Manager
Dewberry



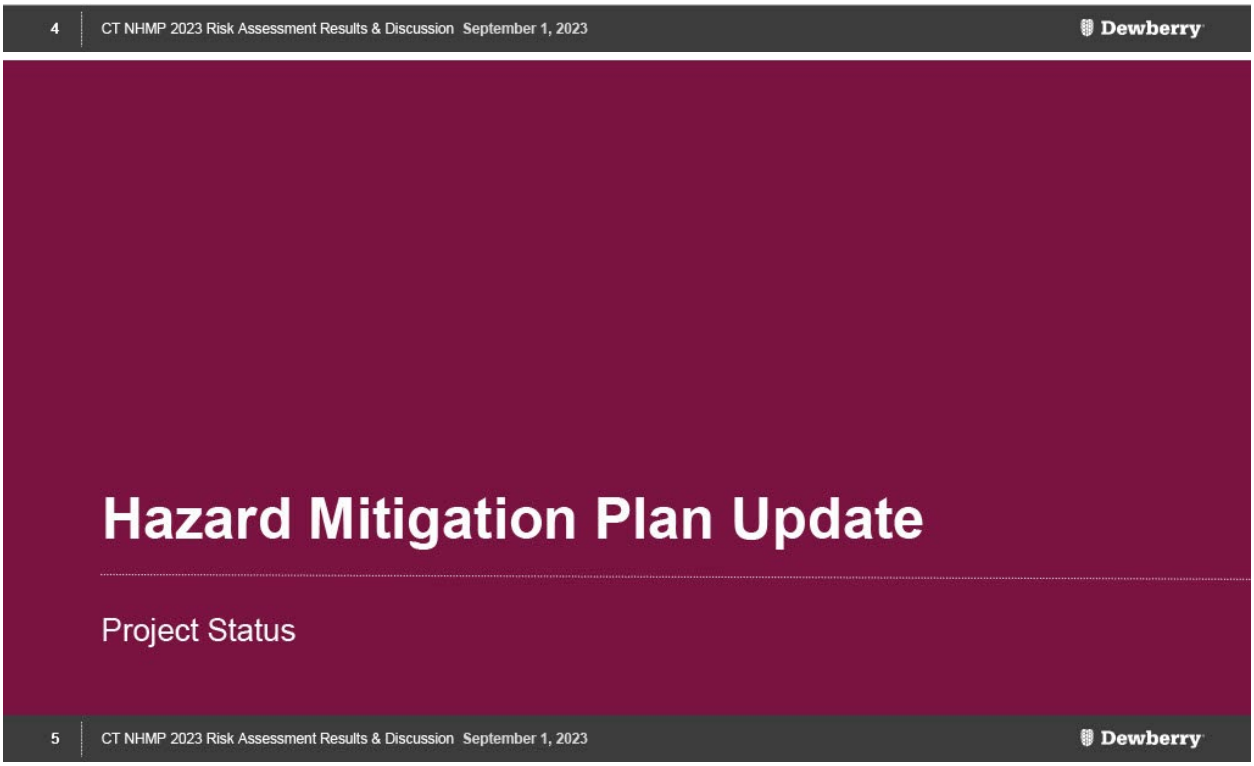
Hanna Rush
Plan Development Lead
Dewberry



Ashley Gordon
Risk Assessment Lead
Dewberry

Agenda

1. Hazard Mitigation Plan Update Status
2. Hazard Identification & Risk Assessment Process
3. Hazard Identification & Risk Assessment Results
4. Next Steps & Questions/Discussion



Planning Process

Overview



Planning Process

Milestones



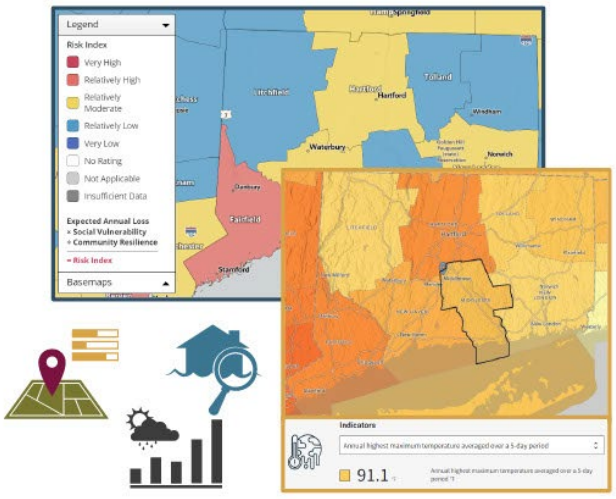
Hazard Identification & Risk Assessment

Process Overview

Hazard ID & Risk Assessment

Overview

- **Purpose:** Provides a factual basis for prioritizing hazard mitigation activities
- **Steps:**
  1. Identify and describe hazards
  2. Identify assets
  3. Assess risk
  4. Summarize vulnerability



Hazard ID & Risk Assessment

Components



Hazard Ranking



Hazard Profiles



Climate Change Impacts



Hazard History
(Locations, Extents, Occurrences)



Exposure & Loss Estimations



Probability of Future Events



Vulnerability & Potential Impacts



Integration of Local Hazard Mitigation Plans

Hazard ID & Risk Assessment

2023 Improvements

- Additional hazards: Extreme Cold & Extreme Heat
- Integrated updated CIRCA CCVI Social Sensitivity data
- Hazus v6.0 for flood, earthquake, and hurricane wind
- Hazard summary one-pagers
- FEMA Community Lifelines
- Improved hazard ranking methodology (*more on this later!*)
- Vulnerability assessment by Council of Government & County

Hazard ID & Risk Assessment

Data Highlights

- CIRCA Climate Change Vulnerability Index (CCVI)
- CIRCA Sea Level Rise Projections
- State owned/operated facilities & assets
- NCEI Storm Events Database
  - County-level reported hazard events between 1950 – 2022
- FEMA National Risk Index (NRI)
- IPCC 6th Assessment Report
- U.S. Climate Mapping for Resilience & Adaptation (CMRA)
- FEMA Flood Maps
- Hazus-MH v6.0



Hazard ID & Risk Assessment

CIRCA CCVI Social Sensitivity

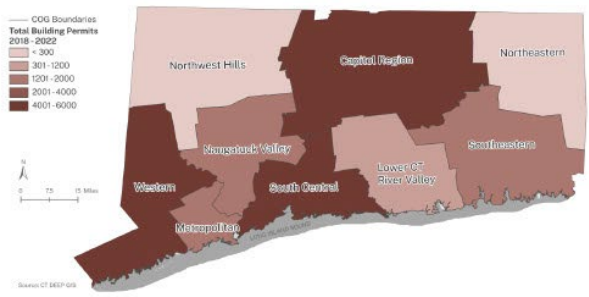
Component	Indicator	Flood CCVI Factor
Sensitivity	Social	• Household Median Income
		• Over 5 with a Disability
		• Percent Living Below 185% Federal Poverty Level
		• Percent Over 25 without a high school diploma
		• Percent Over 65
		• Percent Population Under 5
		• Percent Population Unemployed
		• Population Density
		• Non-White Population
		• Speaks English Less Than Well/Not At All
		• Over 65 Living Alone (Households)
		• Single Parent Households



Hazard ID & Risk Assessment

Future Conditions

- Requirement of 2022 FEMA State Mitigation Planning Policy Guide
- Building permits & population projections





14 | CT NHMP 2023 Risk Assessment Results & Discussion September 1, 2023 | Dewberry

Hazard ID & Risk Assessment

Hazard One-Pagers



Flood-Related

Concern: High

Connecticut Hazard Summary

Locations at Risk

All of Connecticut is susceptible to flooding, but communities located in the floodplain are more vulnerable to flood impacts.

Future Probability

Based on past flood events it is estimated that the state will experience multiple flood events per year. Future probability varies by location within the floodplain.

Climate Effects

- Flood intensity and frequency of events is projected to increase in Connecticut due to climate change. Riverine flooding location is not projected to change, but coastal flooding may impact areas further inland due to stronger storms increasing the extent of coastal flooding.

Community Impacts

People

Population living in or near the floodplain areas have the highest risk. People traveling in flooded areas or living in urban areas with poor stormwater management are also at risk.

Vulnerable populations include: populations without access to early warning systems to evacuate from flooding; individuals over age 65, and individuals with functional needs; individuals with low English language fluency; populations with low socioeconomic status who may consider the economic impacts of evacuating.

State Government

A total of 284 state-owned buildings are located within the floodplain. The highest number of exposed facilities is in New London and Litchfield Counties. The 284 state owned buildings that fall within the 100-year and 500-year floodplain have a combined total of approximately $332 million dollars in building value.

Built Environment

A total of 227 critical facilities were determined to be located within the floodplain, with the highest amount of critical facilities exposed in Fairfield, New Haven, and New London counties. Floods can cause damage to the built environment through water damage and loss of power, which can render critical facilities inoperable.

Environment

The environmental impact of floods includes loss of crops, fluvial erosion, and potential for landslides. Landslides can occur following flood events when high flows oversaturate soils on steep slopes, causing them to fail.

Economy

In areas impacted by flood damage, economic impacts can be significant. Economic impacts may include loss of inventory, relocation costs, wage losses, and rental losses due to the repair or replacement of buildings.

Connecticut Natural Hazard Mitigation Plan 2023

15 | CT NHMP 2023 Risk Assessment Results & Discussion September 1, 2023 | Dewberry

Hazard ID & Risk Assessment

Executive Order 21-3

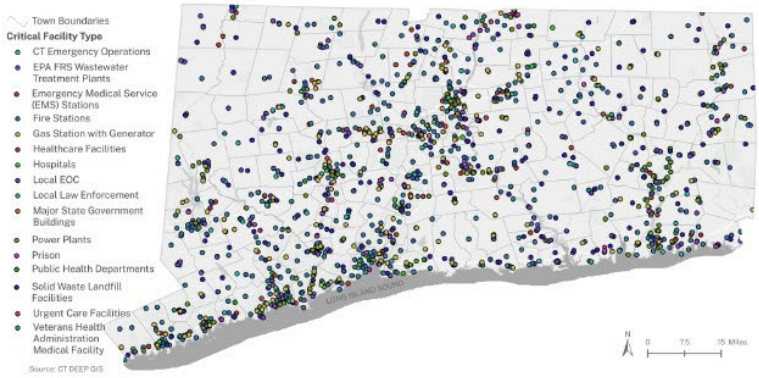


- Hazard risk assessment in this plan will be expanded upon through the upcoming statewide vulnerability assessment
  - Action 11 – Assess the vulnerability of state government assets and operations to the impacts of climate change and create a list of priority assets and infrastructure for climate resilience projects for each agency (**OPM, DAS, DEEP, DESPP**)
  - Action 13 – Maintain a list of state and local critical facilities (**OPM, DAS, DEEP, DESPP**)
- Any changes to state asset vulnerability results can be added to the 2023 Natural Hazard Mitigation Plan as an addendum after FEMA has approved the initial plan

Hazard ID & Risk Assessment

Critical Facilities

- Assessed vulnerability to each hazard
- Number of structures & value of structures exposed to hazards
- FEMA Community Lifelines



Hazard ID & Risk Assessment

State-Owned Buildings

- Assessed vulnerability to each hazard
- Number of structures & value of structures exposed to hazards
- FEMA Community Lifelines



Hazard ID & Risk Assessment

Local Hazard Mitigation Plan Incorporation

- Survey of local hazard mitigation plans
  - Hazard identification terminology
  - Vulnerability and risk assessment methodologies & results
  - Types of mitigation actions
- Incorporate ranking and loss estimates into Connecticut's state hazard risk rankings
- Include actions in state mitigation strategy based on local needs

Hazard Identification & Risk Assessment

Overview of Results

Dam Failure

- **189 high hazard** dams, **245 significant-hazard** dams in the state

Hazard Classification	Number of Dams	Mapped Inundation Areas
C – High Hazard	189	167
B – Significant Hazard	245	21
BB – Moderate Hazard	725	0
A – Low Hazard	1,892	0
AA – Negligible Hazard	496	0
Unclassified	667	0
Total	**4,214**	**188**





Dam Failure

COG Vulnerability

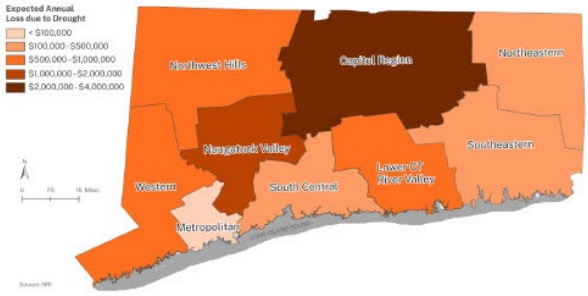
COG Region	State-Owned Buildings in Dam Inundation Areas
Capitol Region	0.9%
Metropolitan	5.8%
Lower CT River Valley	0.3%
Naugatuck Valley	10.3%
Northeastern	0.0%
Northwest Hills	18.8%
South Central	6.4%
Southeastern	2.9%
Western	23.5%
Total	**4.9%**

COG Region	Critical Facilities in Dam Inundation Areas
Capitol Region	10.3%
Metropolitan	0.0%
Lower CT River Valley	0.0%
Naugatuck Valley	20.6%
Northeastern	0.0%
Northwest Hills	14.3%
South Central	5.0%
Southeastern	2.2%
Western	13.5%
Total	**8.3%**

COG Region	Population in Dam Inundation Areas
Capitol Region	7.4%
Metropolitan	10.0%
Lower CT River Valley	3.7%
Naugatuck Valley	17.6%
Northeastern	0.9%
Northwest Hills	12.4%
South Central	13.7%
Southeastern	1.8%
Western	22.9%
Total	**11.9%**

Drought

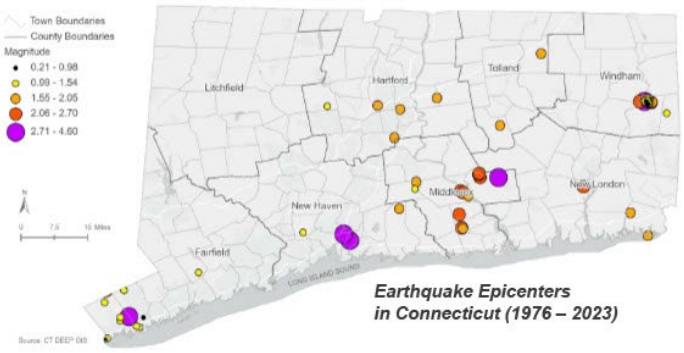
- Integrated information from the *2022 Connecticut Drought Preparedness and Response Plan*
- All parts of the state are vulnerable
  - Agricultural areas may experience worse impacts
  - Increases wildfire risk
- **Capitol Region COG** has the highest expected annual loss & highest agricultural value exposed to drought





Earthquake
History

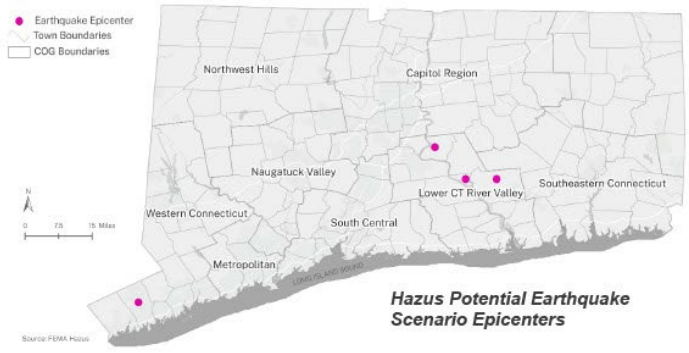
- **59 reported earthquakes** since 1970 (USGS)
  - CT ranks as 43 out of 50 states for earthquake activity (based on geologic and historical data)
  - No earthquake with a magnitude of > 3.5 has occurred in Connecticut within at least the last 30 years



Earthquake Epicenters in Connecticut (1976 – 2023)

Earthquake
Vulnerability

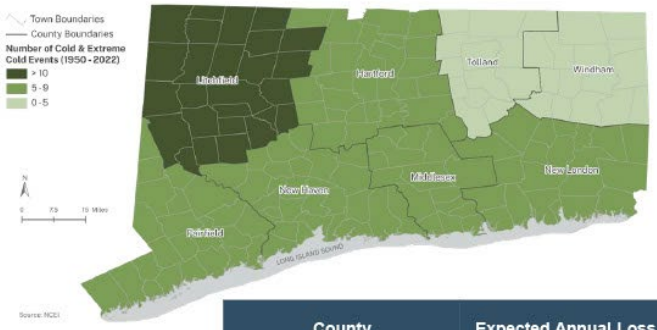
- Hazus probabilistic analysis was used to identify likely impacts from potential scenarios
  - 4 potential earthquake epicenters
  - Located in **Lower Connecticut River Valley COG** & **Western Connecticut COG**



Hazus Potential Earthquake Scenario Epicenters

Extreme Cold

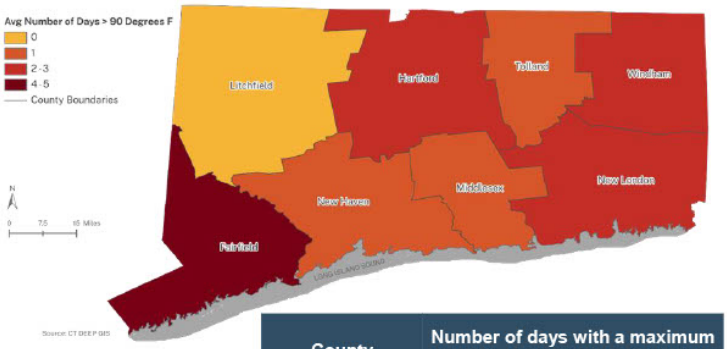
- **89** reported cold events between 1950 – 2022 (NCEI)
- Entire state is exposed to extreme cold
  - Most vulnerable populations include outdoor workers, unhouse individuals, people over 65, low-income households



County	Expected Annual Loss ($)
Fairfield	98,280.09
Hartford	231,603.33
Litchfield	75,196.24
Middlesex	21,546.31
New Haven	99,550.17
New London	33,891.75
Tolland	21,363.18
Windham	16,715.90
State Total	**598,146.98**

Extreme Heat
History

- **144** reported extreme heat days 2012 – 2021 (CDC)
  - Extreme heat days = days with a maximum temperature greater than 90°F
- **Fairfield County** has had the most extreme heat days

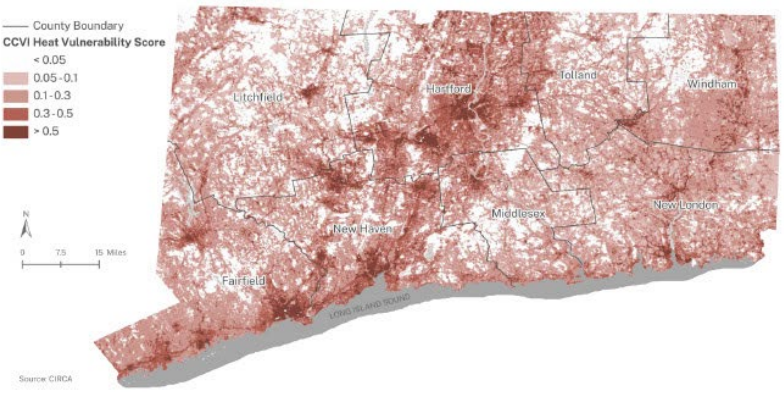


County	Number of days with a maximum temperature greater than 90°F
Fairfield	45
Hartford	26
Litchfield	3
Middlesex	5
New Haven	10
New London	24
Tolland	6
Windham	25
State Total	**144**

Extreme Heat

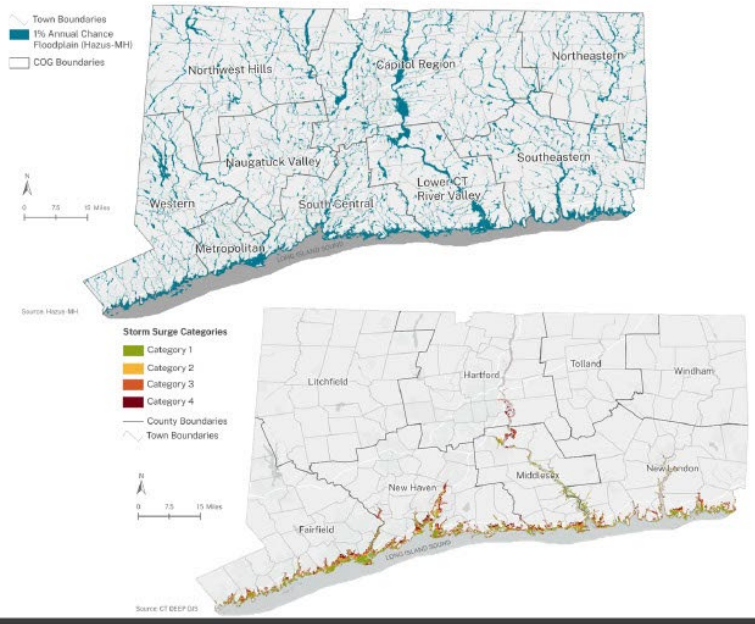
Vulnerability

- CCVI Heat Vulnerability
  - Considerations for tree cover, heat stress, asthma
- Most vulnerable populations include 65+, children, single-parent households, disability, pre-existing health conditions
- Highest vulnerability in urban areas (urban heat island effect)



Flood

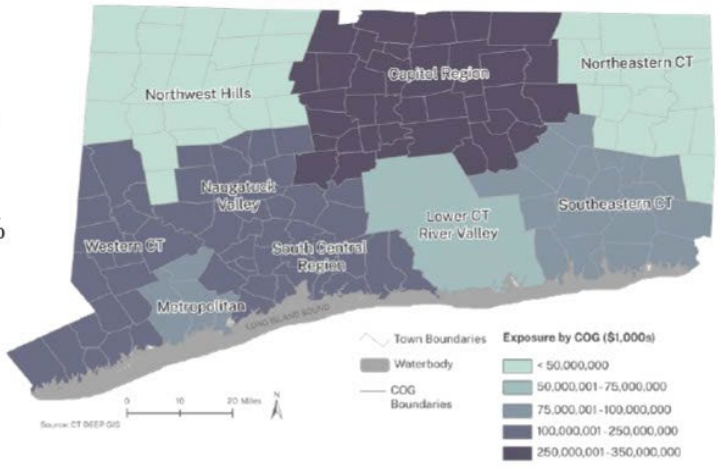
- Riverine, coastal, and flash flooding
- **850** reported flood events 1950 – 2022 (NCEI)
  - **$69,444,687** in estimated property damages
- **3,488 Repetitive Loss** properties, **424 Severe Repetitive Loss** properties (as of April 2023)
  - Majority located in Fairfield, New Haven, Middlesex counties



Flood

Riverine Flooding Losses

- Hazus- MH v6.0: Riverine & coastal flood loss analysis (1% annual chance flood model)
- **Capitol Region COG** has the highest value *exposure* to a 1% annual-chance-flood



Flood

Riverine Flooding Losses

Hazus-MH v6.0 1% annual chance flood loss estimation by COG ($1,000s)

COG Region	Exposure	Building Loss	Contents Loss	Business Disruption	Total Loss	Percent Loss
Capitol Region	$329,362,943	$251,953	$426,366	$3,700,328	$4,378,647	1.33%
Metropolitan	$95,014,173	$517,343	$907,799	$5,947,492	$7,372,634	7.76%
Naugatuck Valley	$133,830,413	$225,855	$460,183	$1,787,282	$2,473,320	1.85%
Northeastern Connecticut	$32,393,754	$152,149	$286,110	$1,017,759	$1,456,018	4.49%
Northwest Hills	$47,102,787	$492,788	$794,092	$2,517,650	$3,804,530	8.08%
Lower Connecticut River Valley	$60,617,277	$265,367	$323,505	$1,457,841	$2,046,713	3.38%
South Central Regional	$185,131,714	$369,949	$573,212	$4,784,701	$5,727,862	3.09%
Southeastern Connecticut	$90,782,941	$333,795	$499,011	$2,185,020	$3,017,826	3.32%
Western Connecticut	$246,578,817	$682,402	$803,516	$4,833,371	$6,319,289	2.56%
Total	**$1,220,814,819**	**$3,291,601**	**$5,073,794**	**$28,231,444**	**$36,596,839**	**3.00%**

Flood

Storm Surge Loss Analysis

- Hazus-MH v6.0
- Hurricane Category 1 – 4 depth grid scenarios
- National Hurricane Center's (NHC) Sea, Lake, and Overland Surges from Hurricanes (SLOSH) Maximum of the Maximum Envelope of Waters (MEOWs) (MOM) depth grid

Building Loss (Millions of Dollars)					
Storm Surge Category	Residential	Commercial	Industrial	Other	Total
Category 1	15,336.97	11,600.78	4,677.44	3,743.48	35,358.66
Category 2	40,857.38	33,487.59	14,264.32	10,458.46	99,067.74
Category 3	74,741.18	66,339.57	26,235.46	20,963.14	188,279.35
Category 4	124,916.37	110,963.42	39,815.99	37,483.85	313,179.62
Total (All Categories)	**255,851.90**	**222,391.36**	**84,993.21**	**72,648.93**	**635,885.37**

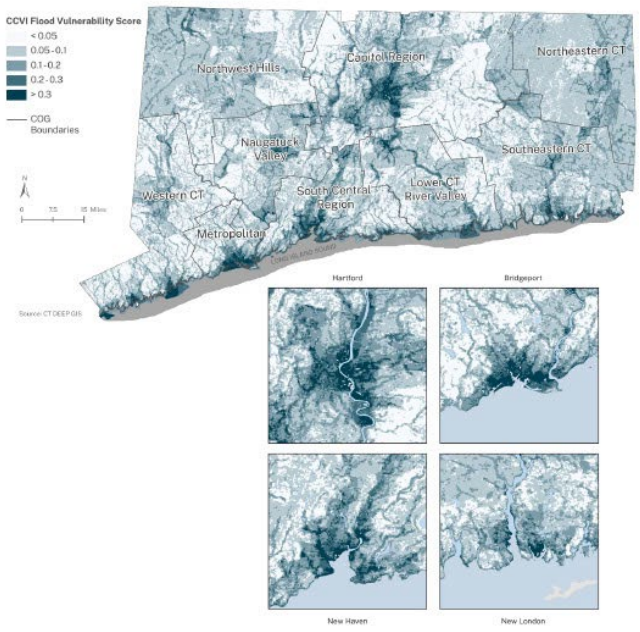
Business Interruption (Millions of Dollars)					
Storm Surge Category	Residential	Commercial	Industrial	Other	Total
Category 1	4,273.55	17,423.30	556.86	20,130.49	42,384.19
Category 2	8,049.87	33,881.49	938.75	34,819.30	77,689.41
Category 3	12,583.74	56,918.38	1,346.46	56,724.11	127,572.69
Category 4	18,867.53	85,809.14	1,773.37	84,156.86	190,606.90
Total (All Categories)	**43,774.69**	**194,032.31**	**4,615.44**	**195,830.76**	**438,253.19**

Flood

CCVI Flood Vulnerability

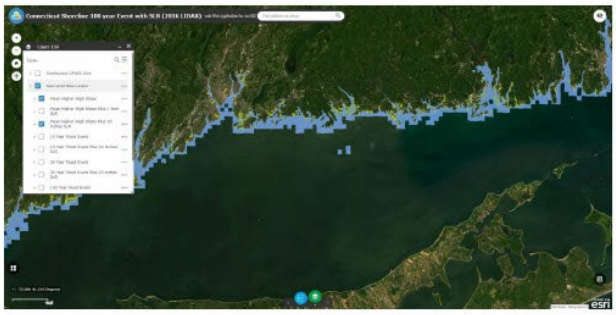
- COG regions with a CCVI Flood Vulnerability Score **above the statewide average**:
  - Metropolitan, Lower Connecticut River Valley, South Central, and Southeastern Connecticut

COG Region	Average CCVI Flood Vulnerability Score
Capitol Region	0.0854
Metropolitan	0.1120
Naugatuck Valley	0.0857
Northeastern Connecticut	0.0830
Northwest Hills	0.0753
Lower Connecticut River Valley	0.0946
South Central Regional	0.1107
Southeastern Connecticut	0.0926
Western Connecticut	0.0792
State Average	**0.0875**



Sea Level Rise

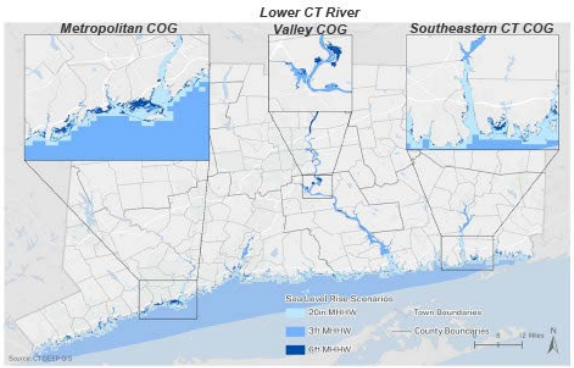
- The rate of sea level rise (SLR) along the Connecticut coast and broader mid-Atlantic coast has been **faster than the global rate**
  - Sea level around Bridgeport has risen by **5 inches since 1964**
- Coastal communities and communities along waterways that drain into the Long Island Sound are most at risk
- **43** nuisance flooding days between 2011-2020
  - Exceeded the number of events in any historically observed 10-year period
- CIRCA sea level rise projections:
  - Sea level will be **20 inches higher** than the national tidal datum in Long Island Sound by 2050



CIRCA Sea Level Rise Web Viewer

Sea Level Rise

- SLR exposure analysis:
  - **20 inches** (based on CIRCA SLR projections for 2050)
  - **3 ft** (based on 2022 Federal Interagency Sea Level Rise Scenarios for 2070)
  - **6 ft** (based on 2022 Federal Interagency Sea Level Rise Scenarios for 2100)
- Vulnerable COGs: Metropolitan, Naugatuck Valley, Lower CT River Valley, South Central Regional, Southeastern CT, Western CT

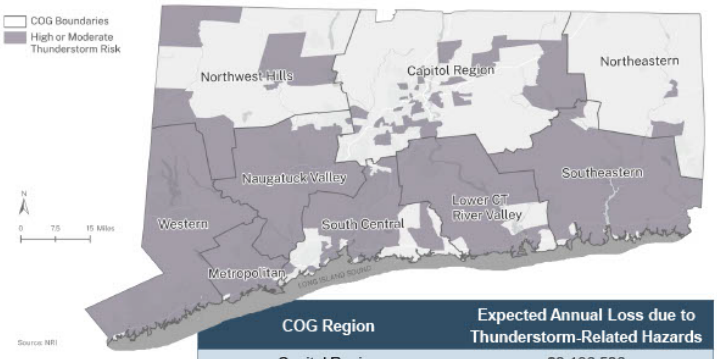


Critical Facilities Exposed to Sea Level Rise by COG Region

COG Region	1.8 ft SLR, MHHW	3 ft SLR, MHHW	6 ft SLR, MHHW
Metropolitan	1	1	6
Naugatuck Valley	0	0	1
Lower Connecticut River Valley	0	1	1
South Central Regional	0	1	5
Southeastern Connecticut	1	2	11
Western Connecticut	1	1	7
Total	3	6	31

Thunderstorm

- **3,503** thunderstorm events between 1950 – 2022 (NCEI)
  - **29** fatalities & **168** injuries
- Every COG has high or moderate thunderstorm risk (NRI)
- Highest expected annual loss due to thunderstorm-related hazards: **Western Connecticut COG, Capitol Region COG**



COG Region	Expected Annual Loss due to Thunderstorm-Related Hazards
Capitol Region	$3,186,506
Metropolitan	$2,970,658
Naugatuck Valley	$2,371,258
Northeastern Connecticut	$381,105
Northwest Hills	$1,043,715
Lower Connecticut River Valley	$1,682,121
South Central Regional	$2,286,782
Southeastern Connecticut	$1,741,071
Western Connecticut	$5,713,508
State Total	**$21,376,724**

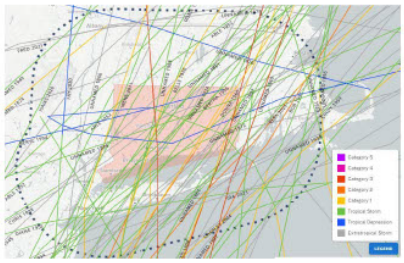
Tornado

- **126** tornado events between 1950 – 2022 (NCEI)
  - Injured over **700** people
  - Caused over **$1.8 billion** in damages
- Tornado **density analysis**: Most vulnerable areas in the State to tornado events based on past event locations
- **Naugatuck Valley COG & Capitol Region COG** have the highest critical facilities & population vulnerability to tornadoes





Tropical Cyclone



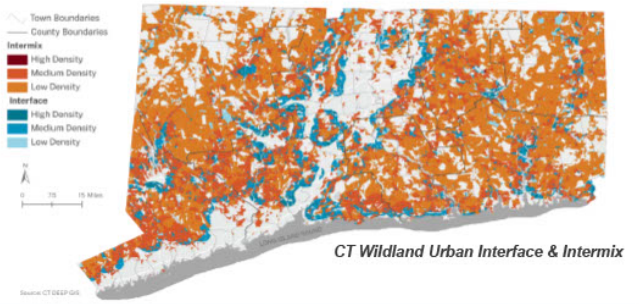
- 39 reported tropical cyclone events that have impacted CT (Northeast States Emergency Consortium)
- The two COGs estimated to have the most significant losses across all cyclone events are the **Capitol Region COG** & **South Central Region COG**

Hazus Total Estimated Losses in Thousands of Dollars for Cyclone Events by COG Region

COG Region	10-yr	20-yr	50-yr	100-yr	200-yr	500-yr	1,000-yr
Capitol Region	$20,051	$219,173	$1,104,687	$2,858,016	$6,948,205	$8,027,356	$16,502,781
Metropolitan	$1,975	$106,402	$170,048	$1,383,519	$2,735,277	$6,715,269	$9,032,938
Naugatuck Valley	$160	$92,408	$159,580	$1,094,598	$2,108,421	$6,517,548	$9,522,721
Northeastern Connecticut	$6,899	$14,868	$477,144	$242,032	$283,931	$110,896	$159,428
Northwest Hills	$907	$48,732	$29,255	$246,980	$422,647	$1,587,975	$2,757,434
Lower Connecticut River Valley	$5,301	$34,342	$632,049	$920,445	$1,800,555	$2,215,615	$2,573,241
South Central Regional	$6,957	$162,145	$755,933	$3,147,096	$6,378,173	$13,217,170	$17,720,094
Southeastern Connecticut	$8,467	$37,136	$2,314,197	$1,168,070	$955,782	$952,579	$782,576
Western Connecticut	$7,665	$197,471	$159,067	$2,172,220	$3,088,004	$8,795,276	$12,950,464
Total	**$58,382**	**$912,678**	**$5,801,960**	**$13,232,975**	**$24,720,997**	**$48,139,684**	**$72,001,677**

Wildland Fire

- **2,430** wildland fire events between 2013 – 2022
- **3,012 acres** burned
- Climate change is projected to increase wildland fire frequency, severity, and duration of the fire season
- **Metropolitan COG, Northwest Hills COG,** and **Lower CT River Valley COG** have **over 70% of critical facilities** located in the Wildland Urban Interface or Intermix

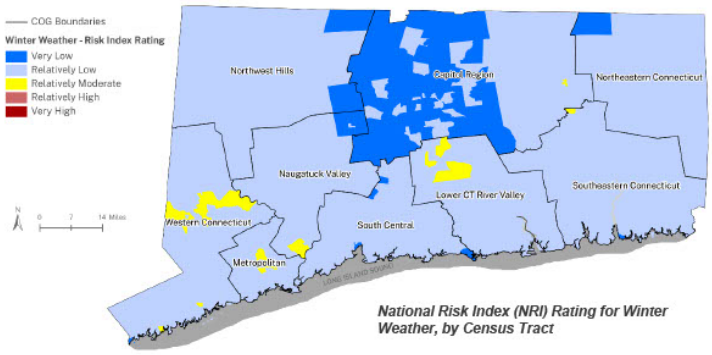


CT Wildland Urban Interface & Intermix

COG Region	Percent Critical Facilities within Intermix	Critical Facilities within Interface	Percent Critical Facilities within Interface	Total Critical Facilities At Risk	Total Percent Critical Facilities At Risk
Capitol Region	25.2%	76	23.7%	157	**48.9%**
Metropolitan	47.0%	36	26.9%	99	**73.9%**
Naugatuck Valley	18.5%	6	6.5%	23	**25.0%**
Northeastern Connecticut	24.4%	66	41.3%	105	**65.6%**
Northwest Hills	64.5%	25	26.9%	85	**91.4%**
Lower Connecticut River Valley	53.1%	34	34.7%	86	**87.8%**
South Central Regional	13.4%	50	24.9%	77	**38.3%**
Southeastern Connecticut	35.5%	59	31.7%	125	**67.2%**
Western Connecticut	21.7%	67	29.1%	117	**50.9%**

Winter Weather

- **1,306** winter weather events have occurred statewide between 1950 - 2022 (NCEI)
  - Includes winter weather, winter storms, blizzard, ice storms, and heavy snow
- **$56,274,910** in estimated property damages (2023 adjusted $)
- **7 deaths** and **54 injuries** from winter weather events were reported between 1950 – 2022
- **Relatively low risk** on average throughout the state (NRI)



National Risk Index (NRI) Rating for Winter Weather, by Census Tract

Hazard Ranking

Factors

- Geographic Extent
- Population Density
- Building Permits
- Facility Intersect
- Annualized Events
- Annualized Losses
- Injury & Death
- Social Vulnerability
- Hazard Concern
- Local Plans

Hazard Ranking

Preliminary Results

	Fairfield	Hartford	Litchfield	Middlesex	New Haven	New London	Tolland	Windham
Dam Failure	Medium	Medium	Medium	Medium	Medium-High	Medium	Medium	Low
Drought	Medium	High	Medium-High	Medium	Medium-High	Medium-High	Medium	Medium
Earthquake	Medium-High	Medium	Low	Medium-Low	Medium	Low	Low	Low
Flood	High	High	Medium	Medium-Low	Medium-High	Medium-High	Low	Medium-Low
Sea Level Rise	High	Medium-Low	Low	Medium	High	Medium-High	Low	Low
Thunderstorm	High	Medium-High	Medium-High	Medium	High	High	Medium	Medium-Low
Tornado	Medium	High	High	Medium-Low	High	Low	Medium	Medium-Low
Tropical Cyclone	High	High	Medium	Medium-High	High	High	Medium	Medium-Low
Wildland Fire	Medium-Low	Medium-Low	Medium	Medium-Low	Medium	Medium	Medium-Low	Medium
Winter Weather	High	Medium-High	Medium	Medium-Low	Medium	Medium-Low	Medium	Medium-Low
Extreme Heat	High	High	Medium	Medium	High	Medium	Medium-Low	Medium-Low
Extreme Cold	High	High	Medium-High	Medium	High	Medium-High	Medium	Medium-Low

Next Steps

& Questions/Discussion

Mitigation Goals & Objective Development

Potential Changes

2019 Goals

1. Promote implementation of sound floodplain management and other natural hazard mitigation principles on a state and local level
2. Implementation of effective natural hazard mitigation projects on a state and local level
3. Increase research and planning activities for the mitigation of natural hazards on a state and local level

+ Executive Orders & State Priorities

+ 2023 FEMA Mitigation Planning Guidance

Strategic Categories

- Encourage Local Physical Projects
- Capability and Capacity Building
- Public Awareness and Education
- Forward-Looking Policy and Planning

Upcoming Mitigation Strategy Meeting

- *In-person* **Mitigation Strategy Workshop** will be held on **Monday, August 7th, from 9:00 – 11:00 am**
  - At least one person per agency on the CT HMPT (who can develop new mitigation activities for their agency) must attend
- Before the meeting:
  - Complete any remaining **2019 activity status updates** for your agency/office. *FEMA requires this*. Due: Friday, 7/27
  - Tell us about new hazard mitigation activities you'd like considered for the 2023 HMP:

Questions & Discussion



Please send any other questions/comments to:

Jade Payne
jpayne@dewberry.com

1.3.2 Agenda



State of Connecticut
Department of Emergency Services & Public Protection
Division of Emergency Management & Homeland Security

Meeting Agenda

Title:	Connecticut State Natural Hazard Mitigation Plan Update Risk Assessment Results	**Location:**	Microsoft Teams
Date:	Wednesday, July 19th, 2023	**Time:**	2:00 – 3:30 pm ET
Purpose:	Summarize the planning process so far, provide an overview of the most interesting results for each hazard, provide the current hazard rankings, and list the next steps		

Agenda Items

Topic	Presenter	Time
CT Natural Hazard Mitigation Plan – Status Update - Overview of presenters - Planning process overview - Milestones check-in	Scott Choquette, Dewberry	2:00 – 2:10 pm

Hazard Identification & Risk Assessment Process Overview
- Purpose & Components
- 2023 improvements
- Data highlights
  o CIRCA CCVI Social Sensitivity
  o Future conditions data
  o Critical facilities & state-owned buildings
- Local hazard mitigation plan incorporation
	Jade Payne, Dewberry	2:10 – 2:30 pm

Risk Assessment Results - Results highlights for each hazard: dam failure, drought, earthquake, extreme cold, extreme heat, flood, sea level rise, thunderstorm, tornado, tropical cyclone, wildland fire, winter weather - Preliminary hazard rankings	Hanna Rush & Ashley Gordon, Dewberry	2:30 – 3:00 pm
Questions & Discussion	*All participants*	3:00 – 3:25 pm
Next Steps	Scott Choquette, Dewberry	3:25 – 3:30 pm

Dewberry

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1.3.3 Notes

State of Connecticut
Department of Emergency Services & Public Protection
Division of Emergency Management & Homeland Security

Meeting Notes

Title: Connecticut State Natural Hazard Mitigation Plan Update Risk Assessment Results

Location: Microsoft Teams

Date: Wednesday, July 19th, 2023

Time: 2:00 – 3:30 pm ET

Purpose: Summarize the planning process so far, provide an overview of the most interesting results for each hazard, provide the current hazard rankings, and list the next steps

Attendance

- Alexander, Ian
- Amanda Kennedy
- Barber, Cora K.
- BenitezOu, Ashley
- Bobula, Kendall
- Bradner, George
- Chakraborty, Mithila
- Choquette, Scott
- Darrin Punchard
- Diaz, Peggy
- Dumais, Kenneth
- Dumais, Kenneth
- Duva, Diane
- Fabris, Gemma
- Francis, Peter
- Fabris, Gemma
- Francis, Peter
- Giron, Zachary
- Glowacki, Douglas
- Gordon, Ashley
- Herrera, Alfredo
- Jamie Caplan
- Keith Hedrick (Guest)
- Knight, Kathleen
- Lee, Charles
- Lindquist, Eric
- Loughlin, Sean
- Mcphee, Eric
- Meghan Seremet
- Meghan Sloan
- Mendolia, Connie
- Mozzer, Michael
- Murphy, David
- Noah Slovin
- O'Donnell, James
- Payne, Jade
- Rush, Hanna R.
- Santoro, Michael C
- Todd Fontanella
- Truscinski, John
- Wozniak-Brown, Joanna
- Zessos, Stephanie

Meeting Summary

Scott Choquette (Project Manager, Dewberry), Jade Payne (Deputy Project Manager, Dewberry), Hanna Rush (Plan Development Lead, Dewberry), and Ashley Gordon (Risk Assessment Lead, Dewberry) met with the Connecticut Hazard Mitigation Planning Team (HMPT) on July 19, 2023, to provide an overview of the recently completed risk assessment results.

A PowerPoint presentation was used to review the project's current status, provide an overview of the risk assessment process, highlight key results for each hazard, and provide an opportunity to ask questions. Discussions were held throughout the presentation to gather feedback from the HMPT on the risk assessment results. Discussion and presentation topics are grouped below with input and questions from the HMPT. The meeting chat log is included at the end.

Dewberry 1

Meeting Notes

Plan Status Update

- Ken Dumais: Thank you to you and your entire team for running this meeting.
- Doug Glowacki: Yes, thank you very much for your team and for helping us out with the planning initiative.
- Ken Dumais:On the original timeline, we were going to get the plan to FEMA in August. Are we on track for September now?
    - Scott Choquette: Yes, the modified schedule has us submitting right around the beginning of September.
    - Sean Loughlin: Yes, the sooner the better. We try to suggest two 45-day review periods on the FEMA side.
    - Scott Choquette: Sure, we will send you the risk assessment first so you can get started on it.

Hazard ID & Risk Assessment Process Overview

- *No comments/notes (see presentation slide for information covered)*

Risk Assessment Results

- George Bradner: [regarding HAZUS hurricane wind losses] Are these economic losses? What is being captured with the dollar figures here?
    - Hanna Rush: We have building losses at the top and economic, or business interruption losses, on the bottom table.
    - Scott Choquette: This also includes lost wages, lost rent, etc. It's not just lost business revenue.
    - George Bradner: Where do those values come from, for residential vs commercial?
    - Scott Choquette: Hazus pulls national-level building inventory data and then applies a depth grid. It looks at foundation type, construction materials, etc. A depth-damage function is used to calculate damages from a particular event. It was created by the Army Corps of Engineers.
- Jim O'Donnell: The CIRCA prediction is *up to* 20 inches, not that it will be 20 inches. It's an important distinction.
    - Ashley Gordon: Yes, we will note in the text that the CIRCA data specifies *up to* 20 inches, but for the purposes of our hazard scenario for 2050, we used 20 inches to show potential damages and impacts.
- George Bradner: For wildfire, was there information on structures that may have been lost? Like the number of structures or the type? One of the concerns we're seeing on the insurance department side is companies filing forms about wildfires in Connecticut, and this information would be helpful. I didn't realize there were 2400 fires since 2013.
    - Scott Choquette: A lot of the data we have is anecdotal, incomplete, and inconsistent.

- Hanna Rush: The data we used considers fires not just in urban areas, but heavily forested and remote areas as well. This may be an overestimation of what you would think of as a wildfire hazard that actively threatens people and property.
- George Bradner: Even so, 3000 acres burned is a lot more than I would have thought. It definitely popped out to me.

Questions & Discussion

- Amanda Kennedy: You mentioned you got population projections from the state. We have an ongoing issue where our population projections aren't good, the 2018 state data center projections specifically. DOT used them previously and the COG executive directors had issues with them, so DOT had to use a modified set of projections. We may have the same issue here. Which projections did you use?
  - Jade Payne: The source is the Connecticut State Data Center from 2021. It was provided on ctdata.gov.
  - Scott Choquette: Please send us an email outlining your concern, and we'll look into it and get back to you.
- Douglas Glowacki: In the executive summary, you should note the most vulnerable areas of the state. One of them would be the wildland-urban interface. The other is urban flooding. We had a string of nasty flooding last week. We had some related deaths as well. Many people, including politicians, will read the executive summary and that's it. Please include a bulleted list of the most significant vulnerabilities.
  - Scott Choquette: Yes, good point Doug, we will do that. The lack of pluvial data makes doing a risk assessment on urban flooding very hard. FEMA's data is focused on fluvial.
  - Doug Glowacki: The state passed an $85 million bond initiative for flooding in North Hartford to help. They will be redesigning the drainage system to handle the level of flooding. The systems are under-designed.
  - Scott Choquette: We will talk about this more during the next meeting, but we want to include a strategy to identify resources to do a large-scale, state-level pluvial analysis of some kind.
  - Ken Dumais: It would be helpful to have that information for upcoming BRIC projects as well, especially the stormwater infrastructure projects.
- Jim O'Donnell: I've been looking at the hazard ranking summary table, and there's some things that don't make sense to me on first look.
  - Scott Choquette: Sure, we definitely want feedback on it. It's preliminary, so it may change some, so we welcome any feedback while we are adjusting the weighting and such.

Next Steps

- Jamie Caplan: The key thing will be for everyone to complete the activity dispositions, so providing updates on old actions and start thinking about what you want your new actions to be. Be ready to make progress at the strategy workshop.

- Sean Loughlin: Are you going to have more manageable chunks of the document this time around? It was over 1000 pages last time.
    - Jade Payne: Yes, we can publish it by sections and all together.

Meeting Chat Log

[Wednesday 2:19 PM] Knight, Kathleen
no sorry

[Wednesday 2:19 PM] Jamie Caplan (Guest)
I see the correct slide

[Wednesday 2:19 PM] Wozniak-Brown, Joanna (Guest)
i have bar scans too

[Wednesday 2:19 PM] Wozniak-Brown, Joanna (Guest)
now on Hazard ID & Risk Assessment

[Wednesday 2:20 PM] Jamie Caplan (Guest)
I see it and can scroll through your slides!

[Wednesday 2:59 PM] Bradner, George
Gotta jump to another call let me know if you need anything from me!
like 1

[Wednesday 3:05 PM] Rush, Hanna R.
Amanda Kennedy here's the source for the Population Projections: https://data.ct.gov/Government/2015-2040-Population-Projections-State-County-and-/pv2w-k7qu

2015-2040 Population Projections - State, County, and Regional Councils of Governments Level | Connecticut Data
[Wednesday 3:08 PM] Murphy, David
Thanks to Scott and his team -- CIRCA is working with CRCOG on the HMP update and we would love to strive for consistency. Also, we are leading a one-hour risk assessment workshop with the CRCOG towns on July 24. We can provide an invite to anyone in this call that may be interested
like 3

[Wednesday 3:17 PM] Loughlin, Sean (Guest)
Great work all with this ambitious statewide effort. Will be a great product for use in the years to come!

[Wednesday 3:18 PM] Fabris, Gemma
Thank you, great presentation and overview of all the work you've done! Already sent the survey out to a few folks to take.
heart 1

1.3.4 Attendance

1. Summary

Meeting title	CT HMP: Hazard Risk Assessment Results
Attended participants	41
Start time	7/19/23, 1:51:23 PM
End time	7/19/23, 3:24:36 PM
Meeting duration	1h 33m 12s
Average attendance time	1h 10m 17s

2. Participants

Name	First Join	In-Meeting Duration	Role
Payne, Jade	7/19/23, 1:55:02 PM	1h 29m 33s	Organizer
Choquette, Scott	7/19/23, 1:56:58 PM	1h 27m 32s	Organizer
Gordon, Ashley	7/19/23, 2:00:05 PM	1h 24m 29s	Organizer
Rush, Hanna R.	7/19/23, 2:00:24 PM	1h 24m 9s	Organizer
Murphy, David	7/19/23, 1:51:27 PM	1h 26m 18s	Attendee
Noah Slovin	7/19/23, 1:53:34 PM	1h 30m 59s	Attendee
Keith Hedrick (Guest)	7/19/23, 1:53:59 PM	38m 38s	Attendee
Todd Fontanella	7/19/23, 1:54:43 PM	1h 29m 52s	Attendee
Glowacki, Douglas	7/19/23, 1:57:43 PM	1h 26m 47s	Attendee
Fabris, Gemma	7/19/23, 1:57:53 PM	1h 20m 56s	Attendee
Mozzer, Michael	7/19/23, 1:58:10 PM	1h 21m 13s	Attendee
Santoro, Michael C	7/19/23, 1:59:19 PM	1h 25m 11s	Attendee
Meghan Seremet	7/19/23, 1:59:25 PM	1h 25m 1s	Attendee
Chakraborty, Mithila	7/19/23, 1:59:42 PM	1h 22m 33s	Attendee
Lindquist, Eric	7/19/23, 1:59:56 PM	1h 3m 31s	Attendee
Dumais, Kenneth	7/19/23, 1:59:59 PM	19m 23s	Attendee
Jamie Caplan	7/19/23, 2:00:13 PM	1h 24m 12s	Attendee
Amanda Kennedy	7/19/23, 2:00:26 PM	1h 17m 28s	Attendee
Mcphee, Eric	7/19/23, 2:00:29 PM	1h 16m 55s	Attendee
Lee, Charles	7/19/23, 2:00:34 PM	1h 23m 56s	Attendee
Bradner, George	7/19/23, 2:00:46 PM	59m 22s	Attendee
Francis, Peter	7/19/23, 2:00:53 PM	1h 12m 32s	Attendee
Knight, Kathleen	7/19/23, 2:00:54 PM	59m 17s	Attendee
Barber, Cora K.	7/19/23, 2:01:14 PM	1h 23m 21s	Attendee
Loughlin, Sean	7/19/23, 2:01:25 PM	1h 23m 4s	Attendee
Truscinski, John	7/19/23, 2:01:34 PM	47m 13s	Attendee
Wozniak-Brown, Joanna	7/19/23, 2:02:08 PM	1h 22m 21s	Attendee
BenitezOu, Ashley	7/19/23, 2:02:24 PM	1h 22m 9s	Attendee
Giron, Zachary	7/19/23, 2:02:39 PM	1h 21m 38s	Attendee
Diaz, Peggy	7/19/23, 2:02:45 PM	1h 20m 36s	Attendee
Meghan Sloan	7/19/23, 2:03:01 PM	1h 21m 24s	Attendee
Mendolia, Connie	7/19/23, 2:03:13 PM	1h 21m 10s	Attendee
Herrera, Alfredo	7/19/23, 2:04:04 PM	1h 20m 31s	Attendee
Darrin Punchard	7/19/23, 2:04:42 PM	1h 6m 12s	Attendee
O'Donnell, James	7/19/23, 2:08:08 PM	1h 16m 23s	Attendee
Dumais, Kenneth	7/19/23, 2:23:13 PM	1h 1m 21s	Attendee
Alexander, Ian	7/19/23, 2:29:19 PM	38m 7s	Attendee

Zessos, Stephanie	7/19/23, 2:29:43 PM	54m 46s	Attendee	
Bobula, Kendall	7/19/23, 2:52:53 PM	31m 43s	Attendee	
Duva, Diane	7/19/23, 2:54:15 PM	6m 12s	Attendee	
	16177772001	7/19/23, 3:24:36 PM		Attendee

3. In-Meeting Activities

Name	Join Time	Duration
Payne, Jade	7/19/23, 1:55:02 PM	1h 29m 33s
Choquette, Scott	7/19/23, 1:56:58 PM	1h 27m 32s
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Meghan Sloan	7/19/23, 2:03:01 PM	1h 21m 24s
Mendolia, Connie	7/19/23, 2:03:13 PM	1h 21m 10s
Herrera, Alfredo	7/19/23, 2:04:04 PM	1h 20m 31s
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Duva, Diane	7/19/23, 2:54:15 PM	6m 12s		
	16177772001	7/19/23, 3:24:36 PM	Attendee	

1.4 Mitigation Strategy Workshop

1.4.1 Presentation

Dewberry



Connecticut Natural Hazard Mitigation Plan

2023 Update

Mitigation Strategy Workshop

Monday, August 7, 2023

Planning Process

Milestones



2 | CT NHMP 2023 Mitigation Strategy Workshop August 7, 2023 | Dewberry

Workshop Agenda

1. Mitigation Strategy Overview
2. Review 2023 Mitigation Goals
3. Discuss Possible Mitigation Actions
4. **BREAKOUT GROUPS:** Identify New Mitigation Actions!
5. Next Steps & Questions/Discussion

Meet Today's Facilitators!



Scott Choquette
Project Manager
Dewberry



Jade Payne
Deputy Project Manager
Dewberry



Hanna Rush
Resilience Planning Lead
Dewberry



Jamie Caplan
Mitigation Strategy Support
Jamie Caplan Consulting



Darrin Punchard
Mitigation Strategy Support
Punchard Consulting



Noah Slovin
Outreach / Local Plan Coordination
SLR Consulting

Mitigation Strategy

The State's long-term blueprint for reducing hazard risk

- Mitigation Goals are broad, long-term policy/vision statements
- Mitigation Actions are specific, measurable activities that are:
  - ✓ Supportive of Mitigation Goals
  - ✓ Informed by previous (2019) mitigation actions/activities
  - ✓ Based on the Risk Assessment
  - ✓ Rooted in the Capability Assessment
  - ✓ Considerate of local/regional hazard mitigation plans and strategies
  - ✓ In alignment with Executive Orders and State priorities

5 | CT NHMP 2023 Mitigation Strategy Workshop August 7, 2023 | Dewberry

Mitigation Goals & Action Development

Potential Changes

2019 Goals

1. Promote implementation of sound floodplain management and other natural hazard mitigation principles on a state and local level
2. Implementation of effective natural hazard mitigation projects on a state and local level
3. Increase research and planning activities for the mitigation of natural hazards on a state and local level

+ Executive Orders & State Priorities

+ 2023 FEMA Mitigation Planning Guidance

Strategic Categories

- Encourage Local Physical Projects
- Capability and Capacity Building
- Public Awareness and Education
- Forward-Looking Policy and Planning

2023 Mitigation Goals

Physical Projects
- Considering current and future conditions, protect human life and safety, public infrastructure, private property, and the environment by implementing physical hazard mitigation and climate adaptation projects that effectively and equitably reduce risk.

High Hazard Dams
- Reduce vulnerabilities to and from high hazard potential dams.

Forward-Looking Policy and Planning
- Adapt to climate change and natural hazards through forward-looking policies, plans, regulations, and programs that reduce risk and support long-term resilience.

Awareness and Education
- Increase general awareness of Connecticut's natural and climate-related hazards and promote measures available to reduce risks through educational outreach.

Capability and Capacity Building
- Enhance the capability and capacity of State agencies, regional entities, and local governments to identify vulnerabilities and risks, integrate risk reduction strategies, and implement resilience projects.

Mitigation Actions

What must be addressed:

- State-owned assets: buildings and infrastructure
- Socially vulnerable populations and underserved communities
- Future conditions and climate resilience
- All identified natural hazards

Natural Hazards

- Dam Failure
- Drought
- Earthquake
- Extreme Cold
- Extreme Heat
- Flood
- Sea Level Rise
- Thunderstorm
- Tornado
- Tropical Cyclone
- Wildland Fire
- Winter Weather

Key Outcomes: Mitigation Action Tracker

Essential Details (Required Today!)	Optional Information	Not Needed Today
• Action Title • Action Description • Lead Agency/Entity • Estimated Cost • Potential Funding Sources • Priority Level • Point of Contact for More Info	• Support Agencies/Partners • Timeframe for Completion • Hazard(s) Addressed	• Action Category • 2023 Goal(s) Supported • Prioritization Breakdown

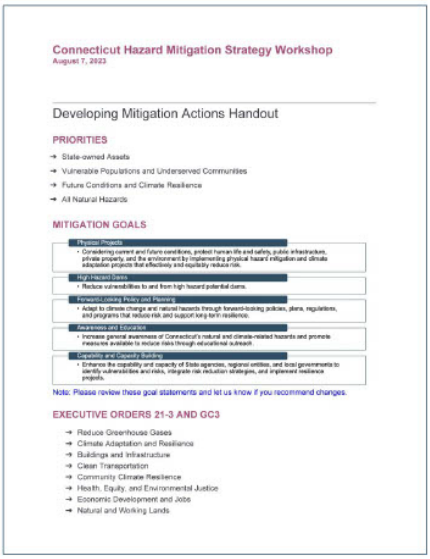
Breakout Groups

1. **DEMHS** (Jamie)
2. **DEEP** (Scott)
3. **COGs + Municipalities** (Noah)
4. **UConn/CIRCA + Stakeholders** (Darrin)
5. **Other Agencies** (Jade & Hanna)

* ***Emily Mills*** *will be in the main meeting room to help with technical difficulties and coordinate a breakout group assignment for anyone who joins late.*

Handout

- Priorities
- Mitigation Goals
- Executive Orders 21-3 and GC3
- HIRA Findings
  - Final Hazard Ranking
  - Problem Statements
- Challenges Identified from Local HMPs
- Types of Mitigation Actions
- Action Prioritization Criteria



Connecticut Hazard Mitigation Strategy Workshop
August 7, 2023

Developing Mitigation Actions Handout

PRIORITIES

- State-owned Assets
- Vulnerable Populations and Underserved Communities
- Future Conditions and Climate Resilience
- All Natural Hazards

MITIGATION GOALS

Physical Projects
- Considering current and future conditions, protect human life and safety, public infrastructure, private property, and the environment by implementing physical hazard mitigation and climate adaptation projects that effectively and equitably reduce risk.

High-Hazard Gains
- Reduce vulnerabilities to and from high hazard potential dams.

Forward-Looking Policy and Planning
- Adapt to climate change and natural hazards through forward-looking policies, plans, regulations, and programs that reduce risk and support long-term resilience.

Awareness and Education
- Increase general awareness of Connecticut's natural and climate-related hazards and promote measures available to reduce risks through educational outreach.

Capability and Capacity Building
- Enhance the capability and capacity of State agencies, regional entities, and local governments to identify vulnerabilities and risks, integrate risk reduction strategies, and implement resilience projects.

Note: Please review these goal statements and let us know if you recommend changes.

EXECUTIVE ORDERS 21-3 AND GC3

- Reduce Greenhouse Gases
- Climate Adaptation and Resilience
- Buildings and Infrastructure
- Clean Transportation
- Community Climate Resilience
- Health, Equity, and Environmental Justice
- Economic Development and Jobs
- Natural and Working Lands

HIRA Main Findings

- **Most frequently occurring hazards**: flooding, thunderstorm, winter weather
  - Highest estimated flood loss $ (Hazus): Metropolitan COG & Western CT COG
  - Highest thunderstorm expected annual loss $ (NRI): Western CT COG, Capitol Region COG
  - Highest winter weather expected annual loss $ (NRI): Western CT COG, Metropolitan COG
- **Highest CCVI Flood Vulnerability Score**: Metropolitan COG & South Central Regional COG
- **Highest CCVI Heat Vulnerability Score**: Metropolitan COG, Capitol Region COG, South Central Regional COG
- Climate change is projected to have the biggest influence on increasing extreme heat occurrences & sea level rise

Survey Results – Hazard Concern

State Hazard Mitigation Team Survey:

Hazard	Concern Weighted Average Score
Flood	2.75
Hurricane/Tropical Cyclone	2.75
Extreme Heat	2.63
Sea Level Rise	2.63
Drought	2.25
Extreme Cold	1.88
Wildland Fire	1.75
Winter Weather	1.75
Thunderstorm	1.65
Dam Failure	1.5
Tornado	1.5
Earthquake	0.88

Stakeholder Survey:

Hazard	Concern Weighted Average Score
Flood	4
Hurricane/Tropical Cyclone	3.71
Extreme Heat	3.57
Drought	3.14
Thunderstorm	3.14
Sea Level Rise	3
Winter Weather	3
Extreme Cold	2.86
Dam Failure	2.29
Tornado	2.29
Wildland Fire	2.14
Earthquake	1.29

Public Survey:

Hazard	Concern Weighted Average Score
Flood	4.1
Extreme Heat	4
Hurricane/Tropical Storm	3.65
Drought	3.2
Extreme Cold	3.2
Winter Weather	3.16
Thunderstorm	3.1
Sea Level Rise	2.8
Tornado	2.6
Wildland Fire	2.16
Dam Failure	2.15
Earthquake	1.65

Hazard Rankings (Statewide)

Hazard	Hazard Score	Updated Hazard Score w/ Climate Weight	Hazard Ranking
Extreme Heat	2.67	3.67	High
Flood	2.65	3.55	High
Drought	2.86	3.47	Medium-High
Tropical Cyclone	3.07	3.39	Medium-High
Thunderstorm	3.01	3.01	Medium-High
Extreme Cold	2.83	2.83	Medium
Tornado	2.70	2.70	Medium
Wildland Fire	2.40	2.69	Medium
Winter Weather	2.45	2.45	Medium-Low
Sea Level Rise	2.20	2.40	Medium-Low
Dam Failure	2.24	2.24	Medium-Low
Earthquake	2.16	2.16	Medium-Low

State Capabilities

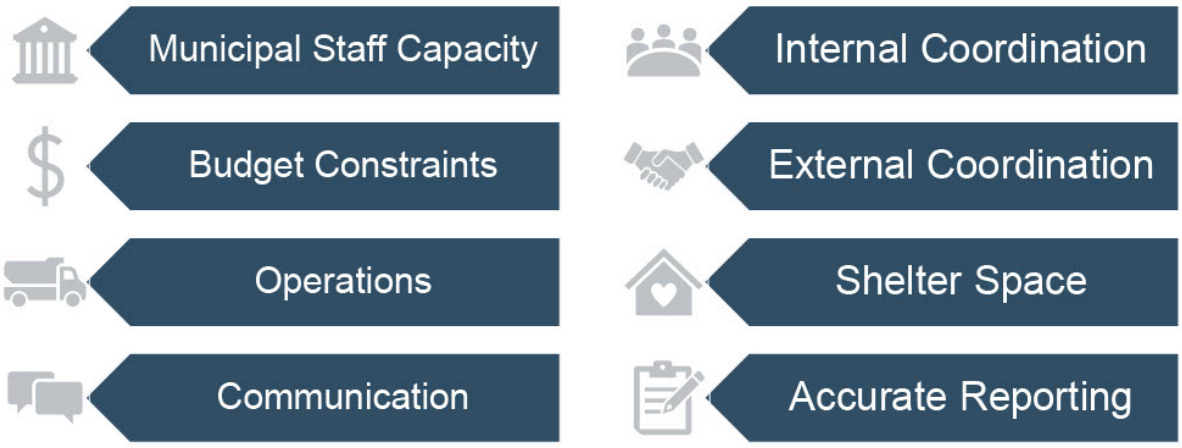
New Capabilities Since 2018 HMP Update

- Recent Executive Orders
- Climate Resilience Fund
- CIRCA Resilient CT Initiative
- Connecticut Equity and Environmental Justice Advisory Council

Hazard Mitigation Capabilities of RPOs

- Technical Assistance
- Planning
- Tools and Data
- Emergency Communication

Local HMP Roll-Up: Identified Challenges



Action Prioritization Criteria

Prioritization Category	Qualification	Points
Hazard Ranking	What level of risk does the action provide protection against?	High = 4 Medium-High = 3 Medium = 2 Medium-Low = 1 Low = 0
Estimated Cost	How much will the action cost to implement?	No Monetary Cost = 4 Low (under $250,000) = 3 Medium ($250,000-$500,000) = 2 High ($500,000 - $1 million) = 1 Very High (Over $1 million) = 0
Life/Safety	How effective is the action at protecting lives and mitigating injuries resulting from the targeted hazard(s)?	Major Support = 3 Moderate Support = 2 Minor Support = 1 None = 0
Equitable Outcomes	Will the action benefit socially vulnerable populations or underserved communities?	Direct Support = 3 Indirect Support = 2 No Support = 0
Protection of Critical Facilities or Infrastructure	Does the action directly protect critical facilities or infrastructure?	Yes = 2 No = 0
Protection of Natural Resources	Does the action protect natural resources?	Yes = 2 No = 0
Alignment with Executive Orders	Does the action align with Executive Orders 21-3 or GC3?	Yes = 2 No = 0
Supports Local Mitigation Efforts	Does the action advance strategies identified in regional/local hazard mitigation plans?	Yes = 2 No = 0
Implementation Timeline	How long will it take for the action to yield benefits from the start of implementation efforts?	1-2 Years = 3 3-4 Years = 2 5 or More Years = 1

Mitigation Action Categories

Plans & Regulations: government authorities, policies, or codes that encourage risk reduction. This may include building codes, state planning regulations, or planning studies.

Structure & Infrastructure Projects: build or modify structures and infrastructure in ways that reduce the impact of hazards.

Natural Systems Protection Projects: minimize losses while also preserving or restoring the function of natural systems.

Education & Awareness Programs: long-term, sustained efforts to inform and educate people about hazards and mitigation options. This could also include training.

Capability and Capacity Building: improve or expand the resources needed to reduce risk and support resilience. This may include people, partnerships, data, funding, etc.

Next Steps and Questions/Discussion



Please send any other questions/comments to:

Jade Payne

jpayne@dewberry.com

1.4.2 Notes

State of Connecticut
Department of Emergency Services & Public Protection
Division of Emergency Management & Homeland Security

Workshop Notes

Title:	Connecticut Hazard Mitigation Strategy Workshop	Location:	Microsoft Teams
Date:	Monday, August 7th, 2023	Time:	9:00 – 11:00 am ET
Purpose:	Decisions on each agency's activities for the upcoming plan will be made during the workshop in working groups. COGs/municipalities/stakeholders will also be able to provide feedback on the types of actions they would like to see included.		

Attendance

- Alexander, Ian[1]
- Andino, Lissette[4]
- Andreucci, Rebecca[3]
- Baklik, Drew[3]
- BenitezOu, Ashley[2]
- Bergeron, Brenda[1]
- Bobula, Kendall[1]
- Boush, Lisa[4]
- Bradner, George[5]
- Burns, Margot[3]
- Caplan, Jamie[1]
- Chandy, Binu[5]
- Choquette, Scott[2]
- Desautels, Dean[4]
- Dumais, Ken[1]
- Fabris, Gemma[1]
- Fedak, Victoria[4]
- Fey, Delia[3]
- Field, John[1]
- Fontanella, Todd[3]
- Francis, Laura[3]
- Francis, Peter[2]
- French, Rebecca[2]
- Gaul, Scott[5]
- Godwin, Joseph[5]
- Ifkovic, Diane[2]
- Kinney, Jonathan[5]
- Larkin, Jim[3]
- Lee, Charles[2]
- Lindquist, Eric[5]
- Loughlin, Sean[2]
- Massano, Cassandra[4]
- Michaels, Karen[2]
- Mills, Emily
- Morrissette, Jeff[1]
- Moyer, Danielle[1]
- Mozzer, Michael[5]
- Murphy, David[4]
- O'Donnell, Jim[4]
- Paszczuk, Henry[1]
- Payne, Jade[5]
- Perkins, Bill[3]
- Pestana, Edith[2]
- Pickering, Francis[3]
- Punchard, Darrin[4]
- Pysh, Emily[5]
- Runowicz, Eric[5]
- Rush, Hanna[5]
- Santoro, Michael[5]
- Seremet, Meghan[2]
- Shiel, Kyle[3]
- Sloan, Meghan[3]
- Slovin, Noah[3]
- Truscinski, John[4]
- Warren, Sheila[4]
- Watson, Sarah[2]
- White, Joshua[4]
- Wozniak-Brown, Joanna[5]
- Xie, Sabrina[2]
- Zessos, Stephanie[1]
- Zigich, Kimberly[1]

Breakout Group:
[1] DEMHS
[2] DEEP
[3] COGs and Municipalities
[4] UCONN/CIRCA & Stakeholders
[5] Other CT Agencies

Dewberry

Meeting Summary

Scott Choquette (Project Manager, Dewberry), Jade Payne (Deputy Project Manager, Dewberry), Hanna Rush (Resilience Planning Lead, Dewberry), Jamie Caplan (Mitigation Strategy Support, Jamie Caplan Consulting), Darrin Punchard (Mitigation Strategy Support, Punchard Consulting), and Noah Slovin (Outreach/Local Plan Coordination, SLR) met with the Connecticut Hazard Mitigation Planning Team (HMPT) and stakeholders determine which actions will be included in the 2023 CT NHMP Mitigation Strategy.

A PowerPoint presentation was used to review the project's status, review the 2023 mitigation goals, discuss possible mitigation actions, and provide an opportunity to ask questions. Five breakout groups (divided by agency/organization) were held to gather feedback from the HMPT and stakeholders on new mitigation actions. Meeting notes were taken in the form of edits to the Excel-based Mitigation Action Tracker. A handout was provided to help with action development. The meeting chat log is included below, and this meeting was recorded.

Meeting Chat Logs

Main Chat:
[9:22 AM] Payne, Jade
Handout Link: https://dewberryportal-my.sharepoint.com/:f:/g/personal/jpayne_dewberry_com/Emmo-EzCPP1Lj05g-gUjRRwBDQaA0_kGEAbueIJ6Acn9QA?e=dlVbFu

[9:23 AM] Pestana, Edith
thank you!

like 1
[9:23 AM]
Payne, Jade pinned a message.
[9:24 AM] Watson, Sarah
Did modeling include increased frequency of heavy precip outside of tropical cyclones?

[9:24 AM] O'Donnell, James
Then I would advise taking it out of the Hazard Risk list. It is the mechanism that is making coastal flood risk much higher in the future. I think that is irrefutable. separating it from flooding is likely to lead to confusion,

[9:24 AM] Murphy, David
O'Donnell, James

Sorry if I missed this, but the distinction between the sea level rise and flood risk in Hazard catgories is confusing. I don't think SLR by itself is a threat on its own...

Jim, over time this will be worked out through the reorganization of hazards by climate driver. I'll show you the new SCCOG HMCAP tomorrow.

[9:25 AM] O'Donnell, James
OK.... I'll try to be patient. thanks.

[9:26 AM] Choquette, Scott

Unfortunately not high intensity rainfall flooding was not modeled. To do so at this scale would significantly surpass the budget for this entire project. That said, pluvial flood modeling should be in the plan as a recommendation so that CT can find some funding and do it before the next update.

like 3
[9:27 AM] Payne, Jade
Watson, Sarah (External)

Did modeling include increased frequency of heavy precip outside of tropical cyclones?

To add on to Scott's answer, we also included the climate weighting in the final hazard ranking to help capture this as best we could in the meantime. Increased rainfall in the future did "bump up" flood in the rankings.

like 2
[9:34 AM] Murphy, David
We will have time after breakout sessions to report out? CIRCA would like the COGs and towns to understand our suggested actions

[9:37 AM] Zessos, Stephanie
https://www.fema.gov/emergency-managers/practitioners/lifelines just dropping this here for general input re: FEMA's addition of **Water Systems** - Potable Water Infrastructure, Wastewater Management to their Community Lifelines in July 2023

heart 1
Community Lifelines
A lifeline enables the continuous operation of critical government and business functions and is essential to human health and safety or economic security.
[10:51 AM] Choquette, Scott
BRB

[10:55 AM] Murphy, David
Zessos, Stephanie (External)

https://www.fema.gov/emergency-managers/practitioners/lifelines just dropping this here for general input re: FEMA's addition of Water Systems - Potable Water Infrastructure, Wastewater Management to their Community Lifelines in July 2023

Water and wastewater was added as a new category of actions in the SCCOG HMCAP (2023) to raise the importance. I can provide more info if needed

like 1 starMSER 1
[11:01 AM]
11:01 AM Meeting ended: 3h 6m 38s

Breakout Group – DEMHS:

[9:46 AM] Bobula, Kendall

ken, kim or i?

[10:06 AM] Bobula, Kendall

if we can edit them, can we take out regulate from the one above? or did you make that change somewhere else?

[10:07 AM] Jamie Caplan (Guest)
I made the change in my notes
like 1
[10:13 AM] Alexander, Ian

Jake Manke DDS

[10:14 AM] Bobula, Kendall

CDS

[10:35 AM] Zessos, Stephanie

possibly move Dam Failure to med

[10:36 AM] Zessos, Stephanie

we "have 238 high hazard dams with 21 miles of levees . river systems highly dependent on the flow and functionality of upstream dams and tributaries"

[10:39 AM] Zessos, Stephanie

+ aging dams (the irony of not having back to back to back disasters) -- aging infrastructure

[10:42 AM] Bobula, Kendall

2-3pm?

like 1
[10:45 AM] Zessos, Stephanie

wondering if we can add language about vulnerable communities to Flood problem statement

[10:46 AM] Bobula, Kendall

flooding worksops>

[10:46 AM] Mills, Emily

Hi everyone, just wanted to provide a time check, we'll be wrapping up the breakout rooms in 5 mins. Thanks.

[10:47 AM] Bobula, Kendall

EMD annual meetings?

[10:49 AM] Bobula, Kendall

zoom grant informational sessions ?

[10:49 AM] Zessos, Stephanie

neighborhoods with the least resources

Breakout Group – DEEP:
[9:44 AM] BenitezOu, Ashley
Comprehensive Materials Management Strategy (ct.gov)

Comprehensive Materials Management Strategy
Information about Connecticut's Comprehensive Materials Management Strategy (CMMS).
[9:46 AM] BenitezOu, Ashley
AAC = An Act Concerning

[9:50 AM] Watson, Sarah
PA 21-115

[9:55 AM]
Sheila Warren, USACE (Guest) was invited to the meeting.
[10:04 AM] Loughlin, Sean (Guest)
Mashantucket and Mohegan just got Approvable Pending Adoption status this past week through participation in the Southeastern CT COG plan as participants in that plan.

[10:26 AM] BenitezOu, Ashley
Sorry, extreme hot weather protocol

Breakout Group – COGs and Municipalities:
[9:51 AM] Francis R. Pickering
Here are the two reports I mentioned:

[9:51 AM] Francis R. Pickering
The case for Riparian Corridor protections (westcog.org)

[9:52 AM] Francis R. Pickering
Flooding in Connecticut: A Status Report on Municipal Flood Prevention Standards (westcog.org)

[9:53 AM] Francis R. Pickering
And the real issue is not so much heat as the dew point or heat index -- the combination of heat and high humidity. (Dehumidification is at least as important as cooling.)

like 1
[10:13 AM]
Payne, Jade removed Kyle Shiel from the chat.
[10:13 AM]
Kyle Shiel was invited to the meeting.
[10:22 AM] Meghan Sloan
The kickoff for MetroCOG's NHMP update was 8/1/23 - it is following the new FEMA policy effective 4/19/23

[10:45 AM] Francis R. Pickering
Re trees -- there are so many invasive species and diseases that are producing elevated tree mortality. We may wish to increase biodiversity in our forests (e.g., reseeding programs of resistant varieties) to mitigate this.

like 1
[10:46 AM] Mills, Emily
Hi everyone, just wanted to provide a time check, we'll be wrapping up the breakout rooms in 5 mins. Thanks.

[10:47 AM] Laura Francis
I need to log off for another meeting. Thank you for allowing us to provide input.

Breakout Group – UCONN/CIRCA and Stakeholders:
[9:53 AM] Sheila Warren, USACE (Guest)

I'm going to jump over to DEEP. Great discussion!

Breakout Group – Other CT Agencies:
[9:50 AM] Wozniak-Brown, Joanna

Since the plan was completed, there was a January 2021 Near Term Actions Report from the GC3

[10:00 AM] Wozniak-Brown, Joanna

- **Train local public works directors on climate change impacts and how to evaluate local infrastructure for risk, identify risk mitigation measures, and incorporate into maintenance/replacement cycle**

[10:00 AM] Wozniak-Brown, Joanna

- **Develop an Extreme Heat Response Plan including tailored actions for vulnerable populations**

like 1

[10:01 AM] Gaul, Scott

I will have to drop, sorry but can follow up w/ Joanna for anything else for OPM

like 1
[10:10 AM]
Payne, Jade removed Morrissette, Jeff J from the chat.
[10:10 AM]
Morrissette, Jeff J was invited to the meeting.
[10:30 AM] Kinney, Jonathan

Thank you everyone, I have to jump to another meeting. Please let me know if there's anything else I can assist with.

[10:31 AM] Chandy, Binu

Me too - please do let me know if there is any help needed wrt DECD-nonSHPO related stuff. Thanks!

[10:36 AM] Santoro, Michael C

Unfortunately, I need to drop off...thanks for allowing us to participate.

1.4.3 Attendance

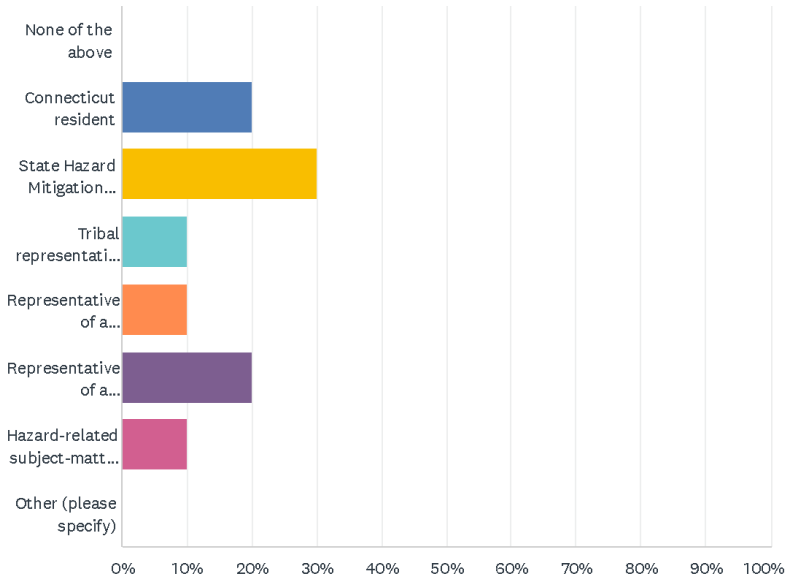
Name	Room Type	Room Name	Join Time
18609336478	Breakout room	COGs + Municipalities	8/07/23, 9:37:37 AM
Alexander, Ian	Breakout room	DEMHS	8/07/23, 9:37:36 AM
Alexander, Ian	Breakout room	DEMHS	8/07/23, 9:39:52 AM
Andino, Lissette	Breakout room	UCONN/CIRCA + Stakeholders	8/07/23, 9:37:46 AM
Andreucci, Rebecca	Breakout room	COGs + Municipalities	8/07/23, 9:37:47 AM
Baklik, Drew	Breakout room	COGs + Municipalities	8/07/23, 9:37:46 AM
BenitezOu, Ashley	Breakout room	DEEP	8/07/23, 9:37:43 AM
Bergeron, Brenda	Breakout room	DEMHS	8/07/23, 9:37:45 AM
Bobula, Kendall	Breakout room	DEMHS	8/07/23, 9:37:45 AM
Boush, Lisa	Breakout room	UCONN/CIRCA + Stakeholders	8/07/23, 9:37:51 AM
Bradner, George	Breakout room	Other CT Agencies	8/07/23, 9:37:49 AM
Burns, Margot	Breakout room	COGs + Municipalities	8/07/23, 9:37:47 AM
Caplan, Jamie	Breakout room	DEMHS	8/07/23, 9:37:48 AM
Chandy, Binu	Breakout room	Other CT Agencies	8/07/23, 9:37:47 AM
Choquette, Scott	Breakout room	DEEP	8/07/23, 9:37:47 AM
Desautels, Dean C	Breakout room	UCONN/CIRCA + Stakeholders	8/07/23, 9:37:46 AM
Dumais, Kenneth	Breakout room	DEMHS	8/07/23, 9:37:46 AM
Fabris, Gemma	Breakout room	DEMHS	8/07/23, 9:37:36 AM
Fedak, Victoria J	Breakout room	UCONN/CIRCA + Stakeholders	8/07/23, 9:37:47 AM
Fey, Delia	Breakout room	COGs + Municipalities	8/07/23, 9:37:47 AM
Field, John	Breakout room	DEMHS	8/07/23, 9:37:47 AM
Fontanella, Todd	Breakout room	COGs + Municipalities	8/07/23, 9:37:48 AM
Francis, Laura	Breakout room	COGs + Municipalities	8/07/23, 9:37:47 AM
French, Rebecca	Breakout room	DEEP	8/07/23, 9:37:46 AM
Gaul, Scott	Breakout room	Other CT Agencies	8/07/23, 9:37:47 AM
Godwin, Joseph	Breakout room	Other CT Agencies	8/07/23, 9:37:46 AM
Ifkovic, Diane	Breakout room	DEEP	8/07/23, 9:37:47 AM
Kinney, Jonathan	Breakout room	Other CT Agencies	8/07/23, 9:37:47 AM
Larkin, Jim	Breakout room	COGs + Municipalities	8/07/23, 9:37:37 AM
Larkin, Jim	Breakout room	COGs + Municipalities	8/07/23, 9:40:21 AM
Lee, Charles	Breakout room	DEEP	8/07/23, 9:37:46 AM
Lindquist, Eric	Breakout room	Other CT Agencies	8/07/23, 9:37:36 AM
Loughlin, Sean	Breakout room	DEEP	8/07/23, 9:41:10 AM
Massano, Cassandra	Breakout room	UCONN/CIRCA + Stakeholders	8/07/23, 9:37:46 AM
Michaels, Karen	Breakout room	DEEP	8/07/23, 9:37:46 AM
Morrissette, Jeff J	Breakout room	Other CT Agencies	8/07/23, 10:11:13 AM
Morrissette, Jeff J	Breakout room	Other CT Agencies	8/07/23, 9:37:46 AM
Moyer, Danielle	Breakout room	DEMHS	8/07/23, 9:37:46 AM
Mozzer, Michael	Breakout room	Other CT Agencies	8/07/23, 9:37:47 AM
Murphy, David	Breakout room	UCONN/CIRCA + Stakeholders	8/07/23, 9:37:46 AM
O'Donnell, James	Breakout room	UCONN/CIRCA + Stakeholders	8/07/23, 9:37:48 AM
Paszczuk, Henry	Breakout room	DEMHS	8/07/23, 9:37:45 AM
Payne, Jade	Breakout room	Other CT Agencies	8/07/23, 9:37:54 AM
Perkins, Bill	Breakout room	COGs + Municipalities	8/07/23, 9:37:46 AM
Pestana, Edith	Breakout room	DEEP	8/07/23, 9:37:46 AM
Pickering, Francis R.	Breakout room	COGs + Municipalities	8/07/23, 9:37:48 AM

Punchard, Darrin	Breakout room	UCONN/CIRCA + Stakeholders	8/07/23, 9:37:47 AM
Pysh, Emily	Breakout room	Other CT Agencies	8/07/23, 9:37:48 AM
Runowicz, Eric T.	Breakout room	Other CT Agencies	8/07/23, 9:37:46 AM
Rush, Hanna R.	Breakout room	Other CT Agencies	8/07/23, 9:37:46 AM
Santoro, Michael C	Breakout room	Other CT Agencies	8/07/23, 9:37:47 AM
Seremet, Meghan	Breakout room	DEEP	8/07/23, 9:37:48 AM
Shiel, Kyle	Breakout room	COGs + Municipalities	8/07/23, 10:13:32 AM
Sloan, Meghan	Breakout room	COGs + Municipalities	8/07/23, 9:42:21 AM
Slovin, Noah	Breakout room	COGs + Municipalities	8/07/23, 9:37:47 AM
Truscinski, John	Breakout room	UCONN/CIRCA + Stakeholders	8/07/23, 9:37:47 AM
Warren, Sheila	Breakout room	UCONN/CIRCA + Stakeholders	8/07/23, 9:37:49 AM
Warren, Sheila	Breakout room	DEEP	8/07/23, 9:55:02 AM
Watson, Sarah	Breakout room	DEEP	8/07/23, 9:37:41 AM
White, Joshua	Breakout room	UCONN/CIRCA + Stakeholders	8/07/23, 9:37:46 AM
Wozniak-Brown, Joanna	Breakout room	Other CT Agencies	8/07/23, 9:37:47 AM
Xie, Sabrina	Breakout room	DEEP	8/07/23, 9:37:46 AM
Zessos, Stephanie	Breakout room	DEMHS	8/07/23, 9:37:46 AM
Zigich, Kimberly	Breakout room	DEMHS	8/07/23, 9:37:46 AM

1.5 Draft Plan Review Survey

Q1 Which most specifically describes you?

Answered: 10 Skipped: 0



ANSWER CHOICES	RESPONSES	
None of the above	0.00%	0
Connecticut resident	20.00%	2
State Hazard Mitigation Planning Team member	30.00%	3
Tribal representative or member	10.00%	1
Representative of a Connecticut Council of Government (COG)	10.00%	1
Representative of a Connecticut municipality	20.00%	2
Hazard-related subject-matter expert	10.00%	1
Other (please specify)	0.00%	0
TOTAL		10

#	OTHER (PLEASE SPECIFY)	DATE
	There are no responses.	

Q2 What is your name?

Answered: 9 Skipped: 1

#	RESPONSES	DATE
1	Emily Pysh	11/17/2023 3:39 PM
2	Cora Barber	11/17/2023 9:35 AM
3	Henry Paszczuk	11/17/2023 9:30 AM
4	Francis R. Pickering	11/15/2023 10:05 PM
5	Alexander Platt	11/9/2023 9:37 AM
6	Diane Ifkovic	11/8/2023 12:47 PM
7	Jerry Lukowski	11/6/2023 11:17 AM
8	Kevin Ortiz	11/6/2023 9:31 AM
9	Hannah	11/5/2023 11:53 AM

Q3 What is the name of your organization/COG/city/tribe (if relevant/applicable)?

Answered: 3 Skipped: 7

#	RESPONSES	DATE
1	Western Connecticut Council of Governments	11/15/2023 10:06 PM
2	Watertown, Ct	11/6/2023 11:19 AM
3	Town of Branford	11/6/2023 9:36 AM

Q4 What is your title/role (if relevant/applicable)?

Answered: 3 Skipped: 7

#	RESPONSES	DATE
1	Executive Director	11/15/2023 10:06 PM
2	Director of Public Works	11/6/2023 11:19 AM
3	Design Engineer	11/6/2023 9:36 AM

Q5 What is your area (or areas) of hazard-related subject matter expertise (if applicable)?

Answered: 3 Skipped: 7

#	RESPONSES	DATE
1	Regional HMP	11/15/2023 10:06 PM
2	Flooding (State and Local Response) - Retired CT Army National Guard Officer w/ Army Corps of Engineers	11/6/2023 11:19 AM
3	Civil Engineer	11/6/2023 9:36 AM

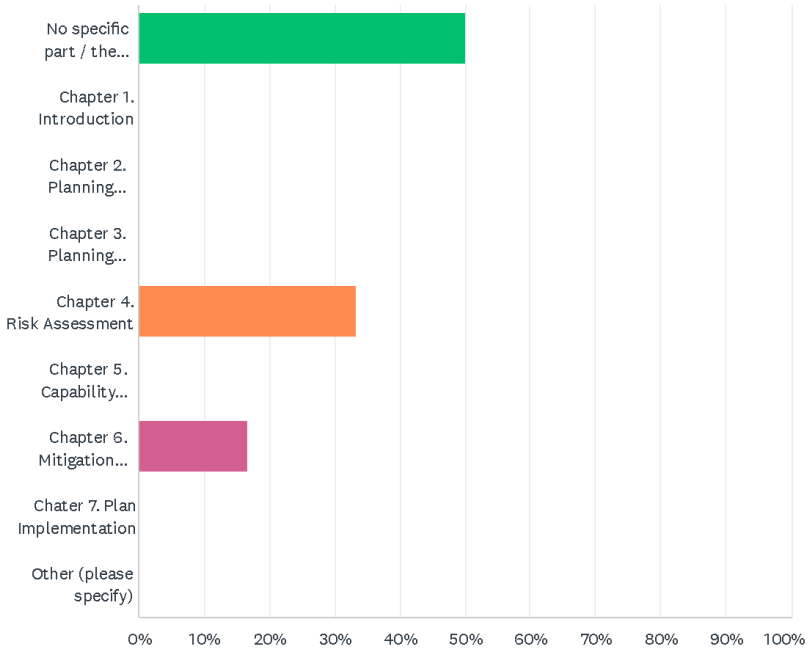
Q6 Do you have any best practices that you believe the State of Connecticut would benefit from implementing?

Answered: 3 Skipped: 7

#	RESPONSES	DATE
1	See attached file.	11/15/2023 10:06 PM
2	Training of these documents How to use these documents Practical Exercise	11/6/2023 11:19 AM
3	Having an evacuation plan for areas that only have one exit route during extreme weather events.	11/6/2023 9:36 AM

Q7 Which part of the plan are you commenting on?

Answered: 6 Skipped: 4



ANSWER CHOICES	RESPONSES	
No specific part / the entire plan	50.00%	3
Chapter 1. Introduction	0.00%	0
Chapter 2. Planning Process	0.00%	0
Chapter 3. Planning Context	0.00%	0
Chapter 4. Risk Assessment	33.33%	2
Chapter 5. Capability Assessment	0.00%	0
Chapter 6. Mitigation Strategy	16.67%	1
Chater 7. Plan Implementation	0.00%	0
Other (please specify)	0.00%	0
TOTAL		6

#	OTHER (PLEASE SPECIFY)	DATE
	There are no responses.	

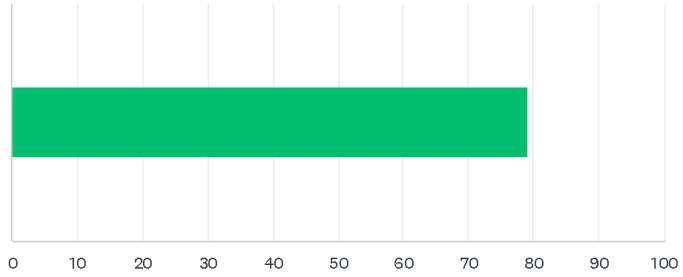
Q8 If you have feedback in a separate document, please upload it here.

Answered: 3 Skipped: 7

#	FILE NAME	FILE SIZE	DATE
1	Comments_CTDOT.docx	19.6KB	11/17/2023 3:44 PM
2	CT%20Natural%20Hazard%20Mitigation%20Plan%20Comments.docx	13.2KB	11/17/2023 10:08 AM
3	WestCOG%20Comments%20on%20State%20HMP.pdf	1.1MB	11/15/2023 10:06 PM

Q9 How well do you feel the 2023 draft plan will encourage worthwhile hazard mitigation activities throughout Connecticut?

Answered: 6 Skipped: 4

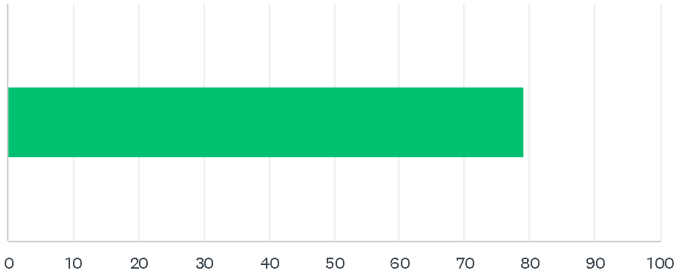


ANSWER CHOICES	AVERAGE NUMBER	TOTAL NUMBER	RESPONSES
	79	474	6
Total Respondents: 6			

#		DATE
1	89	11/19/2023 1:57 PM
2	100	11/17/2023 10:08 AM
3	60	11/15/2023 10:07 PM
4	70	11/8/2023 12:47 PM
5	60	11/6/2023 11:20 AM
6	95	11/5/2023 11:54 AM

Q10 How well do you feel the 2023 draft plan integrates and addresses equity and socially vulnerable communities throughout Connecticut?

Answered: 6 Skipped: 4



ANSWER CHOICES	AVERAGE NUMBER	TOTAL NUMBER	RESPONSES
	79	474	6
Total Respondents: 6			

#		DATE
1	69	11/19/2023 1:57 PM
2	95	11/17/2023 10:08 AM
3	85	11/15/2023 10:07 PM
4	70	11/8/2023 12:47 PM
5	60	11/6/2023 11:20 AM
6	95	11/5/2023 11:54 AM

Q11 What feedback/input would you like to provide?

Answered: 4 Skipped: 6

#	RESPONSES	DATE
1	Please see my attached document in number 4.	11/17/2023 10:08 AM
2	See attached document.	11/15/2023 10:07 PM
3	Training of these documents will bring it closer to 100% Hard to fully digest a 1,000 plus pages between the four documents. What about a short video 5-20 minutes on giving some background.	11/6/2023 11:20 AM
4	It looks great! Thank you for putting this comprehensive document together for the state.	11/5/2023 11:54 AM

Q12 Please provide any additional comments or questions to be addressed as the State of Connecticut updates their Natural Hazard Mitigation Plan.

Answered: 1 Skipped: 9

#	RESPONSES	DATE
1	Thanks for sharing.	11/6/2023 11:21 AM

1.6 Outreach and Engagement

1.6.1 State Hazard Mitigation Planning Team Survey

Connecticut Hazard Mitigation Planning Team Survey

Q1 What state agency or organization do you represent?

Answered: 12 Skipped: 0

#	RESPONSES	DATE
1	CT-DEMHS	8/7/2023 4:18 PM
2	DEEP	8/3/2023 12:32 PM
3	Department of Public Health	8/3/2023 10:46 AM
4	CT DEEP Geological Survey	8/2/2023 12:10 PM
5	CTDEEP	7/25/2023 11:50 AM
6	CT DPH	7/25/2023 9:32 AM
7	DEMHS	7/19/2023 2:05 PM
8	Emergency Management	7/19/2023 2:05 PM
9	DEMHS	7/19/2023 2:04 PM
10	Connecticut DEEP	7/19/2023 2:03 PM
11	DPH	7/14/2023 1:18 PM
12	DEEP	7/14/2023 12:14 PM

1 / 16

Q2 Please provide your contact information.

Answered: 11 Skipped: 1

ANSWER CHOICES	RESPONSES	
Name	100.00%	11
Title/Position	100.00%	11
Email Address	100.00%	11

#	NAME	DATE
1	Kim	8/7/2023 4:18 PM
2	Christopher Martin	8/3/2023 12:32 PM
3	Multiple	8/3/2023 10:46 AM
4	Meghan M Seremet	8/2/2023 12:10 PM
5	Diane Ifkovic	7/25/2023 11:50 AM
6	Francesca Provenzano	7/25/2023 9:32 AM
7	Gemma Fabris	7/19/2023 2:05 PM
8	Ken Dumais	7/19/2023 2:05 PM
9	Douglas Glowacki	7/19/2023 2:04 PM
10	Peter Francis	7/19/2023 2:03 PM
11	Ashley G. Benitez	7/14/2023 12:14 PM

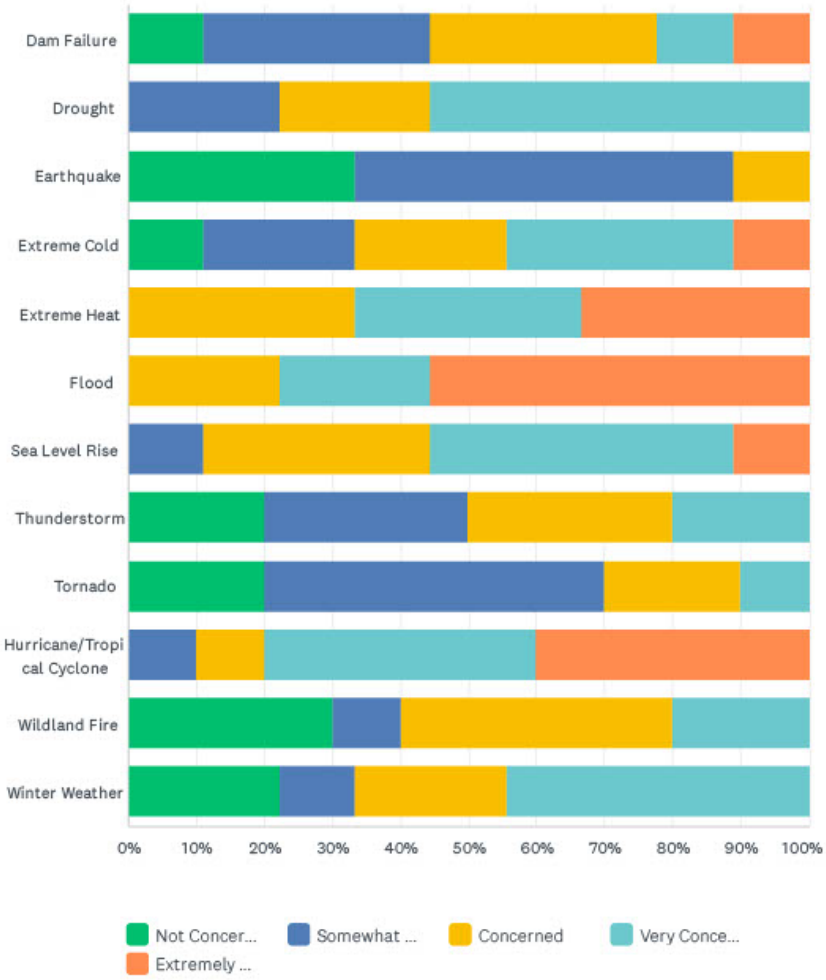
#	TITLE/POSITION	DATE
1	Attorney	8/7/2023 4:18 PM
2	Forestry Director	8/3/2023 12:32 PM
3	Multiple	8/3/2023 10:46 AM
4	State Geologist	8/2/2023 12:10 PM
5	State NFIP Coordinator	7/25/2023 11:50 AM
6	Public Health Section Chief	7/25/2023 9:32 AM
7	GIS/EMPS	7/19/2023 2:05 PM
8	SHMO	7/19/2023 2:05 PM
9	EMPS	7/19/2023 2:04 PM
10	Boating Division Director	7/19/2023 2:03 PM
11	Environmental Analyst 2	7/14/2023 12:14 PM

#	EMAIL ADDRESS	DATE
1	kimberly.zigich@ct.gov	8/7/2023 4:18 PM
2	christopher.martin@ct.gov	8/3/2023 12:32 PM
3	Multiple	8/3/2023 10:46 AM
4	meghan.seremet@ct.gov	8/2/2023 12:10 PM

5	diane.ifkovic@ct.gov	7/25/2023 11:50 AM
6	francesca.provenzano@ct.gov	7/25/2023 9:32 AM
7	Gemma.fabris@ct.gov	7/19/2023 2:05 PM
8	Kenneth.dumais@ct.gov	7/19/2023 2:05 PM
9	Douglas.Glowacki@ct.gov	7/19/2023 2:04 PM
10	peter.francis@ct.gov	7/19/2023 2:03 PM
11	ashley.benitezou@ct.gov	7/14/2023 12:14 PM

Q3 How concerned are you about each of the following hazards impacting Connecticut?

Answered: 10 Skipped: 2

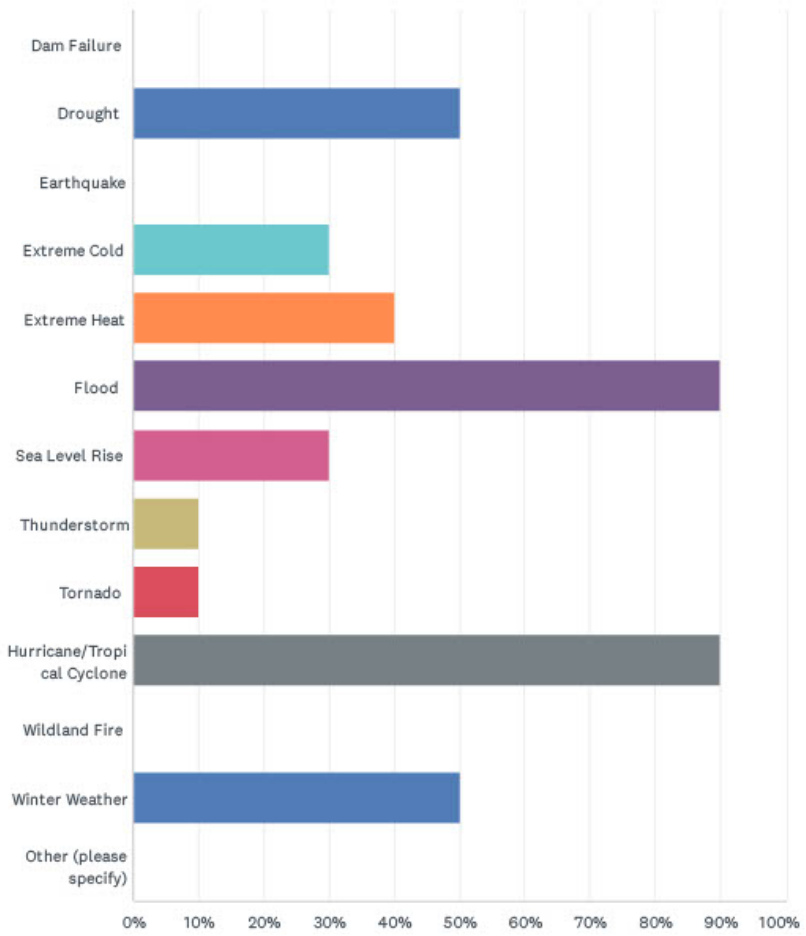


Connecticut Hazard Mitigation Planning Team Survey

	NOT CONCERNED	SOMEWHAT CONCERNED	CONCERNED	VERY CONCERNED	EXTREMELY CONCERNED	TOTAL	WEIGHTED AVERAGE
Dam Failure	11.11% 1	33.33% 3	33.33% 3	11.11% 1	11.11% 1	9	1.67
Drought	0.00% 0	22.22% 2	22.22% 2	55.56% 5	0.00% 0	9	2.33
Earthquake	33.33% 3	55.56% 5	11.11% 1	0.00% 0	0.00% 0	9	0.78
Extreme Cold	11.11% 1	22.22% 2	22.22% 2	33.33% 3	11.11% 1	9	2.00
Extreme Heat	0.00% 0	0.00% 0	33.33% 3	33.33% 3	33.33% 3	9	2.67
Flood	0.00% 0	0.00% 0	22.22% 2	22.22% 2	55.56% 5	9	2.78
Sea Level Rise	0.00% 0	11.11% 1	33.33% 3	44.44% 4	11.11% 1	9	2.44
Thunderstorm	20.00% 2	30.00% 3	30.00% 3	20.00% 2	0.00% 0	10	1.50
Tornado	20.00% 2	50.00% 5	20.00% 2	10.00% 1	0.00% 0	10	1.20
Hurricane/Tropical Cyclone	0.00% 0	10.00% 1	10.00% 1	40.00% 4	40.00% 4	10	2.70
Wildland Fire	30.00% 3	10.00% 1	40.00% 4	20.00% 2	0.00% 0	10	1.50
Winter Weather	22.22% 2	11.11% 1	22.22% 2	44.44% 4	0.00% 0	9	1.89

Q4 Which of the following natural hazards do you believe have already had a significant negative impact on Connecticut?

Answered: 10 Skipped: 2



Connecticut Hazard Mitigation Planning Team Survey

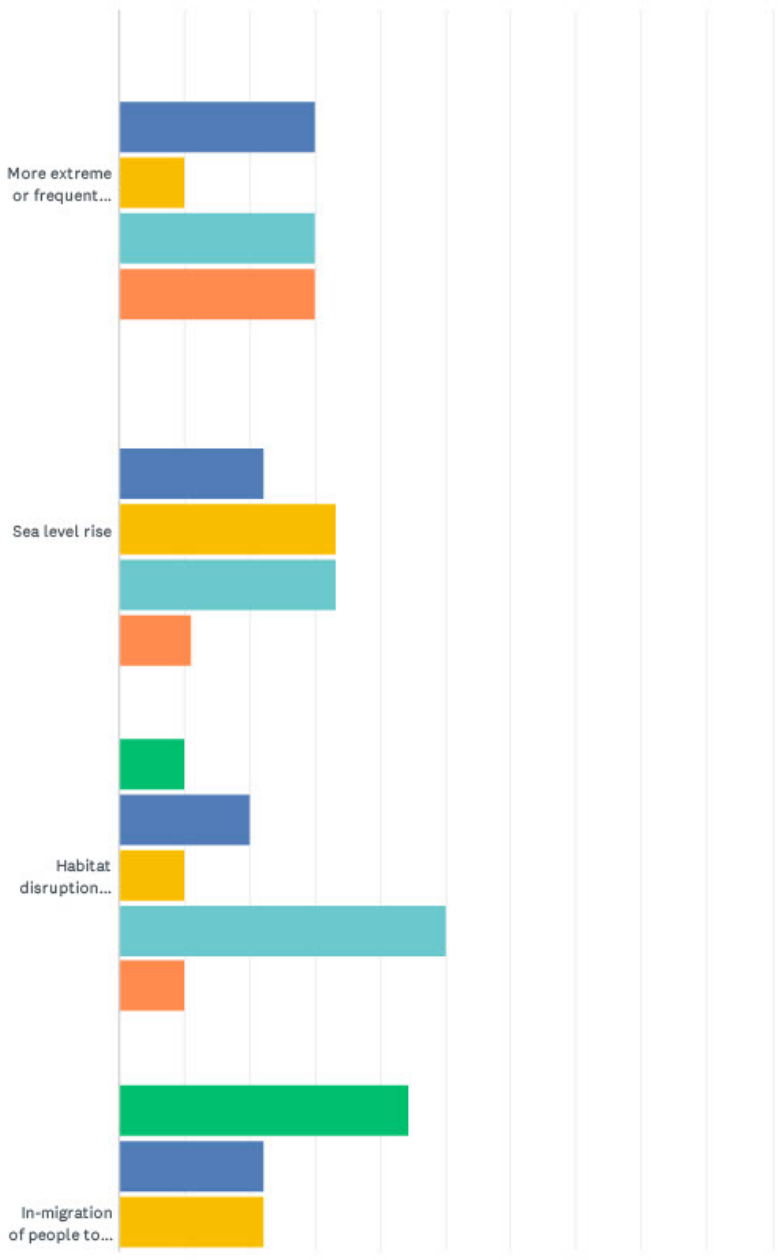
ANSWER CHOICES	RESPONSES	
Dam Failure	0.00%	0
Drought	50.00%	5
Earthquake	0.00%	0
Extreme Cold	30.00%	3
Extreme Heat	40.00%	4
Flood	90.00%	9
Sea Level Rise	30.00%	3
Thunderstorm	10.00%	1
Tornado	10.00%	1
Hurricane/Tropical Cyclone	90.00%	9
Wildland Fire	0.00%	0
Winter Weather	50.00%	5
Other (please specify)	0.00%	0
Total Respondents: 10		

#	OTHER (PLEASE SPECIFY)	DATE
	There are no responses.	

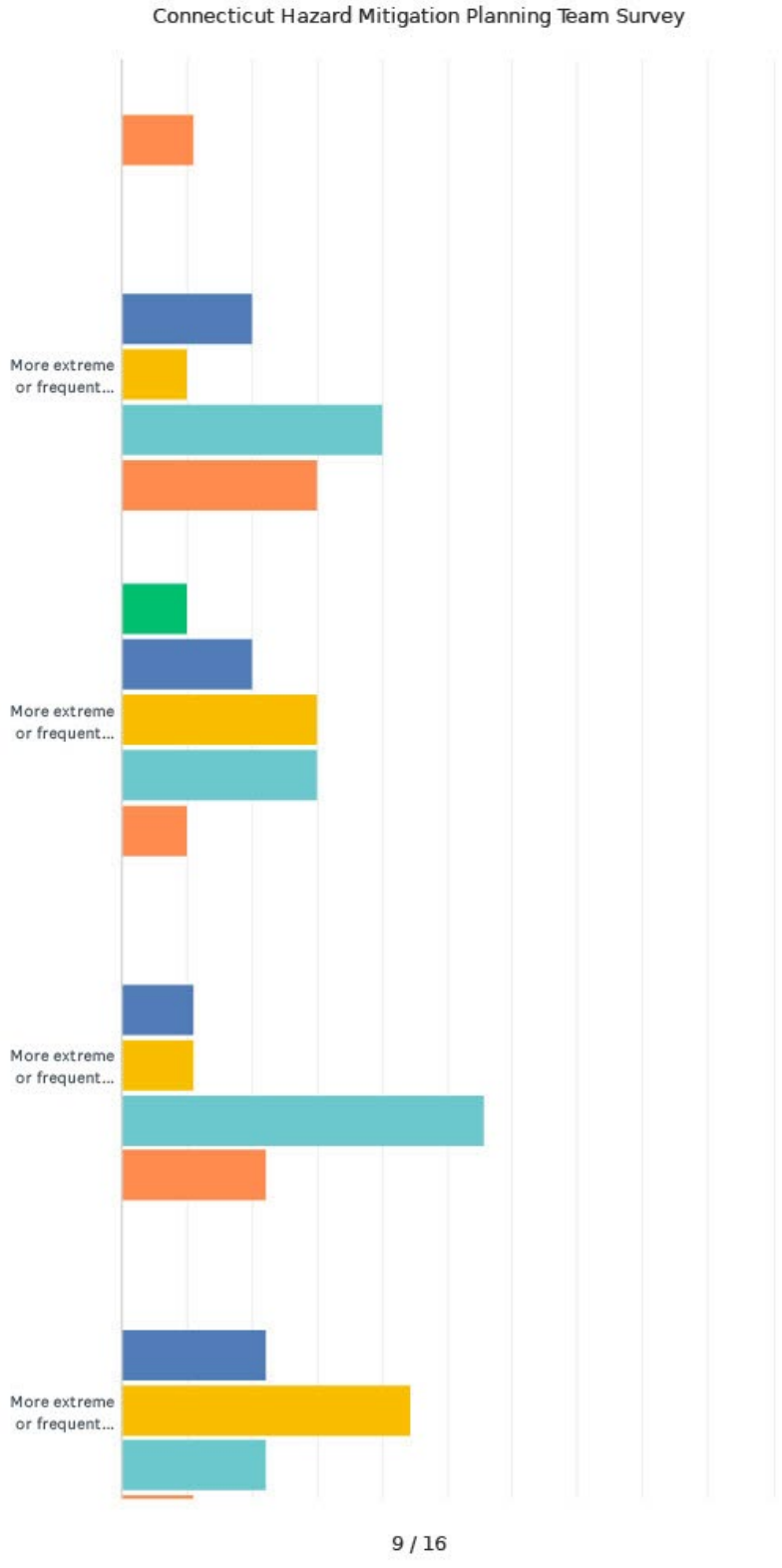
Connecticut Hazard Mitigation Planning Team Survey

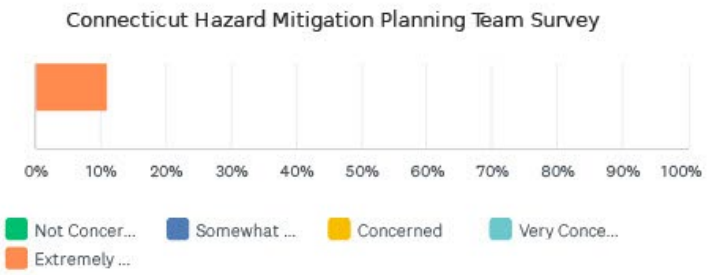
Q5 How concerned are you about each of the following climate-related impacts affecting Connecticut?

Answered: 10 Skipped: 2



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Connecticut Hazard Mitigation Planning Team Survey
More extreme or frequent...
More extreme or frequent...
More extreme or frequent...
More extreme or frequent...
9 / 16

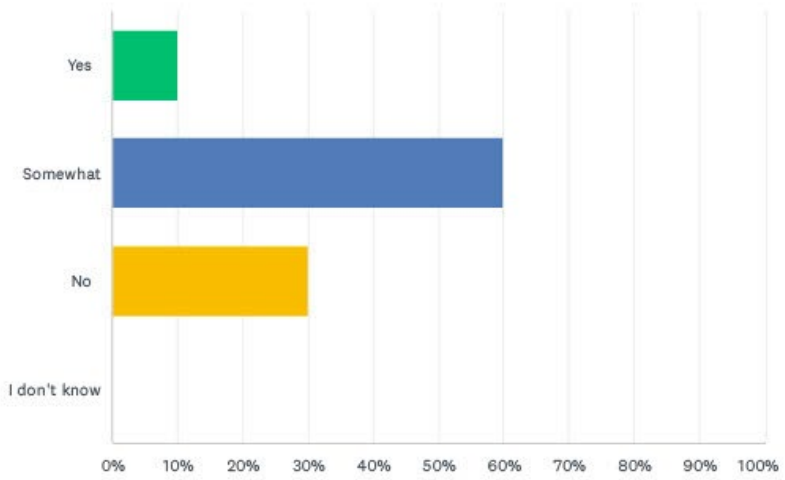


	NOT CONCERNED	SOMEWHAT CONCERNED	CONCERNED	VERY CONCERNED	EXTREMELY CONCERNED	TOTAL	WEIGHTED AVERAGE
More extreme or frequent heatwaves	0.00% 0	30.00% 3	10.00% 1	30.00% 3	30.00% 3	10	2.30
Sea level rise	0.00% 0	22.22% 2	33.33% 3	33.33% 3	11.11% 1	9	2.22
Habitat disruption (including tree loss/changes)	10.00% 1	20.00% 2	10.00% 1	50.00% 5	10.00% 1	10	2.20
In-migration of people to Connecticut from areas more severely impacted by climate change	44.44% 4	22.22% 2	22.22% 2	0.00% 0	11.11% 1	9	1.00
More extreme or frequent rainfall events (more frequent flooding)	0.00% 0	20.00% 2	10.00% 1	40.00% 4	30.00% 3	10	2.50
More extreme or frequent droughts	10.00% 1	20.00% 2	30.00% 3	30.00% 3	10.00% 1	10	2.00
More extreme or frequent storm events (including thunderstorms, hurricanes, tropical storms, and tornadoes)	0.00% 0	11.11% 1	11.11% 1	55.56% 5	22.22% 2	9	2.67
More extreme or frequent winter storm events (including ice storms and cold temperatures)	0.00% 0	22.22% 2	44.44% 4	22.22% 2	11.11% 1	9	2.11

Connecticut Hazard Mitigation Planning Team Survey

Q6 Do you feel that Connecticut is adequately resilient?

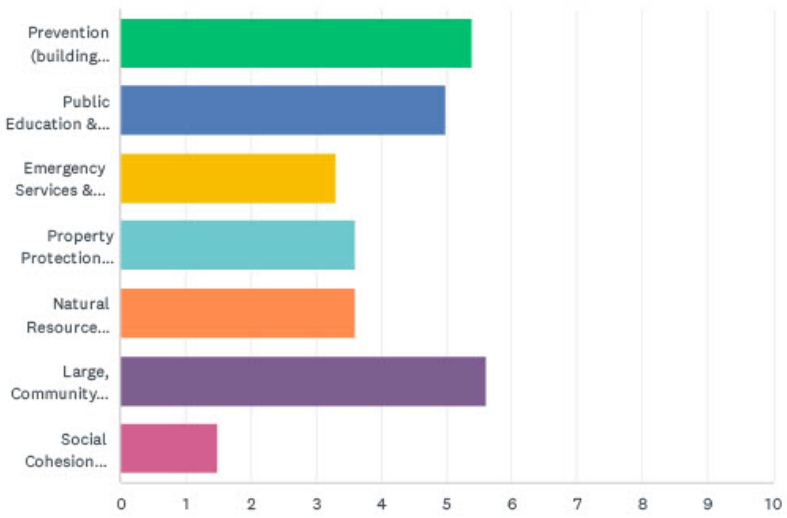
Answered: 10 Skipped: 2



ANSWER CHOICES	RESPONSES	
Yes	10.00%	1
Somewhat	60.00%	6
No	30.00%	3
I don't know	0.00%	0
TOTAL		10

Q7 Many community activities can reduce the risk from natural hazards. Please rank the following activity categories in order of what you consider most important (1) to least important (7).

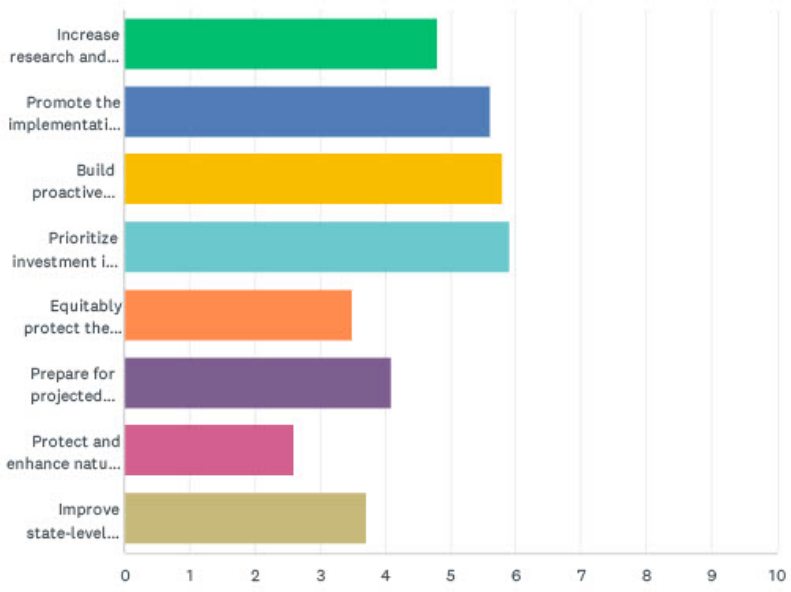
Answered: 10 Skipped: 2



	1	2	3	4	5	6	7	TOTAL	SCORE
Prevention (building codes, zoning regulations, etc.)	20.00% 2	30.00% 3	20.00% 2	30.00% 3	0.00% 0	0.00% 0	0.00% 0	10	5.40
Public Education & Awareness (workshops, websites, etc.)	30.00% 3	20.00% 2	10.00% 1	10.00% 1	20.00% 2	10.00% 1	0.00% 0	10	5.00
Emergency Services & Preparedness (generators, safe rooms, etc.)	0.00% 0	10.00% 1	0.00% 0	30.00% 3	40.00% 4	10.00% 1	10.00% 1	10	3.30
Property Protection (floodproofing, hurricane windows, relocation, etc.)	10.00% 1	0.00% 0	20.00% 2	20.00% 2	10.00% 1	40.00% 4	0.00% 0	10	3.60
Natural Resource Protection (habitat restoration, green space, etc.)	10.00% 1	0.00% 0	30.00% 3	10.00% 1	10.00% 1	30.00% 3	10.00% 1	10	3.60
Large, Community Structural Projects (stormwater infrastructure, flood control, etc.)	30.00% 3	40.00% 4	20.00% 2	0.00% 0	0.00% 0	0.00% 0	10.00% 1	10	5.60
Social Cohesion Projects (resilience hubs, community services, etc.)	0.00% 0	0.00% 0	0.00% 0	0.00% 0	20.00% 2	10.00% 1	70.00% 7	10	1.50

Q8 What outcomes would you like to see from this plan? Please select all that apply.

Answered: 10 Skipped: 2



Connecticut Hazard Mitigation Planning Team Survey

	1	2	3	4	5	6	7	8	TOTAL	SCORE
Increase research and planning activities for the mitigation of natural hazards	20.00% 2	30.00% 3	0.00% 0	0.00% 0	20.00% 2	0.00% 0	0.00% 0	30.00% 3	10	4.80
Promote the implementation of effective natural hazard mitigation projects	30.00% 3	20.00% 2	0.00% 0	30.00% 3	0.00% 0	0.00% 0	10.00% 1	10.00% 1	10	5.60
Build proactive strategies for taking action to reduce long-term risk to life and property	20.00% 2	20.00% 2	20.00% 2	20.00% 2	10.00% 1	0.00% 0	10.00% 1	0.00% 0	10	5.80
Prioritize investment in projects that protect life and property	20.00% 2	20.00% 2	20.00% 2	20.00% 2	10.00% 1	10.00% 1	0.00% 0	0.00% 0	10	5.90
Equitably protect the health and safety of the public through awareness, preparedness, and partnership	0.00% 0	0.00% 0	10.00% 1	20.00% 2	20.00% 2	30.00% 3	0.00% 0	20.00% 2	10	3.50
Prepare for projected climate change and future natural hazard conditions	0.00% 0	10.00% 1	30.00% 3	0.00% 0	10.00% 1	20.00% 2	30.00% 3	0.00% 0	10	4.10
Protect and enhance natural resources to increase resilience	0.00% 0	0.00% 0	10.00% 1	0.00% 0	10.00% 1	20.00% 2	40.00% 4	20.00% 2	10	2.60
Improve state-level natural hazard data and information	10.00% 1	0.00% 0	10.00% 1	10.00% 1	20.00% 2	20.00% 2	10.00% 1	20.00% 2	10	3.70

Q9 Please list any additional outcomes that you would like to see from this plan.

Answered: 2 Skipped: 10

#	RESPONSES	DATE
1	Consideration and priority should be focused on lower income populations or housing developments located in areas of the state that are vulnerable to natural hazards (e.g., shoreline), as well as development of systems and sustainable programs that promote recovery and resilience.	7/25/2023 9:40 AM
2	All of the outcomes are equally important to me. I think the ranking was supposed to be a selection(?). This is more of an output than an outcome (but it will bring good outcomes), and I think we all mentioned this already. A shorter version of the NHMP like a summary for policymakers and the public (results+strategies+activities, with citing corresponding pages in the original document). This is because this document is receiving greater attention now and you are doing a fantastic job in providing more in-depth analysis so the HMP is becoming an even more useful report for all. Thank you!	7/14/2023 2:06 PM

Q10 Please provide any additional comments or questions.

Answered: 1 Skipped: 11

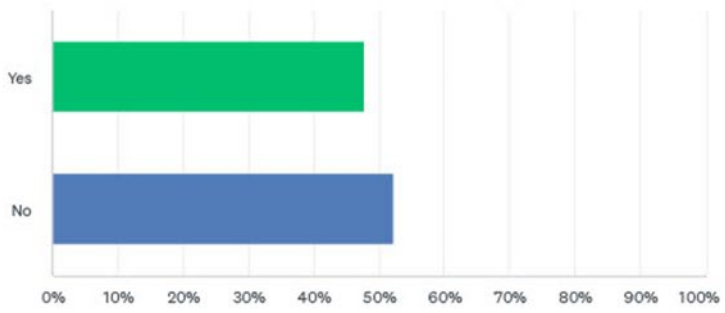
#	RESPONSES	DATE
1	No priorities are listed relating to 'Health in Policies' or implementing 'Health Impact Assessments' as part of C&D plans. This would ensure equitable and resilient communities. It's a well-established framework utilized by states such as CA, WA, OR, CO and others.	7/25/2023 9:40 AM

1.6.2 Stakeholder Hazard Survey

Connecticut Natural Hazard Mitigation Stakeholder Survey

Q1 Are you a representative of a Council of Government or jurisdiction within Connecticut?

Answered: 67 Skipped: 0



ANSWER CHOICES	RESPONSES	
Yes	47.76%	32
No	52.24%	35
TOTAL		67

Q2 Which community or organization do you represent?

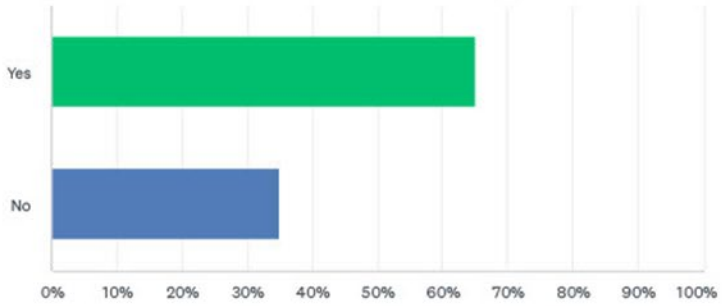
Answered: 67 Skipped: 0

#	RESPONSES	DATE
1	Jewett City	8/30/2023 8:56 PM
2	Jewett City, CT	8/30/2023 1:55 PM
3	Sprague	8/29/2023 12:16 PM
4	Jewett City	8/28/2023 5:13 AM
5	Lebanon Volunteer Fire Department	8/27/2023 6:37 PM
6	Griswold	8/27/2023 7:44 AM
7	Granby	8/24/2023 7:57 AM
8	granby	8/22/2023 11:46 AM
9	Granby,Ct	8/22/2023 6:44 AM
10	homeowner	8/21/2023 1:20 PM
11	Granby	8/21/2023 1:07 PM
12	Cert	8/21/2023 12:25 PM
13	GRANBY	8/21/2023 12:01 PM
14	Granby	8/21/2023 11:34 AM
15	Granby, CT	8/21/2023 11:27 AM
16	Granby	8/21/2023 11:24 AM
17	None	8/21/2023 11:15 AM
18	Na	8/21/2023 10:19 AM
19	TOWN OF CANTERBURY	8/15/2023 4:23 PM
20	Mohegan Tribe Health Department	8/15/2023 8:52 AM
21	Masons Island Company	8/14/2023 2:54 PM
22	Masons Island resident	8/14/2023 8:44 AM
23	Town of Union	8/13/2023 9:41 AM
24	Darien	8/11/2023 11:35 AM
25	Town of West Hartford	8/10/2023 9:21 AM
26	Stonington	8/9/2023 9:10 PM
27	Masons' Island	8/9/2023 9:01 PM
28	Darien	8/9/2023 1:23 PM
29	Town of Voluntown	8/9/2023 10:44 AM
30	.	8/9/2023 9:37 AM
31	Non Profit Disaster Preparedness	8/9/2023 8:42 AM
32	Weston	8/8/2023 10:49 PM
33	RiverCOG and Estuary Transit District	8/8/2023 3:54 PM

34	Town of South Windsor	8/8/2023 3:28 PM
35	None	8/8/2023 3:16 PM
36	Rocky Hill	8/8/2023 1:18 PM
37	Town of South Windsor	8/8/2023 9:51 AM
38	Farmington	8/8/2023 8:28 AM
39	Town of Watertown	8/8/2023 8:09 AM
40	mystic	8/7/2023 4:32 PM
41	Clinton	8/7/2023 3:40 PM
42	Municipal Electric Division	8/7/2023 1:41 PM
43	Town of Guilford	8/7/2023 10:40 AM
44	Masons Island Company	8/7/2023 10:28 AM
45	Mystic River Harbormangement Commission	8/7/2023 10:27 AM
46	NVCOG	8/7/2023 9:02 AM
47	DECD - State Historic Preservation Office	8/7/2023 8:36 AM
48	City of Milford	8/7/2023 8:31 AM
49	City of Milford	8/7/2023 8:22 AM
50	CT DECD	8/7/2023 8:12 AM
51	Town of Marlborough	8/7/2023 8:09 AM
52	Town of Somers	8/7/2023 6:43 AM
53	Masons Island Fire District, Mystic, CT	8/4/2023 6:21 PM
54	Town of Prospect	8/4/2023 3:28 PM
55	Town of Orange	8/4/2023 3:25 PM
56	Town of Southington	8/4/2023 3:18 PM
57	Town of Branford	8/4/2023 2:22 PM
58	Cheshire	8/4/2023 1:29 PM
59	New Milford DPW	8/4/2023 12:34 PM
60	Southington	8/4/2023 11:52 AM
61	NECCOG	8/2/2023 4:27 PM
62	Northeastern CT Council of Governments	7/24/2023 4:08 PM
63	City of Groton	7/19/2023 2:11 PM
64	SCCOG	7/19/2023 2:08 PM
65	Long Island Sound Study, Watersheds, WPLR, CTDEEP	7/19/2023 2:05 PM
66	City of Groton	7/17/2023 3:21 PM
67	Western Connecticut Council of Governments	7/17/2023 1:52 PM

Q3 Before today, were you aware that the State of Connecticut has a Natural Hazard Mitigation Plan?

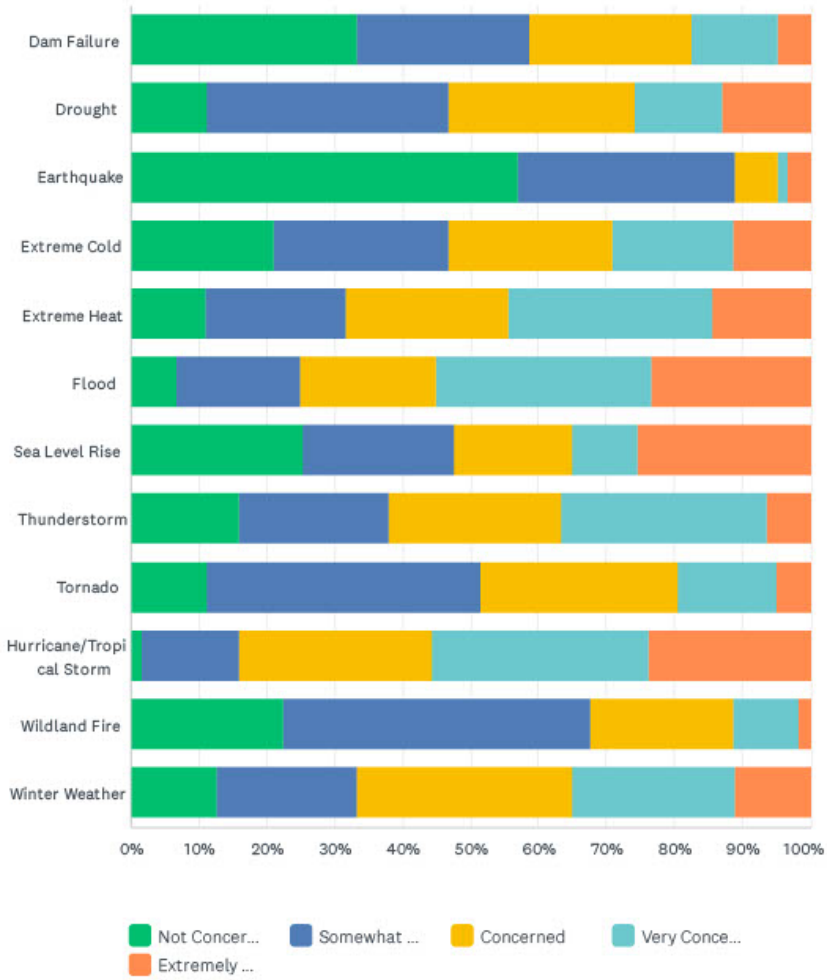
Answered: 63 Skipped: 4



ANSWER CHOICES	RESPONSES	
Yes	65.08%	41
No	34.92%	22
TOTAL		63

Q4 How concerned are you about each of the following hazards impacting your community or the State of Connecticut as a whole?

Answered: 63 Skipped: 4

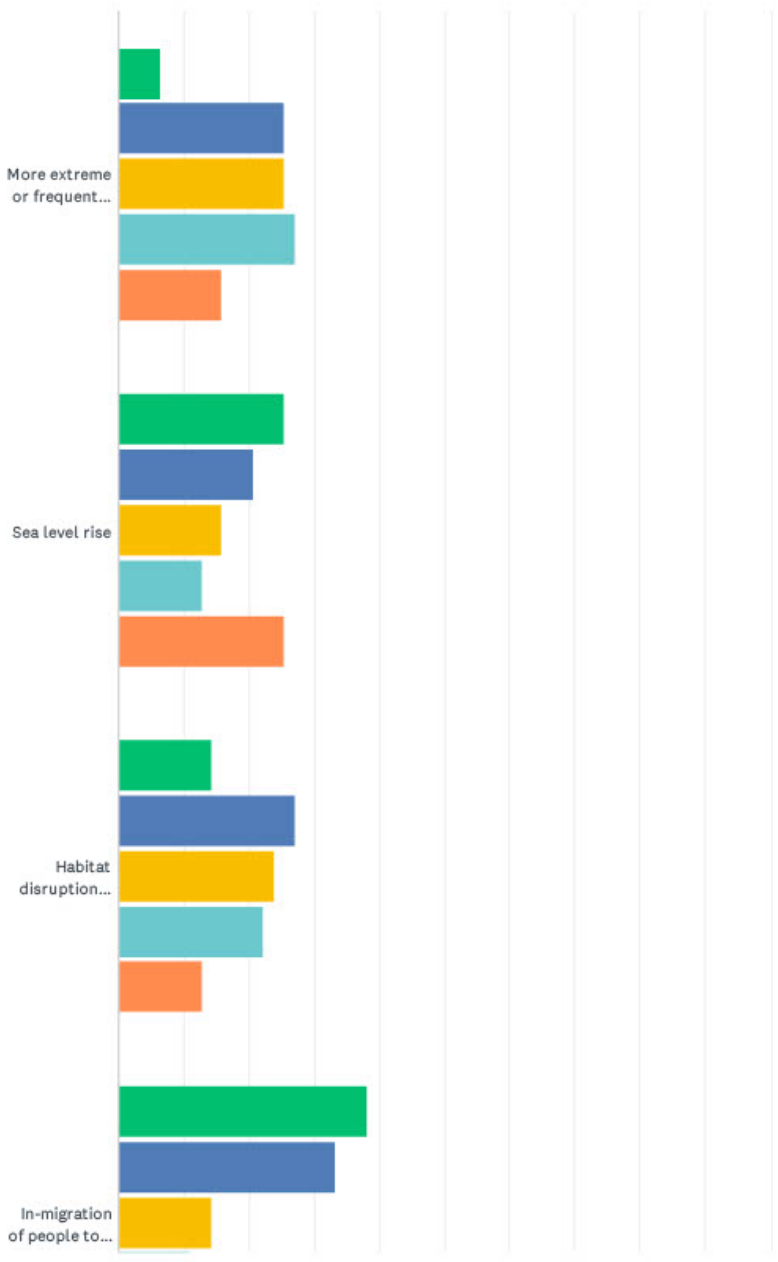


Connecticut Natural Hazard Mitigation Stakeholder Survey

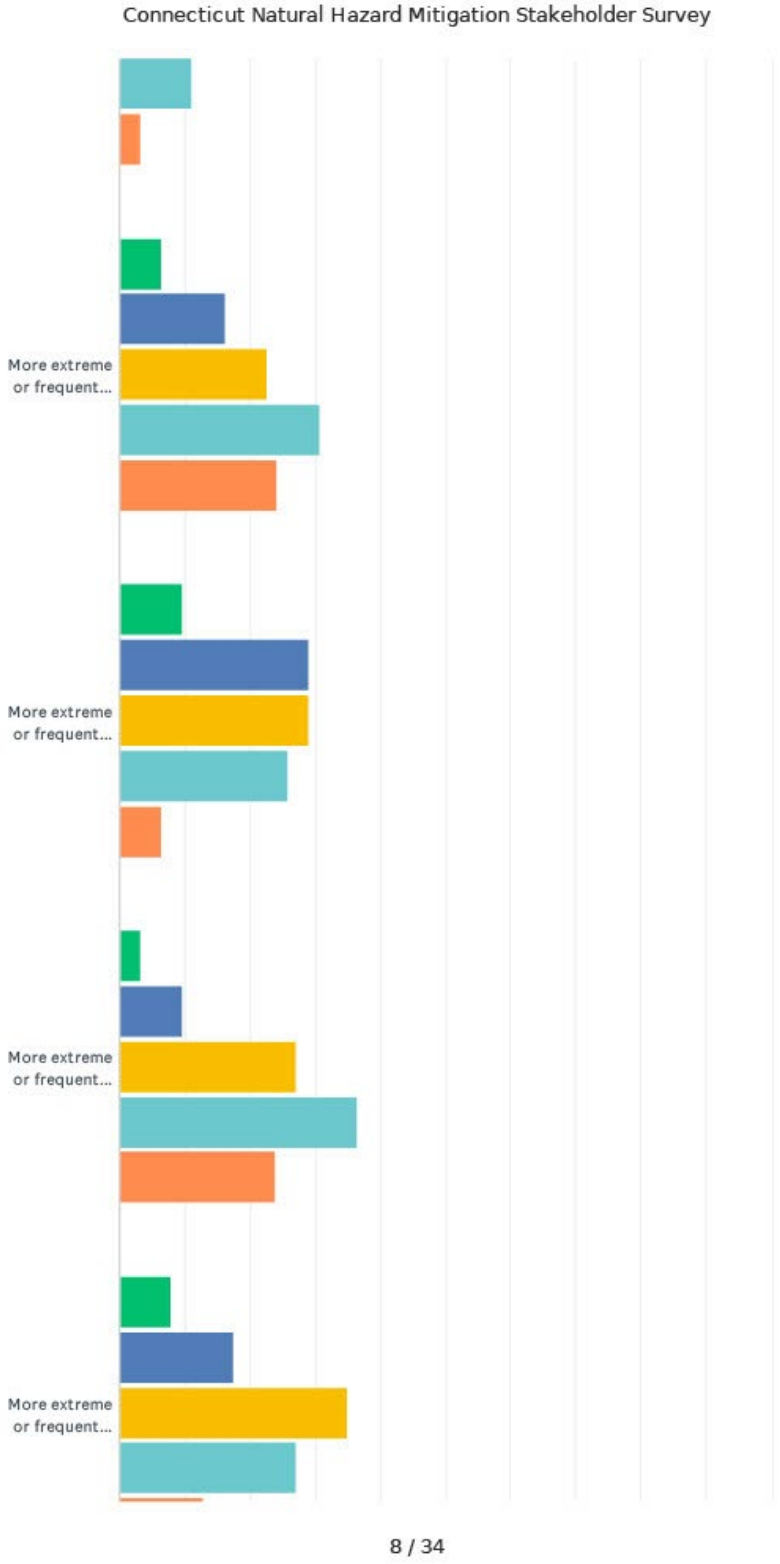
	NOT CONCERNED	SOMEWHAT CONCERNED	CONCERNED	VERY CONCERNED	EXTREMELY CONCERNED	TOTAL	WEIGHTED AVERAGE
Dam Failure	33.33% 21	25.40% 16	23.81% 15	12.70% 8	4.76% 3	63	2.30
Drought	11.29% 7	35.48% 22	27.42% 17	12.90% 8	12.90% 8	62	2.81
Earthquake	57.14% 36	31.75% 20	6.35% 4	1.59% 1	3.17% 2	63	1.62
Extreme Cold	20.97% 13	25.81% 16	24.19% 15	17.74% 11	11.29% 7	62	2.73
Extreme Heat	11.11% 7	20.63% 13	23.81% 15	30.16% 19	14.29% 9	63	3.16
Flood	6.67% 4	18.33% 11	20.00% 12	31.67% 19	23.33% 14	60	3.47
Sea Level Rise	25.40% 16	22.22% 14	17.46% 11	9.52% 6	25.40% 16	63	2.87
Thunderstorm	15.87% 10	22.22% 14	25.40% 16	30.16% 19	6.35% 4	63	2.89
Tornado	11.29% 7	40.32% 25	29.03% 18	14.52% 9	4.84% 3	62	2.61
Hurricane/Tropical Storm	1.59% 1	14.29% 9	28.57% 18	31.75% 20	23.81% 15	63	3.62
Wildland Fire	22.58% 14	45.16% 28	20.97% 13	9.68% 6	1.61% 1	62	2.23
Winter Weather	12.70% 8	20.63% 13	31.75% 20	23.81% 15	11.11% 7	63	3.00

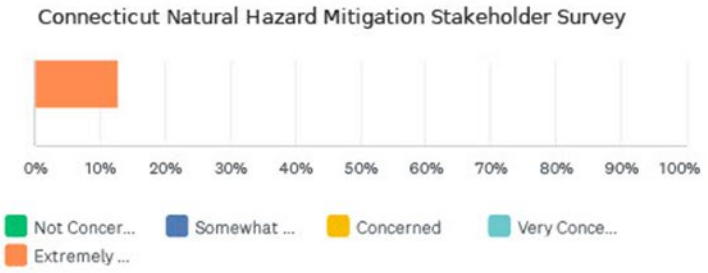
Q5 How concerned are you about each of the following climate-related impacts affecting your community or the State of Connecticut as a whole?

Answered: 63 Skipped: 4



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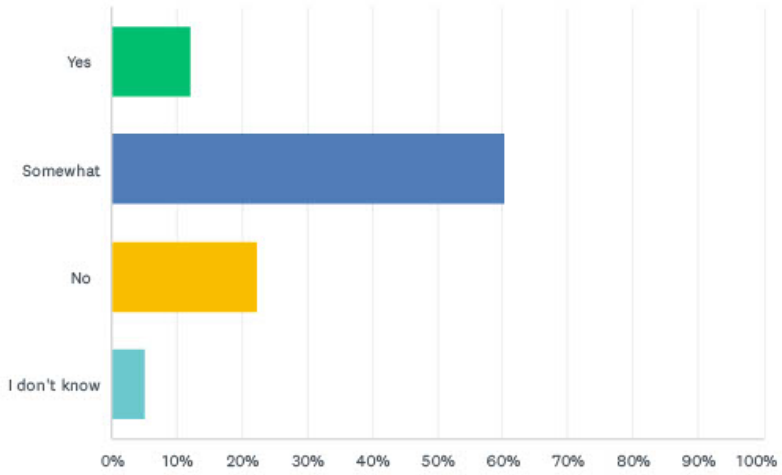

Connecticut Natural Hazard Mitigation Stakeholder Survey
More extreme or frequent...
More extreme or frequent...
More extreme or frequent...
More extreme or frequent...
8 / 34



	NOT CONCERNED	SOMEWHAT CONCERNED	CONCERNED	VERY CONCERNED	EXTREMELY CONCERNED	TOTAL	WEIGHTED AVERAGE
More extreme or frequent heatwaves	6.35% 4	25.40% 16	25.40% 16	26.98% 17	15.87% 10	63	3.21
Sea level rise	25.40% 16	20.63% 13	15.87% 10	12.70% 8	25.40% 16	63	2.92
Habitat disruption (including tree loss/changes)	14.29% 9	26.98% 17	23.81% 15	22.22% 14	12.70% 8	63	2.92
In-migration of people to Connecticut from areas more severely impacted by climate change	38.10% 24	33.33% 21	14.29% 9	11.11% 7	3.17% 2	63	2.08
More extreme or frequent rainfall events (more frequent flooding)	6.45% 4	16.13% 10	22.58% 14	30.65% 19	24.19% 15	62	3.50
More extreme or frequent droughts	9.68% 6	29.03% 18	29.03% 18	25.81% 16	6.45% 4	62	2.90
More extreme or frequent storm events (including thunderstorms, hurricanes, tropical storms, and tornadoes)	3.17% 2	9.52% 6	26.98% 17	36.51% 23	23.81% 15	63	3.68
More extreme or frequent winter storm events (including ice storms and cold temperatures)	7.94% 5	17.46% 11	34.92% 22	26.98% 17	12.70% 8	63	3.19

Q6 Do you feel that the State of Connecticut is adequately resilient (prepared for natural hazards or disasters and able to reduce their negative impacts)?

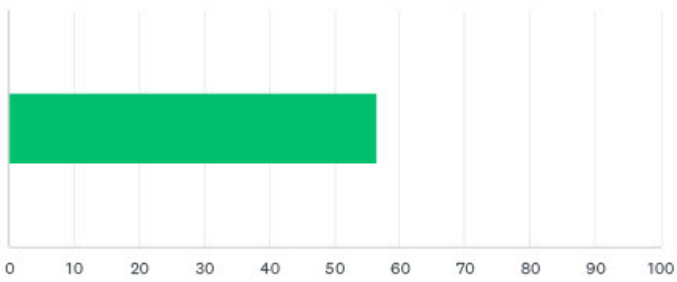
Answered: 58 Skipped: 9



ANSWER CHOICES	RESPONSES	
Yes	12.07%	7
Somewhat	60.34%	35
No	22.41%	13
I don't know	5.17%	3
TOTAL		58

Q7 How would you describe your community's capabilities in natural hazard prevention and mitigation? (i.e., ability to reduce the loss of life and property by lessening the impact of future hazards)

Answered: 58 Skipped: 9



ANSWER CHOICES	AVERAGE NUMBER	TOTAL NUMBER	RESPONSES
	57	3,277	58
Total Respondents: 58			

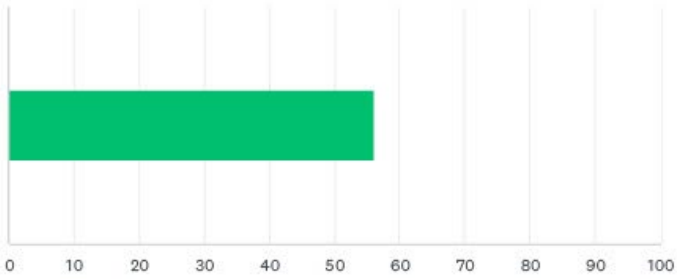
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8	50	8/22/2023 6:47 AM
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10	43	8/21/2023 1:24 PM
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12	55	8/21/2023 11:35 AM
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14	37	8/21/2023 11:17 AM
15	66	8/21/2023 10:21 AM
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23	27	8/9/2023 9:14 PM
24	80	8/9/2023 1:27 PM
25	42	8/9/2023 10:47 AM
26	47	8/9/2023 8:47 AM
27	90	8/8/2023 10:52 PM
28	50	8/8/2023 3:57 PM
29	85	8/8/2023 3:46 PM
30	50	8/8/2023 3:18 PM
31	89	8/8/2023 1:22 PM
32	95	8/8/2023 8:30 AM
33	50	8/8/2023 8:14 AM
34	52	8/7/2023 4:35 PM
35	50	8/7/2023 3:42 PM
36	70	8/7/2023 10:43 AM
37	20	8/7/2023 10:31 AM
38	70	8/7/2023 9:05 AM
39	50	8/7/2023 8:42 AM
40	49	8/7/2023 8:39 AM
41	49	8/7/2023 8:38 AM
42	25	8/7/2023 8:33 AM
43	50	8/7/2023 8:16 AM
44	75	8/7/2023 6:47 AM
45	65	8/4/2023 6:26 PM
46	100	8/4/2023 3:32 PM
47	70	8/4/2023 3:30 PM
48	80	8/4/2023 3:22 PM
49	86	8/4/2023 2:24 PM
50	40	8/4/2023 1:33 PM
51	75	8/4/2023 12:38 PM
52	56	8/4/2023 11:53 AM
53	40	8/2/2023 4:30 PM
54	80	7/24/2023 4:11 PM
55	38	7/19/2023 2:15 PM
56	78	7/19/2023 2:10 PM

57	65	7/17/2023 3:26 PM
58	21	7/17/2023 1:56 PM

Q8 How would you describe your community's capabilities in natural hazard protection? (i.e., ability to protect citizens, residents, visitors, or assets against natural hazards)

Answered: 58 Skipped: 9



ANSWER CHOICES	AVERAGE NUMBER	TOTAL NUMBER	RESPONSES
	56	3,252	58
Total Respondents: 58			

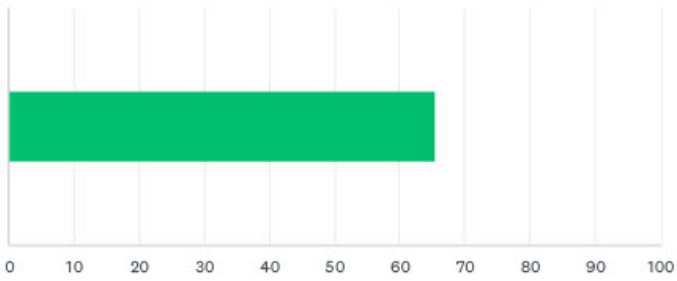
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26	51	8/9/2023 8:47 AM
27	90	8/8/2023 10:52 PM
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29	70	8/8/2023 3:46 PM
30	50	8/8/2023 3:18 PM
31	89	8/8/2023 1:22 PM
32	94	8/8/2023 8:30 AM
33	60	8/8/2023 8:14 AM
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54	81	7/24/2023 4:11 PM
55	51	7/19/2023 2:15 PM
56	88	7/19/2023 2:10 PM

57	100	7/17/2023 3:26 PM
58	22	7/17/2023 1:56 PM

Q9 How would you describe your community's capabilities in natural hazard response? (i.e., ability to respond quickly to save lives; protect property and the environment; and meet basic human needs in the aftermath of an incident)

Answered: 58 Skipped: 9



ANSWER CHOICES	AVERAGE NUMBER	TOTAL NUMBER	RESPONSES
	66	3,800	58
Total Respondents: 58			

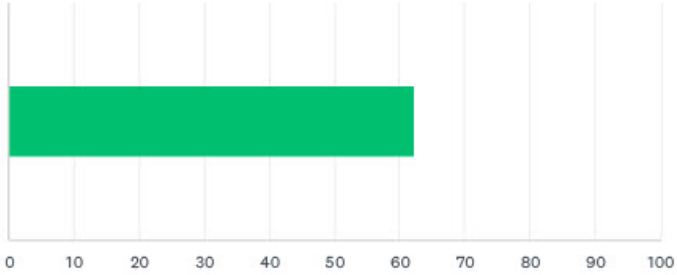
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52	60	8/4/2023 11:53 AM
53	53	8/2/2023 4:30 PM
54	90	7/24/2023 4:11 PM
55	73	7/19/2023 2:15 PM

56	92	7/19/2023 2:10 PM
57	90	7/17/2023 3:26 PM
58	42	7/17/2023 1:56 PM

Q10 How would you describe your community's capabilities in natural hazard recovery? (i.e., ability to recover through a focus on the timely restoration, strengthening, and revitalization of infrastructure, housing, and a sustainable economy, as well as the health, social, cultural, historic, and environmental fabric of communities affected by an incident)

Answered: 58 Skipped: 9



ANSWER CHOICES	AVERAGE NUMBER	TOTAL NUMBER	RESPONSES
	62	3,615	58
Total Respondents: 58			

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38	75	8/7/2023 9:05 AM
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40	73	8/7/2023 8:39 AM
41	75	8/7/2023 8:38 AM
42	46	8/7/2023 8:33 AM
43	90	8/7/2023 8:16 AM
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50	80	8/4/2023 1:33 PM
51	75	8/4/2023 12:38 PM
52	61	8/4/2023 11:53 AM
53	26	8/2/2023 4:30 PM
54	89	7/24/2023 4:11 PM

55	53	7/19/2023 2:15 PM
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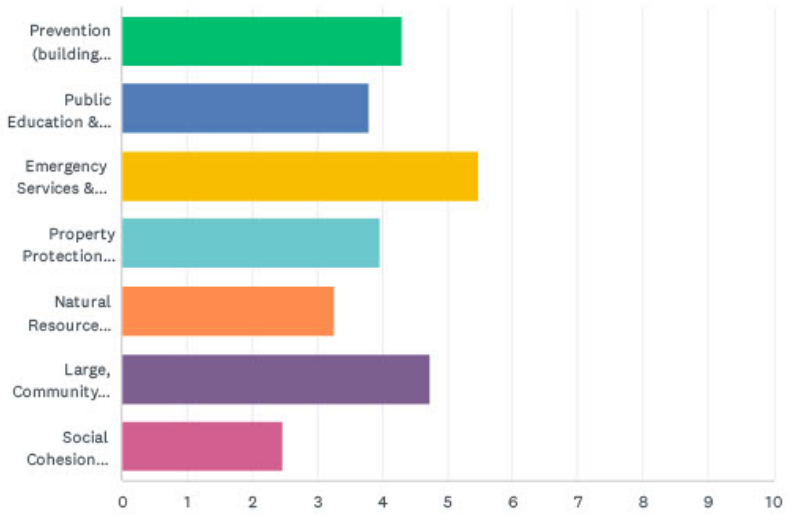
Q11 Please provide any additional detail or capabilities that increase your community or organization's resilience.

Answered: 14 Skipped: 53

#	RESPONSES	DATE
1	A State wide program to bury the utility infrastructure (electric, cable, fiber, communications, etc) especially during road work and/or re-design of transportation areas.	8/21/2023 11:35 AM
2	Mohegan Sun Casino is utilized as a RDS for Region 4 PHEP activities	8/15/2023 8:55 AM
3	We need to be better prepared for the more frequent impactful severe rain events leading to repetitive flooding.	8/10/2023 9:25 AM
4	The town is in a fairly strong financial position to be proactive in mitigation efforts	8/9/2023 1:27 PM
5	No plan comprehensive plan for longer term power/internet disruptions; limited housing; overbuilding in flood-prone areas; lack of ability to quickly repair road-ways/infrastructure.	8/9/2023 8:47 AM
6	We are planning and executing projects to reduce flood prone areas in town, but this is a long-term project approximately 10 years. Biggest issue is funding to solve, then design and then permits.	8/8/2023 8:14 AM
7	Town of Stonington and the Masons Island Fire District need to have up to date Hurricane plans.	8/7/2023 10:31 AM
8	Lessons learned Irene and Sandy response and recovery.	8/7/2023 8:39 AM
9	We have established a task force focused on protecting our sole egress road along the eastern shoreline of the island. We have had community support from Masons Island Property Owners Association and the Masons Island Fire District Board and voters.	8/4/2023 6:26 PM
10	well planned drainage improvements The Town has oversized drainage to handle flooding Maintenance of public improvements done well by Mayor and Assistant DPW	8/4/2023 3:32 PM
11	established a Coastal Resiliency Fund to fund resiliency programs and projects; undertaking or planned resiliency projects throughout town	8/4/2023 2:24 PM
12	emergency operation center well coordinated FD-PD-PW	8/4/2023 1:33 PM
13	The City of Groton has a Municipal Electric Utility. Additionally, we have Public Works, Police and Fire Department for assistance.	7/19/2023 2:15 PM
14	Our emergency response network is well honed partly because they drill a lot because Millstone is in our region.	7/19/2023 2:10 PM

Q12 Many community activities can reduce the risk from natural hazards. Please rank the following activity categories in order of what you consider most important (1) to least important (7).

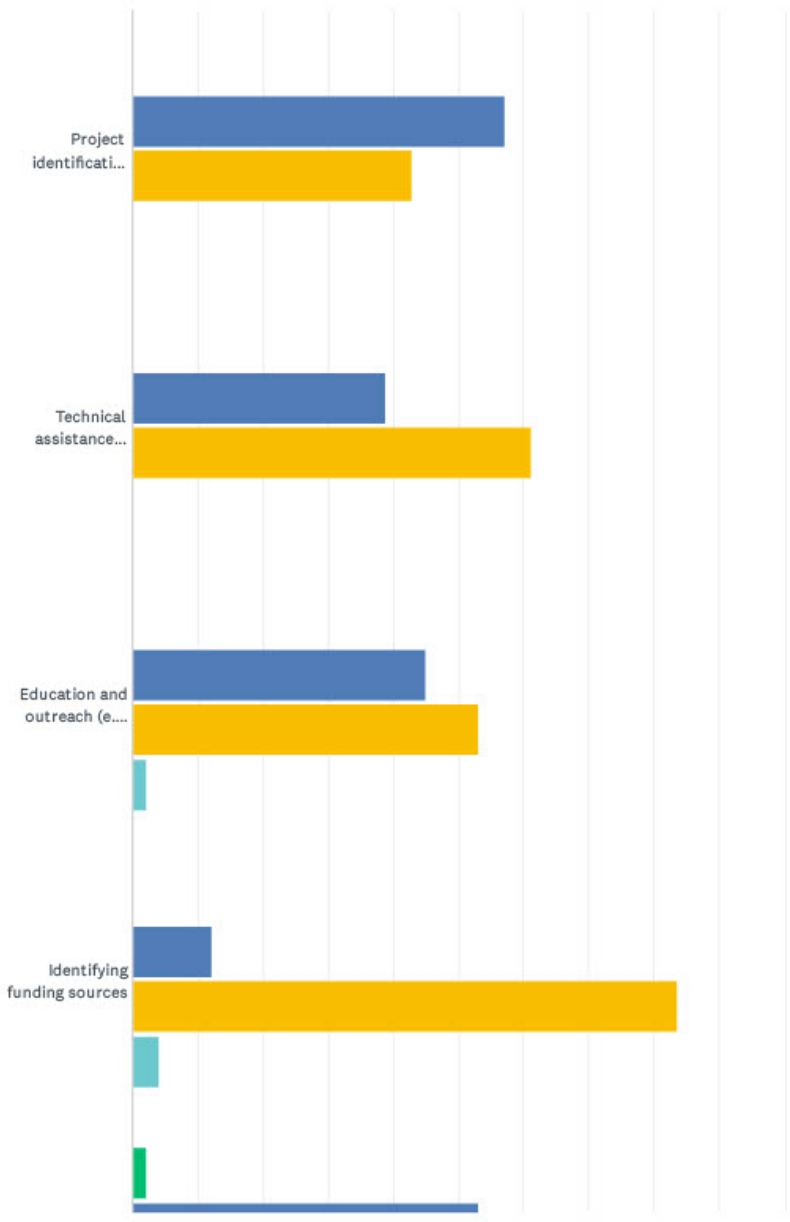
Answered: 49 Skipped: 18



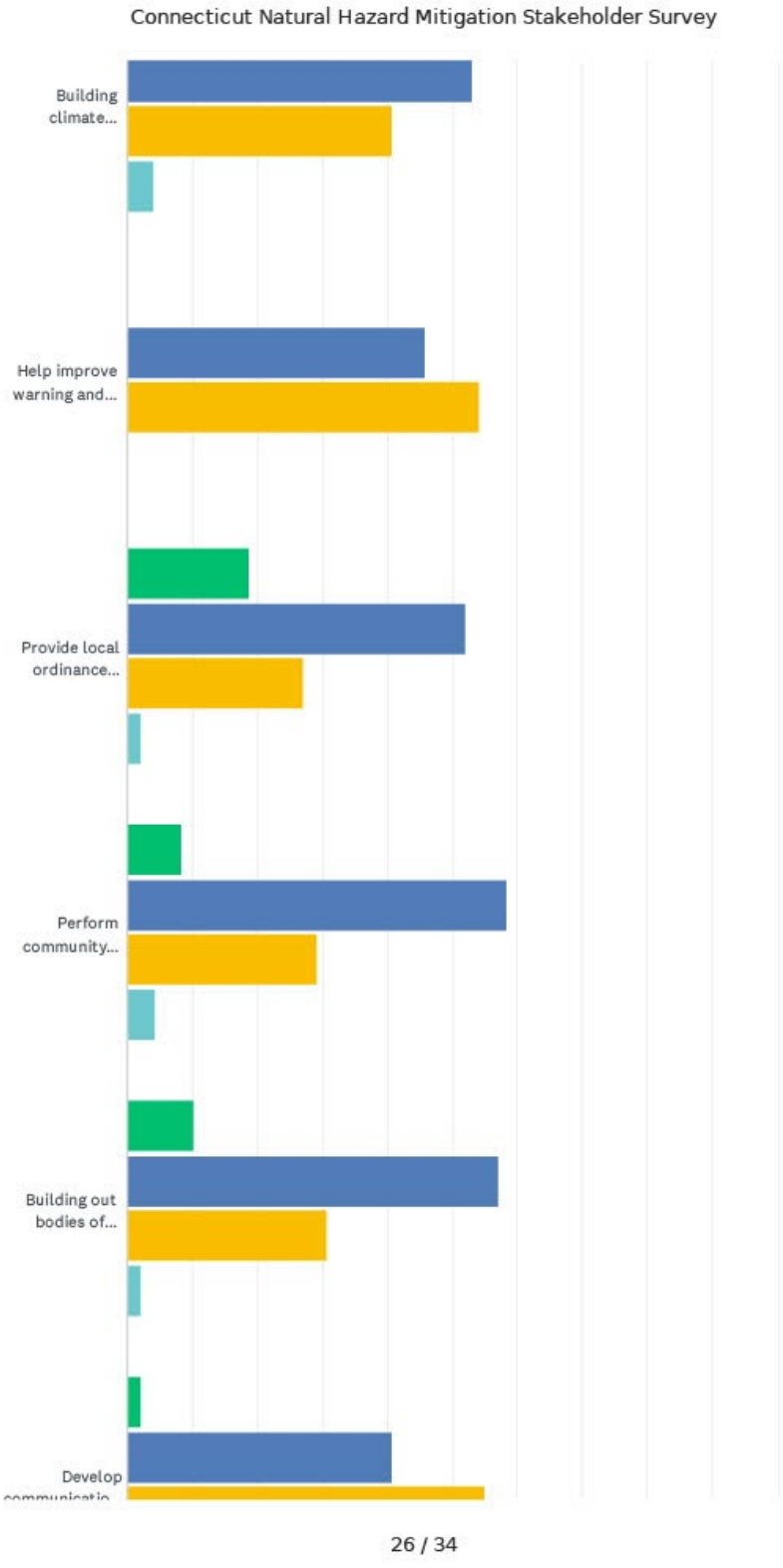
	1	2	3	4	5	6	7	TOTAL	SCORE
Prevention (building codes, zoning regulations, etc.)	14.29% 7	8.16% 4	24.49% 12	24.49% 12	10.20% 5	12.24% 6	6.12% 3	49	4.31
Public Education & Awareness (workshops, websites, etc.)	14.29% 7	16.33% 8	4.08% 2	10.20% 5	22.45% 11	20.41% 10	12.24% 6	49	3.80
Emergency Services & Preparedness (generators, safe rooms, etc.)	30.61% 15	32.65% 16	12.24% 6	12.24% 6	6.12% 3	2.04% 1	4.08% 2	49	5.47
Property Protection (floodproofing, hurricane windows, relocation, etc.)	8.16% 4	6.12% 3	24.49% 12	22.45% 11	18.37% 9	14.29% 7	6.12% 3	49	3.96
Natural Resource Protection (habitat restoration, green space, etc.)	6.12% 3	12.24% 6	10.20% 5	4.08% 2	26.53% 13	22.45% 11	18.37% 9	49	3.27
Large, Community Structural Projects (stormwater infrastructure, flood control, etc.)	22.45% 11	20.41% 10	14.29% 7	20.41% 10	2.04% 1	14.29% 7	6.12% 3	49	4.73
Social Cohesion Projects (resilience hubs, community services, etc.)	4.08% 2	4.08% 2	10.20% 5	6.12% 3	14.29% 7	14.29% 7	46.94% 23	49	2.47

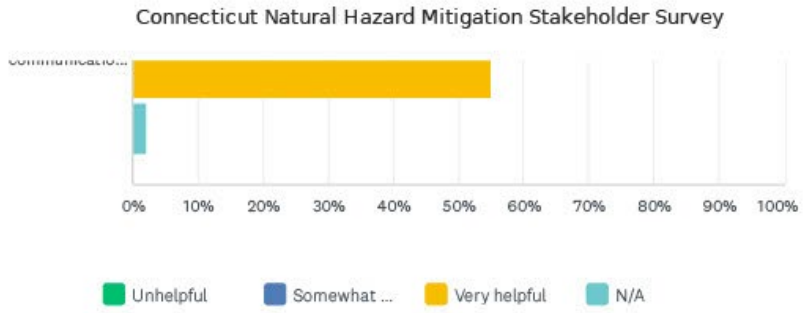
Q13 What kind of assistance could your organization use from the State of Connecticut to help further your hazard mitigation goals? Please identify how helpful each action is for your organization:

Answered: 49 Skipped: 18



25 / 34


Connecticut Natural Hazard Mitigation Stakeholder Survey
Building climate...
Help improve warning and...
Provide local ordinance...
Perform community...
Building out bodies of...
Develop
26 / 34

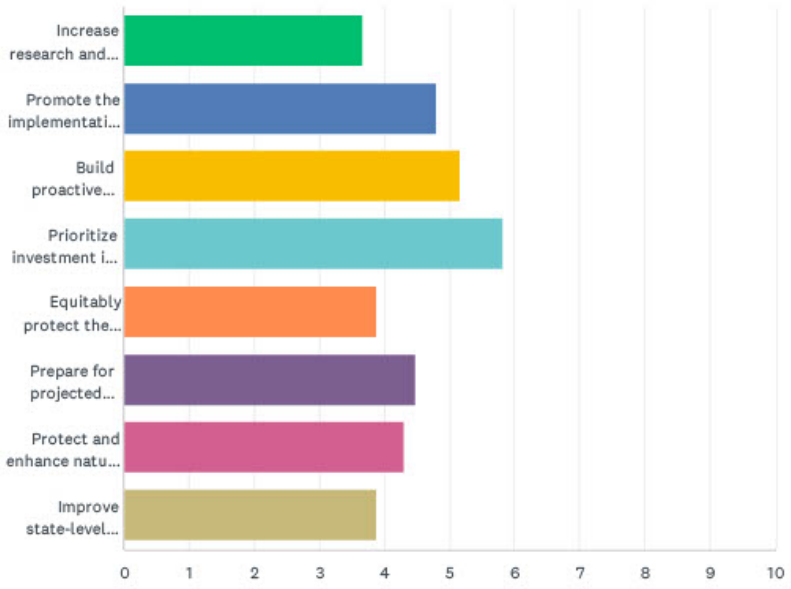


	UNHELPFUL	SOMEWHAT HELPFUL	VERY HELPFUL	N/A	TOTAL
Project identification and prioritization	0.00% 0	57.14% 28	42.86% 21	0.00% 0	49
Technical assistance (e.g. erosion mapping, streamflow modeling, and land use planning)	0.00% 0	38.78% 19	61.22% 30	0.00% 0	49
Education and outreach (e.g. training, workshops, and presentations)	0.00% 0	44.90% 22	53.06% 26	2.04% 1	49
Identifying funding sources	0.00% 0	12.24% 6	83.67% 41	4.08% 2	49
Building climate resilience strategies	2.04% 1	53.06% 26	40.82% 20	4.08% 2	49
Help improve warning and response systems to improve disaster management	0.00% 0	45.83% 22	54.17% 26	0.00% 0	48
Provide local ordinance reviews for communities	18.75% 9	52.08% 25	27.08% 13	2.08% 1	48
Perform community assistance visits	8.33% 4	58.33% 28	29.17% 14	4.17% 2	48
Building out bodies of relevant research for hazard mitigation and resilience	10.20% 5	57.14% 28	30.61% 15	2.04% 1	49
Develop communication systems from the State to your organization	2.04% 1	40.82% 20	55.10% 27	2.04% 1	49

#	OTHER (PLEASE SPECIFY)	DATE
1	Focus on regional and State planning and response rather than on municipal focus resiliency and response activities.	8/9/2023 8:53 AM
2	Funding !!! And how to access the funding	8/8/2023 8:18 AM
3	equip local government ability to deny building in flood prone areas	8/7/2023 4:42 PM
4	Links on DEMHS website to hazard mitigation.	8/7/2023 9:03 AM

Q14 Please rank the following potential outcomes of the CT Natural Hazard Mitigation Plan in order of what you consider most important (1) to least important (7).

Answered: 45 Skipped: 22



Connecticut Natural Hazard Mitigation Stakeholder Survey

	1	2	3	4	5	6	7	8	TOTAL	SCORE
Increase research and planning activities for the mitigation of natural hazards	2.22% 1	4.44% 2	24.44% 11	6.67% 3	6.67% 3	20.00% 9	15.56% 7	20.00% 9	45	3.67
Promote the implementation of effective natural hazard mitigation projects	13.33% 6	15.56% 7	11.11% 5	11.11% 5	22.22% 10	8.89% 4	8.89% 4	8.89% 4	45	4.80
Build proactive strategies for taking action to reduce long-term risk to life and property	22.22% 10	15.56% 7	11.11% 5	11.11% 5	11.11% 5	11.11% 5	11.11% 5	6.67% 3	45	5.16
Prioritize investment in projects that protect life and property	22.22% 10	22.22% 10	13.33% 6	20.00% 9	11.11% 5	2.22% 1	8.89% 4	0.00% 0	45	5.82
Equitably protect the health and safety of the public through awareness, preparedness, and partnership	4.44% 2	11.11% 5	11.11% 5	13.33% 6	17.78% 8	8.89% 4	11.11% 5	22.22% 10	45	3.89
Prepare for projected climate change and future natural hazard conditions	13.33% 6	13.33% 6	11.11% 5	13.33% 6	11.11% 5	11.11% 5	8.89% 4	17.78% 8	45	4.47
Protect and enhance natural resources to increase resilience	11.11% 5	8.89% 4	13.33% 6	11.11% 5	13.33% 6	15.56% 7	17.78% 8	8.89% 4	45	4.31
Improve state-level natural hazard data and information	11.11% 5	8.89% 4	4.44% 2	13.33% 6	6.67% 3	22.22% 10	17.78% 8	15.56% 7	45	3.89

Q15 Please list any additional outcomes that you would like to see from this plan.

Answered: 3 Skipped: 64

#	RESPONSES	DATE
1	Relying on municipal leadership or COGs to take lead on mitigation will cause uneven responses; advocate for state-level and regional responsibility for mitigation and response planning and activation.	8/9/2023 8:53 AM
2	Training on how to access funding and strategies. Training on how to fill out State and FEMA paperwork to ease the burden and funding after the storm.	8/8/2023 8:18 AM
3	I am concerned about heat waves and how older homes without A/C will be able to accommodate the residents who live in them, who are often low-income.	7/19/2023 2:13 PM

Q16 Please provide any additional comments, questions, or feedback to be addressed as the State of Connecticut updates its Natural Hazard Mitigation Plan.

Answered: 8 Skipped: 59

#	RESPONSES	DATE
1	Courses in the afternoon for those who are volunteer or part-time EMD's for the development and implementation of the plans would be most effective.	8/27/2023 7:50 AM
2	It would be beneficial to all if local and state public health professionals were included in the Natural Hazard Mitigation Plan. The public health of the state will be impacted by natural hazards such as heat, flooding, climate change, etc. ESF-8 has strong networks and knowledge to help with this too.	8/15/2023 9:00 AM
3	N/A	8/14/2023 8:54 AM
4	Longer-term housing plan for those displaced. State building codes and coastal building/flood zone development plan to forestall overbuilding/building in higher impact areas of CT. Planning for power and internet outages.	8/9/2023 8:55 AM
5	Happy to talk about additional concerns about hazard resiliency when it comes to emergency transportation through our public transit fleet and the role we plan and can plan in helping vulnerable residents reach safe locations.	8/8/2023 4:03 PM
6	Key items: Funding, Training and Communication. All town just not Watertown has to maintain the current infrastructure. Biggest thing to start at the top of the watershed is Detention/Retention Basin need to be cleaned and maintained. Removal of Sediment is key. This is a statewide issue in many towns. Development occurred over the past 50 years and the Detention/Retention Basins have had limited to no maintenance. Other thoughts is we have four town owned dams. We need to plan to lower the water storage behind the dam before the storm. But we need an engineered/environmental plan. And how do you lower with these quick afternoon/evening rain events. It's not like a Hurricane where you have days to track and plan to lower the water elevation.	8/8/2023 8:24 AM
7	Statutes and regulations that would create a better resiliency.	8/7/2023 9:11 AM
8	Help towns find funding for bridge work and water treatment plants needed for climate resilience due to increasing number and severity of storms combined with sea level rise.	8/4/2023 6:36 PM

Q17 If you would like to be contacted to discuss potential ways you can further participate in the hazard mitigation planning process as a stakeholder, please provide contact information.

Answered: 21 Skipped: 46

ANSWER CHOICES	RESPONSES	
Name	100.00%	21
Title	95.24%	20
Address	0.00%	0
Address 2	0.00%	0
City/Town	0.00%	0
State/Province	0.00%	0
ZIP/Postal Code	0.00%	0
Country	0.00%	0
Email Address	100.00%	21
Phone Number	0.00%	0

#	NAME	DATE
1	Noah Rhoades	8/30/2023 1:59 PM
2	Richard Waselik	8/27/2023 7:50 AM
3	chris lippke	8/15/2023 4:40 PM
4	Chris Seery	8/15/2023 9:00 AM
5	Donald Anderson	8/9/2023 1:31 PM
6	Tracey Hanson	8/9/2023 10:52 AM
7	Brendan Geraghty	8/8/2023 4:03 PM
8	Scott Roberts	8/8/2023 3:55 PM
9	Gerald (Jerry) Lukowski	8/8/2023 8:24 AM
10	Janice A. Plaziak	8/7/2023 10:51 AM
11	Lou Allyn	8/7/2023 10:36 AM
12	Drew Baklik	8/7/2023 9:11 AM
13	Anthony Fabrizi	8/7/2023 9:11 AM
14	Todd Gianetti	8/7/2023 8:26 AM
15	Todd Rolland	8/7/2023 6:55 AM
16	Kristin Foster	8/4/2023 6:36 PM
17	Jim Grappone	8/4/2023 4:14 PM
18	Jack Healy	8/4/2023 12:46 PM

19	John Filchak	7/24/2023 4:16 PM
20	Keith Hedrick	7/19/2023 2:21 PM
21	Cierra Patrick	7/17/2023 3:33 PM
#	**TITLE**	**DATE**
1	Firefighter	8/30/2023 1:59 PM
2	Deputy Emergency Management Director	8/27/2023 7:50 AM
3	Environmental Health Specialist	8/15/2023 9:00 AM
4	Chief of Police	8/9/2023 1:31 PM
5	First Selectman	8/9/2023 10:52 AM
6	Transit Planner	8/8/2023 4:03 PM
7	ATM/CIO	8/8/2023 3:55 PM
8	Director of Public Works	8/8/2023 8:24 AM
9	Guilford Town Engineer	8/7/2023 10:51 AM
10	Scretary Masons Island Company	8/7/2023 10:36 AM
11	Director of Municipal Affairs	8/7/2023 9:11 AM
12	Fire Chief/EMD	8/7/2023 9:11 AM
13	Emergency Management Director	8/7/2023 8:26 AM
14	Director of Land Use & Public Works	8/7/2023 6:55 AM
15	Chair of MIFD Shoreline Road Protection Task Force	8/4/2023 6:36 PM
16	Assistant Town Engineer	8/4/2023 4:14 PM
17	Director of Public Works	8/4/2023 12:46 PM
18	Executive Director	7/24/2023 4:16 PM
19	Mayor	7/19/2023 2:21 PM
20	Economic Development Manager	7/17/2023 3:33 PM
#	**ADDRESS**	**DATE**
	There are no responses.	
#	**ADDRESS 2**	**DATE**
	There are no responses.	
#	**CITY/TOWN**	**DATE**
	There are no responses.	
#	**STATE/PROVINCE**	**DATE**
	There are no responses.	
#	**ZIP/POSTAL CODE**	**DATE**
	There are no responses.	
#	**COUNTRY**	**DATE**
	There are no responses.	
#	**EMAIL ADDRESS**	**DATE**
1	12rhoadesnoah@gmail.com	8/30/2023 1:59 PM
2	richardwaselik@outlook.com	8/27/2023 7:50 AM

3	firstselectman@canterburyct.org	8/15/2023 4:40 PM
4	cseery@moheganmail.comj	8/15/2023 9:00 AM
5	danderson@darienct.gov	8/9/2023 1:31 PM
6	thanson@voluntown.gov	8/9/2023 10:52 AM
7	bgeraghty@estuarytransit.org	8/8/2023 4:03 PM
8	scott.roberts@southwindsor-ct.gov	8/8/2023 3:55 PM
9	lukowski@watertownct.org	8/8/2023 8:24 AM
10	plaziakj@guilfordct.gov	8/7/2023 10:51 AM
11	allynlouis6@gmail.com	8/7/2023 10:36 AM
12	dbaklik@nvcogct.gov	8/7/2023 9:11 AM
13	AFabrizi@milfordct.gov	8/7/2023 9:11 AM
14	emd@marlboroughct.net	8/7/2023 8:26 AM
15	trolland@somersct.gov	8/7/2023 6:55 AM
16	kdnfoster24@gmail.com	8/4/2023 6:36 PM
17	grapponej@southington.org	8/4/2023 4:14 PM
18	jhealy@newmilford.org	8/4/2023 12:46 PM
19	john.filchak@neccog.org	7/24/2023 4:16 PM
20	hedrickk@cityofgroton-ct.gov	7/19/2023 2:21 PM
21	Patrickc@cityofgroton-ct.gov	7/17/2023 3:33 PM
#	**PHONE NUMBER**	**DATE**
	There are no responses.	

Connecticut Natural Hazard Mitigation Stakeholder Survey

#68

COMPLETE

Collector:	Stakeholders (Web Link)
Started:	Wednesday, September 06, 2023 9:35:09 AM
Last Modified:	Wednesday, September 06, 2023 9:44:36 AM
Time Spent:	00:09:26
IP Address:	162.246.4.210

Page 2: Basic Information

Q1 **Yes**

Are you a representative of a Council of Government or jurisdiction within Connecticut?

Q2

Which community or organization do you represent?

Town of Bolton

Page 3: Hazard Experience

Q3 **Yes**

Before today, were you aware that the State of Connecticut has a Natural Hazard Mitigation Plan?

Q4

How concerned are you about each of the following hazards impacting your community or the State of Connecticut as a whole?

Dam Failure	**Concerned**
Drought	**Somewhat Concerned**
Earthquake	**Not Concerned**
Extreme Cold	**Somewhat Concerned**
Extreme Heat	**Somewhat Concerned**
Flood	**Somewhat Concerned**
Sea Level Rise	**Not Concerned**
Thunderstorm	**Somewhat Concerned**
Tornado	**Somewhat Concerned**
Hurricane/Tropical Storm	**Very Concerned**
Wildland Fire	**Somewhat Concerned**
Winter Weather	**Concerned**

Q5

How concerned are you about each of the following climate-related impacts affecting your community or the State of Connecticut as a whole?

More extreme or frequent heatwaves	**Concerned**
Sea level rise	**Not Concerned**
Habitat disruption (including tree loss/changes)	**Somewhat Concerned**
In-migration of people to Connecticut from areas more severely impacted by climate change	**Not Concerned**
More extreme or frequent rainfall events (more frequent flooding)	**Somewhat Concerned**
More extreme or frequent droughts	**Somewhat Concerned**
More extreme or frequent storm events (including thunderstorms, hurricanes, tropical storms, and tornadoes)	**Concerned**
More extreme or frequent winter storm events (including ice storms and cold temperatures)	**Very Concerned**

Page 4: Current Community Resilience

Q6

Do you feel that the State of Connecticut is adequately resilient (prepared for natural hazards or disasters and able to reduce their negative impacts)?

Yes

Q7 How would you describe your community's capabilities in natural hazard prevention and mitigation? (i.e., ability to reduce the loss of life and property by lessening the impact of future hazards)	**70**
Q8 How would you describe your community's capabilities in natural hazard protection? (i.e., ability to protect citizens, residents, visitors, or assets against natural hazards)	**70**
Q9 How would you describe your community's capabilities in natural hazard response? (i.e., ability to respond quickly to save lives; protect property and the environment; and meet basic human needs in the aftermath of an incident)	**100**
Q10 How would you describe your community's capabilities in natural hazard recovery? (i.e., ability to recover through a focus on the timely restoration, strengthening, and revitalization of infrastructure, housing, and a sustainable economy, as well as the health, social, cultural, historic, and environmental fabric of communities affected by an incident)	**95**
Q11 Please provide any additional detail or capabilities that increase your community or organization's resilience.	**Respondent skipped this question**

Page 5: Mitigation Strategy

Q12

Many community activities can reduce the risk from natural hazards. Please rank the following activity categories in order of what you consider most important (1) to least important (7).

Prevention (building codes, zoning regulations, etc.)	6
Public Education & Awareness (workshops, websites, etc.)	1
Emergency Services & Preparedness (generators, safe rooms, etc.)	3
Property Protection (floodproofing, hurricane windows, relocation, etc.)	2
Natural Resource Protection (habitat restoration, green space, etc.)	4
Large, Community Structural Projects (stormwater infrastructure, flood control, etc.)	5
Social Cohesion Projects (resilience hubs, community services, etc.)	7

Q13

What kind of assistance could your organization use from the State of Connecticut to help further your hazard mitigation goals? Please identify how helpful each action is for your organization:

Project identification and prioritization	**Somewhat helpful**
Technical assistance (e.g. erosion mapping, streamflow modeling, and land use planning)	**Unhelpful**
Education and outreach (e.g. training, workshops, and presentations)	**Somewhat helpful**
Identifying funding sources	**Very helpful**
Help improve warning and response systems to improve disaster management	**Somewhat helpful**
Provide local ordinance reviews for communities	**Unhelpful**
Perform community assistance visits	**Unhelpful**
Building out bodies of relevant research for hazard mitigation and resilience	**Unhelpful**
Develop communication systems from the State to your organization	**Very helpful**

Q14

Please rank the following potential outcomes of the CT Natural Hazard Mitigation Plan in order of what you consider most important (1) to least important (7).

Increase research and planning activities for the mitigation of natural hazards	6
Promote the implementation of effective natural hazard mitigation projects	2
Build proactive strategies for taking action to reduce long-term risk to life and property	7
Prioritize investment in projects that protect life and property	3
Equitably protect the health and safety of the public through awareness, preparedness, and partnership	5
Prepare for projected climate change and future natural hazard conditions	4
Protect and enhance natural resources to increase resilience	1
Improve state-level natural hazard data and information	8

Q15

Please list any additional outcomes that you would like to see from this plan.

Respondent skipped this question

Page 6: Conclusion

Q16

Please provide any additional comments, questions, or feedback to be addressed as the State of Connecticut updates its Natural Hazard Mitigation Plan.

Respondent skipped this question

Q17

If you would like to be contacted to discuss potential ways you can further participate in the hazard mitigation planning process as a stakeholder, please provide contact information.

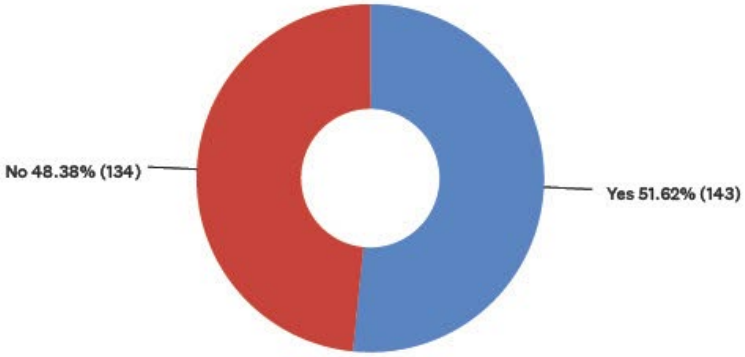
Respondent skipped this question

1.6.3 Public Hazard Survey

Connecticut Natural Hazard Mitigation Public Survey

Q1 Before today, were you aware that Connecticut has a hazard mitigation plan?

Answered: 277 Skipped: 10

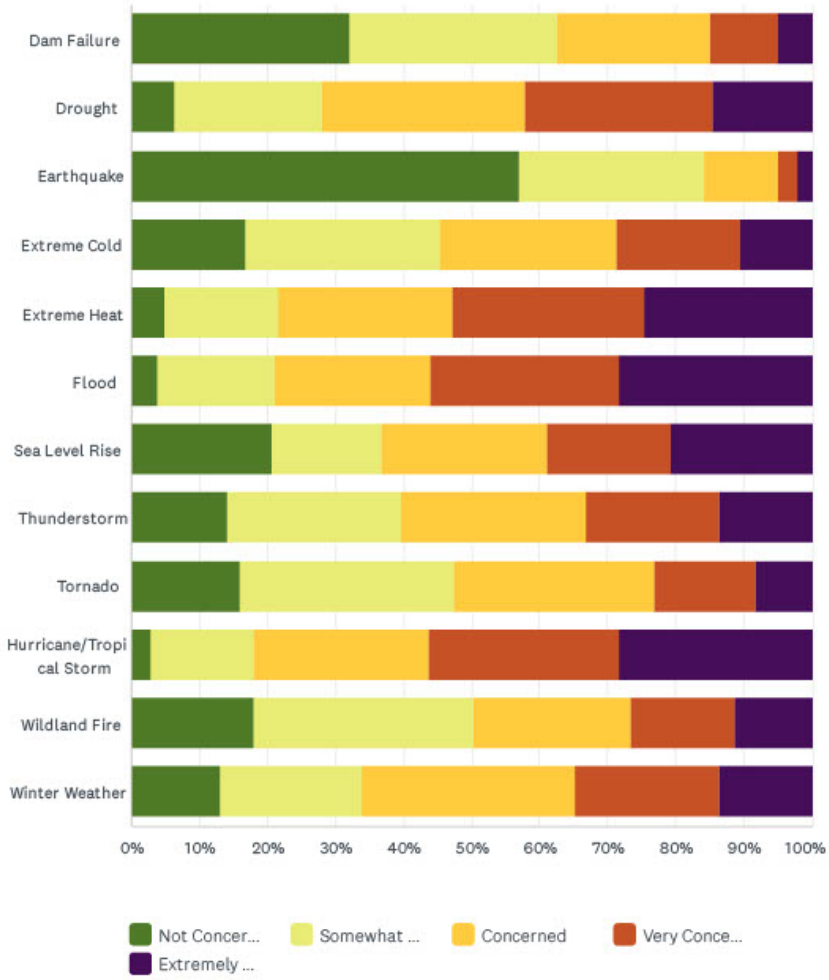


ANSWER CHOICES	RESPONSES	
Yes	51.62%	143
No	48.38%	134
TOTAL		277

1 / 46

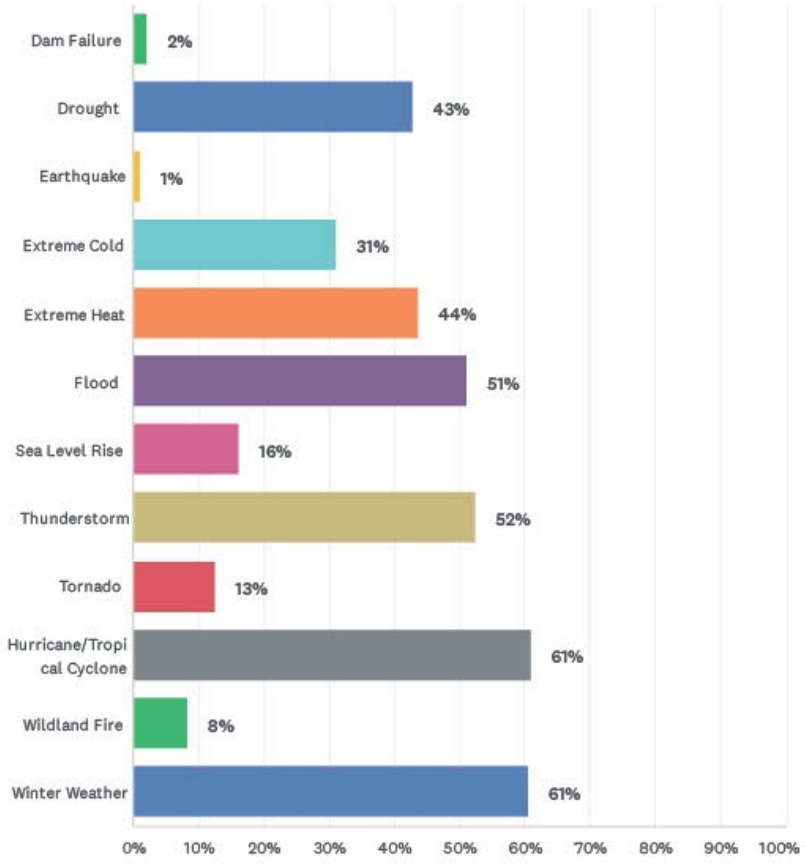
Q2 How concerned are you about each of the following hazards impacting your community?

Answered: 286 Skipped: 1



Q3 Which of the following hazards have you been negatively impacted by while in Connecticut?

Answered: 277 Skipped: 10



Q4 Can you describe a time when you were negatively impacted by a natural hazard in Connecticut?

Answered: 231 Skipped: 56

#	RESPONSES	DATE
1	Heat Hurricane Driving after a storm and having roads by water flooded. Having to stay at home due to extreme heat or winter weather.	9/3/2023 1:47 PM
2	Hurricane Power Outage Power outages from hurricanes	9/1/2023 3:49 PM
3	Hurricane Hurricane and topical storms Irene and Sandy. High tide was about 8.5 ft above normal and caused a great deal of debri and damage to the shore line. If the winds had not clocked around to the north and help push the waters into LIS, damage would have been far greater.	9/1/2023 10:12 AM
4	Flooding Some minor basement flooding recently	8/31/2023 7:56 PM
5	Heat Lack of tree canopy in Stratford causes extreme heat islands in the summer. Unbearable to walk or bike outside during this heat. Need more trees near businesses and residential neighborhoods in the south end of Stratford.	8/31/2023 11:46 AM
6	Heat The heat, humidity and smoke from Canadian forest fires kept me inside for weeks.	8/30/2023 9:39 PM
7	Hurricane Power Outage Storm Isaias knocked out power, as did Irene and Sandy. Also, in mid-March, there was a brush fire at the end of my street that took two hours and 3 fire trucks to extinguish	8/30/2023 4:44 PM
8	Hurricane Power Outage We have been out of electricity for several days after hurricanes/tropical storms. That negatively impacted us through loss of refrigerated food and loss of ability to cook.	8/30/2023 4:25 PM
9	Hurricane Power Outage No electricity for 5 days when storm Albert hit in October 2011	8/30/2023 4:17 PM
10	Hurricane Power Outage 2011 Storm Alfred, "October Snowstorm" left without power for 8 days	8/30/2023 2:42 PM
11	a tornado brought down trees on to my house on 2 different occasions. I have a standing seam metal roof. I have had water in my basement on 2 occasions, and one year we had a drought enough to drain our wells. I moved to Old Lyme in 2003. I have been snowed in several times, but that seems normal.	8/30/2023 2:33 PM
12	Loss of big maple tree. It fell on my house; needing repars to the house as well ass a new roof.	8/30/2023 12:49 PM
13	Power Outage Electricity outages	8/30/2023 12:43 PM
14	Hurricane severe storms damage to roof shingles, losing branches, drought forcing me to use tap water for plants, heavy rains clogging street gutters with debris, severe snow storms in past years almost 3 ft in street	8/30/2023 12:24 PM
15	Power Outage During the 2011 Halloween weekend, trick-or-treating door-to-door was cancelled in Windsor due to a severe snowstorm that dumped approximately 2 feet of snow. There were dangerous downed power lines in the streets and blizzard conditions. Electric was out everywhere for days.	8/30/2023 10:43 AM
16	Breathing wildfire smoke from Canada	8/29/2023 9:51 PM
17	I have a brook on my property. It passes through a culvert that is in disrepair and for years has been inadequate to accommodate the increase in run off from development...never mind climate change.	8/29/2023 9:18 PM
18	Power Outage power lines down due to conditions	8/29/2023 9:08 PM

19	Hurricane Power Outage Hurricane Irene, snowstorm Nemo, the October snowstorm that knocked out power to much of the state, numerous heavy rains that have flooded my property	8/29/2023 8:07 PM
20	Power Outage No power for over ten days Massive tree nearly hit the house	8/29/2023 7:55 PM
21	Hurricane Power Outage My family and I were negatively impacted Tropical storm Isaias. We lost power for about four days. We had a lot of limbs from trees in our yard down too. We were able to hook up our refrigerator and stove to a backup generator. There were a lot of trees down in East Hartford and getting around to stores and businesses was difficult does out two weeks.	8/29/2023 5:24 PM
22	Flooding Hurricane Winter storms and hurricanes. Live in a coastal town that is affected by flooding, but I also realize we are geographically in one of the safest locations in the country. I also feel more safe knowing how these things come about, such as less of a wildfire risk if it has been incredibly wet, rather than a drought. Still have never heard of disaster mitigation plans.	8/29/2023 4:01 PM
23	Heat Power Outage We have had several large trees toppled and a large amount of crown damage, then long power outages due to extreme rain followed by heavy windstorms. Also large trees have died because of drought. This costs tens of thousands of dollars to remove the downed and dead trees. The power outages were difficult to live through as we depend on electricity for water and home heating.	8/29/2023 3:41 PM
24	Power Outage When we lost power for a very long time and it was freezing cold	8/29/2023 3:17 PM
25	Flooding Hurricane Hurricane Irene, extensive flooding in the South End.	8/29/2023 12:37 PM
26	Power Outage 80 foot tree on our property downed during Katrina. took out power lines.	8/29/2023 12:33 PM
27	Hurricane Power Outage On Halloween about 10 years ago, we lost power for four days because an unusual ice storm blanketed tress before their leaves were gone.	8/29/2023 12:26 PM
28	Hurricane Power Outage Several ice storm or tonado related power outages lasting up to 6 days.	8/29/2023 12:03 PM
29	Power Outage Loss of power due to snow.	8/29/2023 10:53 AM
30	Microburst brought down multiple trees on land - in forest so not a major impact but illustrates the damage that can occur.	8/29/2023 10:04 AM
31	SANDY	8/29/2023 10:04 AM
32	Heat Living and working in non-airconditioned buildings means summer productivity and activities are curtailed. Extreme heat is also coupled with poor air quality. Smoke from wildfires in Canada and other areas made ordinary outside activities difficult or impossible to perform. Just a short walk with the dog left me coughing for several hours.	8/29/2023 9:38 AM
33	Some of our pachysandra died last year from drought, the first loss we've had in 59 years at this location.	8/29/2023 9:33 AM
34	Over 9 inch rain fell on Glenville in 24 hrs. First time I had water in basement in last 15 yrs. Ended up spending night in ER when wife gashed open her elbow after slipping and falling on the wet tile floor.	8/28/2023 11:41 PM
35	Hurricane Hurricane Ida flooded my home	8/28/2023 9:53 PM
36	3' snowstorm Hurricane Drought	8/28/2023 5:21 PM
37	Hurricane Blizzard back in1970's, about 3 hurricanes since 1970's	8/28/2023 4:45 PM
38	Power Outage Loss of power.	8/28/2023 2:44 PM
39	Significant property damage from flooding	8/28/2023 12:28 PM
40	Flooding 9-inch rain event created a 4-5 foot deep trench out of our road so that it was impassable until it was repaired and repaved.	8/28/2023 8:22 AM
41	house flood	8/28/2023 8:13 AM
42	Hurricane Power Outage Following several hurricanes and tropical storms, we have lost power for several days.	8/28/2023 12:09 AM

43	Flooding Hurricane Hurricanes brought high water to yard. No flooding but a lot of debris and tree damage.	8/27/2023 7:22 PM
44	Hurricane Power Outage Downed trees and loss of power for five days due to tropical storm. Well couldn't meet our needs during dry year.	8/26/2023 11:06 PM
45	Flooding Flood after heavy rain on burr street and minor road	8/26/2023 12:39 PM
46	Hurricane Power Outage There have been several storms that knocked out power for extended periods of time.	8/26/2023 8:38 AM
47	Flooding With all the thunderstorms lately my house has gotten some damage. With all the rain the flooding has effected crops but not ruined and last year when we had just about no rain it was hard to keep crops alive.	8/25/2023 8:00 PM
48	Trees falling, following heavy rain and winds.	8/25/2023 7:57 PM
49	Hurricane Ongoing drought of the last ten years. Tropical storm Isaac. Recent days with 3 inch rainfall. No snow last winter. Smoke pollution from wildfires	8/25/2023 5:04 PM
50	Drought and extreme weather has impacted tree health negatively.	8/25/2023 4:38 PM
51	Flooding Some flooding into our basement several years ago after torrential rains made a neighboring vernal pool overflow into our property	8/25/2023 4:17 PM
52	I have experienced flooding several times in my years in CT (2017-the present)	8/25/2023 4:08 PM
53	Access to my house from the roads was impossible for 2 days due to flooding.	8/25/2023 4:02 PM
54	Hurricane I have been impacted by heavy rain associated with hurricanes and thunderstorms.	8/25/2023 3:57 PM
55	Power Outage The main negative impact is concerning the loss of electricity as a result of heavy wind, snow fall.	8/25/2023 8:21 AM
56	Hurricane Hurricane Sandy	8/24/2023 10:47 PM
57	lost a giant 80 year old tree in a massive rain/wind storm	8/24/2023 5:29 PM
58	Hurricane Power Outage 1985 Hurrican Gloria left us flood and without power for 7 days in Mystic. 2011 Floods from Hurrican Irene in Mystic home with 3 feet of sea water in basement, without power for several days. Trees down blocking roads. 2011 Blizzard lost power for 8 days in Griswold. 2012 Evacuated due to Super Storm Sandy in Stonington Borough. Lost power for 12 days.	8/24/2023 2:54 PM
59	one time ... water in basement during a spring thaw & heavy rain; about 14 years ago	8/24/2023 2:50 PM
60	no. moved here less than 2 years ago	8/24/2023 2:37 PM
61	n/a	8/24/2023 2:13 PM
62	Hurricane Power Outage Winter storm that left many residents without power for many days - Crews had to come from out of state to help restore power.	8/24/2023 1:57 PM
63	Hurricane Power Outage August 2020 - Thunderstorm caused power outages. We have a well so this meant no water in addition to no electricity. We were out for 13 days. We are in Litchfield, CT and that was the worst but there have been three other events while we have lived here since 2006 like this. Another time was just an isolated thunderstorm that left us out of power for 10 days; the October freak snowstorm left us out of power for 10 days. We cannot afford to buy a generator or batteries for our solar panels so we are at the mercy of these storms and inconsistent maintenance by the power company.	8/24/2023 1:47 PM
64	Hurricane Power Outage Extreme flooding caused water to build up in parents basement in Marlborough. Many years ago my family had a house on Lord's Point in Stonington that got extremely damaged from two seperate hurricanes. Winter Hurricane wiped out power to house for almost a week.	8/24/2023 9:47 AM
65	Hurricane Hurricane Sandy/Irene falling trees flooding	8/24/2023 8:23 AM
66	Hurricane Hurricanes Irene & Sandy (falling trees), winter storms (roof weight, 4 days closed in; freezing flood from Q river in trailer park), summer flooding (downtown roads flooded; microburst closing Sleeping Giant State Park and damaging too many houses	8/23/2023 10:50 PM

67	Hurricane After every snow storm, our road is always the last to be plowed. This means I am late to work, etc.	8/23/2023 3:28 PM
68	yes	8/23/2023 1:44 PM
69	String wind brought down a tree that destroyed a 12x16 shed.	8/23/2023 11:18 AM
70	commuting can be of a real concern especially in late winter/early spring during times of significant flooding potential.	8/23/2023 8:52 AM
71	Hurricane flood of 1955 - ice storms - heavy snows - high winds/possible tornado actions	8/23/2023 8:37 AM
72	Hurricane Power Outage Forest fire threatened our house about 10 years ago. Kids let off fireworks in adjacent Mansfield Hollow State Park. Fire spread to the forest floor and smoldered for days then burst out and threatened our land and house. Thunderstorms have struck our well head twice and we have had to replace the well pump and water equipment in the basement which blew out from lightening strike that followed electric wires back into the house. Heavy winter storms and our long driveway get up stranded for days sometimes, but we have woodstove and a generator and keep fuel available. Hurricane cleared our pine forest location in 1985 of more than a dozen trees; took it as a sign from GOD to build where Nature cleared. Droughts and insect damage have killed a lot of trees and caused us to have to cut or pay others to cut lots of damaged trees.	8/22/2023 10:10 PM
73	Hurricane Power Outage Hurricane - eight days without power	8/22/2023 7:44 PM
74	Flooding Recent thunderstorms have resulted in street flooding and personal property flooding.	8/22/2023 3:34 PM
75	Drought causing ideal conditions for Spongey Moth to defoliate oak trees. We are still dealing with the remnants of the last oak mortality event.	8/22/2023 3:17 PM
76	Flooding Unable to leave my home for 6 hours due to West End and Hartford CT flooding. First time that has happened, let alone twice in one month.	8/22/2023 2:01 PM
77	Power Outage have lost power for 1 week and again for 10 days due to snowstorms.	8/22/2023 1:09 PM
78	over the 40 years that I have lived in New London, I have seen the beach erode/sea level rise. Sand washes in and out over the year, however we have seen a loss of 2' of sand. The diversity and abundance of shellfish, crustaceans and fish has also been depleated(though the post covid years have seen more eagles and ospreys).	8/22/2023 1:01 PM
79	Flooding we are flooded every high tide	8/22/2023 12:33 PM
80	Hurricane The Nemo Blizzard 2013, Juno 2015, Super Storm Sandy	8/22/2023 12:24 PM
81	Power Outage High winds, power outages	8/22/2023 12:02 PM
82	Flooding In 1982 we had heavy spring rains. Then on June 4th or 5th we we hit by a nor'easter. The ground was so saturated the additional moisture penetrated the foundation of the houses in the area. The fire department spent days pumping out basements and lower levels of the homes.	8/22/2023 11:43 AM
83	Hurricane Power Outage ice storm in the 70's that closed roads. hurricane in 2011 when power was out for 11 days. but i believe climate is always changing...this is nothing new to our planet.	8/22/2023 11:42 AM
84	Flooding Hurricane Power Outage Many winter storms or tropical storms/depressions that brought intense amounts of rain/snow/wind and caused power outages.	8/22/2023 11:17 AM
85	Flooding Hurricane Power Outage Hurricanes Gloria, Bob, Irene, Sandy - Lost power, property damage, flooding; Blizzard in 2014 lost power	8/22/2023 10:31 AM
86	Winter	8/22/2023 10:12 AM
87	Hurricane hurricane Gloria, hurricane Bob, Hurricane Irene, superstorm Sandy	8/22/2023 10:10 AM
88	Hurricane Hurricane Sandy	8/22/2023 9:51 AM
89	Heat On the very hot days I find it difficult to be outside, and have to run my air conditioner all day to make it even slightly comfortable inside.	8/22/2023 9:35 AM

90	Fires of 2002 made me realize that we can be a fire prone atatw	8/22/2023 9:15 AM
91	Flooding More flooding events have caused my basement to be inundated regularly.	8/22/2023 9:00 AM
92	Hurricane Storm Sandy winds blew a tree out front across the road so people couldn't get by until a road crew moved the tree from the road to adjacent land.	8/22/2023 8:35 AM
93	Flooding Hurricane Power Outage We have lost power for days and had tree damage during several hurricanes in past years. Streets routinely flood in town now during heavy rainstorms.	8/22/2023 8:30 AM
94	Flooding Hurricane Increases in the intensity of storms has caused flooding which makes roads impassable - impacting businesses and residents. This is becoming a common occurrence throughout the year.	8/22/2023 8:26 AM
95	Hurricane Power Outage Storm Albert knocked out power for 10 days.	8/22/2023 8:19 AM
96	Isias	8/22/2023 7:53 AM
97	Power Outage Trees down on our land, loss of power- sometimes for days, drought and spongy moths killed several trees on our land, plant invasives also a problem with global warming adding to the problem	8/22/2023 7:52 AM
98	Hurricane Power Outage Hurricane sandy from 2012. Ridgefield lost power for 10 days	8/22/2023 4:23 AM
99	Power Outage 2011. Loss of electricity for 7 days. Windsor.	8/22/2023 3:52 AM
100	Drought which weakens the abundant plantings we have maintained on our propertyu	8/22/2023 12:20 AM
101	Hurricane Power Outage After hurricanes that result in power loss	8/21/2023 10:37 PM
102	Flooding Heat Hurricane Power Outage Lost power, flooded basement, roads impassable, kept indoors due to ground-level ozone & humidity & heat, kept indoors due to ice storm & impassable roads, ice dams in roof.	8/21/2023 8:01 PM
103	Hurricane Power Outage Hurricane Isaias shut off our power for 5 days.	8/21/2023 7:03 PM
104	Flooding Hurricane Power Outage Loss of power from storms, road closures, work days lost, flooded underpasses, etc.- lost a teacher in 1982 (swept away as water flooded roadway at night) - an unimaginable tragedy for her family and our community!	8/21/2023 6:59 PM
105	Flooding Power Outage An early snowstorm in 2011 took out our power for almost 2 weeks. Flooding/excessive rain and thunderstorms impacted roads for the past few summers I remember and my garden and the farm i work at suffered	8/21/2023 6:13 PM
106	My car was totaled in the tornado that struck Bradley Airport and destroyed the air museum and National Guard aircraft.	8/21/2023 6:09 PM
107	Heat Hurricane Power Outage Fortunately, we have not been severely impacted, but we lost power three times in the past 12 years for three or more days, causing us to lose hundreds of dollars in groceries in the refrigerator and freezer. One time was from Hurricane Irene (7 days), one from Winter Storm Alfred (5 days) and the third was from a thunderstorm. We also lost power for 1.5 days during an ice storm last Christmas Eve. We also lost a huge tree during a thunderstorm at our former home, also in Connecticut. As far as extreme heat, the negative impact is to the ability to enjoy the outside during the summertime heat, which is far worse than ever before.	8/21/2023 5:20 PM
108	Heat The extreme heat this summer, it seems to be building up each year.	8/21/2023 4:44 PM
109	Hurricane Power Outage power outage due to storm	8/21/2023 4:20 PM
110	Hurricane Power Outage The extreme weather is interferring with insect hatching and bird migration -- they are not meshing. All of the hurricanes in the last several years that have hit Connecticut have resulted in no power to our area for many days and having to deal with downed branches. The drought in Tolland County last year had us taking extreme measures to conserve water (under non-drought conditions, we still act to not waste water).	8/21/2023 4:19 PM
111	Flooding Hurricane Power Outage primarily increased property and neighborhood flooding plus loss of electricity; additionally one or two extreme snow storms	8/21/2023 4:17 PM
112	Flooding Maybe 40 years ago, a dam burst and some musical equipment of ours got ruined	8/21/2023 4:10 PM

	in a flooded recording studio. In about 1996, some very cold weather caused a frost heave in our yard and pushed in the side of our inground swimming pool, ruining it. (We had to fill it in.) M aybe 15 years ago, a large thunderstorm blew some shingles off our roof, resulting in water coming into our house.	
113	No	8/21/2023 4:02 PM
114	Power Outage I've had home water pipes freeze and burst, and this year wildfire smoke from Canada was a serious air-quality problem, as I have asthma. In general, I worry that Connecticut does not take the dangers of climate change seriously and will leave individuals to fend for themselves rather than take leadership on the issue...	8/21/2023 3:50 PM
115	Hurricane Hurricane Sandy, October 29, 2012	8/21/2023 3:23 PM
116	Flooding Hurricane Power Outage Evacuation in advance of Hurricanes Sandy and Irene, followed by 5+ days of power outage. Snow issues that prevented leaving house for 3 days. Road issues (closed roads, rerouting) from rain and coastal surge.	8/21/2023 3:20 PM
117	October 03, 1979	8/21/2023 3:12 PM
118	Halloween blizzard	8/21/2023 3:05 PM
119	Hurricane Power Outage During the October 2011 snow storm we lost power for 11 days and cable/phone for a shorter period of time. Fortunately, Aquarion maintained water service. A few years earlier a series of snow storms threatened the integrity of our home.	8/21/2023 2:54 PM
120	Tornado came thru my town and damaged my property about 14 years ago.	8/21/2023 2:48 PM
121	Heat Power Outage The recent smoke from fires in Canada were very concerning, especially given how widespread and longlasting the fires were there. I don't think the general public understands the connection between extreme heat, reduced air quality, and human health.	8/21/2023 2:44 PM
122	Hurricane Several hurricanes; Sandy, Irene, Snowtober an TS Ida	8/21/2023 2:41 PM
123	Hurricane Hurricane Irene Superstorm Sandy August tornado 2021 (?) in North Haven	8/21/2023 2:32 PM
124	Hurricane Power Outage Power failures associated with severe thunderstorms, tropical storms/hurricanes	8/21/2023 2:29 PM
125	Droughts in summers 2021 and 2022. Tornado in Bethany in 2018	8/21/2023 2:28 PM
126	Irene , Gloria and others	8/21/2023 2:20 PM
127	Heat I suffered a severe case of dehydration and fainted twice during extreme heat days this year.	8/21/2023 2:20 PM
128	Hurricane Power Outage Winter Storm-resulting in power failure for 7 days	8/21/2023 2:15 PM
129	Hurricane Power Outage Hurricane Sandy. Power out for a week. We need to bury the electric distribution lines to avoid this. Removing trees to protect an overhead system is simply exacerbating the problem. That simply removes a climate mitigation tool. Overhead wires are at risk from more than just yrees	8/21/2023 2:15 PM
130	My well went dry during the drought late summer 2019	8/21/2023 2:13 PM
131	Hurricane Power Outage Tropical Storm Isaias - caused wind damage to trees. Hurricane Sandy - was unable to return to CT due to airport closures Winter Storm Albert - No power for nine days. Extensive tree damage	8/21/2023 2:12 PM
132	Hurricane Power Outage Hurricane Sandy - loss of electricity	8/21/2023 2:10 PM
133	Heat Snow fall at a rate of 1" or more per hour. Extreme heat, above 100 degrees Drought because of gardens, food production, wells	8/21/2023 1:55 PM
134	Hurricane Power Outage August 2020 storm - lost power for an entire week. lost food and productivity, etc.	8/21/2023 1:52 PM
135	Flooding Flooding in basement and school cancelations leading to childcare issues	8/21/2023 1:52 PM
136	Microburst or something blew down a lot of trees everywhere. I could leave my road for 2 days.	8/21/2023 1:47 PM

137	Heat Most recently, my heat went out during an extreme cold spell. Finding a contractor was very difficult, but the alternative was frozen pipes. I succeeded in getting the problem fixed but the panic was not fun.	8/21/2023 1:39 PM
138	Hurricane October 2011 winter storm right before halloween.	8/21/2023 1:38 PM
139	Hurricane Power Outage (It depends on how you define "negatively impacted" -- financially? emotionally?) In my community (New Haven) we were negatively impacted by Irene and Sandy (power outages, trees down) and by winter storms: e.g., the storm in Feb 2013 which dumped 36" overnight. The plows couldn't get through, and our street was impassable for 3 days.	8/21/2023 1:34 PM
140	Flooding Hurricane Power Outage Hurricane led to flooding and power outages.	8/21/2023 1:32 PM
141	Power Outage Power loss for over a week.	8/21/2023 1:32 PM
142	Flooding Hurricane I live in a community on the coast that has seem damage and flooding from hurricanes/tropical storms.	8/21/2023 1:32 PM
143	Wind events have caused cleanup efforts efforts related to tree removal.	8/21/2023 1:29 PM
144	Flooding A sudden heavy rain in August 2021 engorged a nearby stream and washed out a nearby road. It took about 8 months to repair and reopen this road, which hampered neighborhood access. A nearby condo had one of it's 2 access roads cut off by the same extreme rain, which took even longer to repair and hampered fire department access to the property. The condo had to bear the expense since it was not a public road. Two years of drought also caused a loss of a large area of our ground-cover plantings. I am still working to restore them.	8/21/2023 1:26 PM
145	Trees down micro burst	8/21/2023 1:25 PM
146	Heat Most recently, my heating system went out during extreme cold. It was hard to find somebody to repair it, due to the volume of calls they were getting. However, it had to be done -- the alternative was frozen pipes.	8/21/2023 1:22 PM
147	We are reliant on our well for water, and over the last 3 years we have run out of water for a period of time in the summer. Drought is a HUGE concern.	8/21/2023 1:21 PM
148	Flooding Flooding is frequent. Even in neighborhoods not bordering the Sound. Our waste water system is inadequate.	8/21/2023 1:21 PM
149	Hurricane Power Outage Two storms in 2012 - lost power for 5 days in August and 9 days in October - could not communicate or get to elderly relatives	8/21/2023 1:20 PM
150	Heat Hurricane Power Outage lost power for weeks after hurricane, multiple times; increased cost for heat and AC with more extreme weather temperatures	8/21/2023 1:19 PM
151	Flooding Loss of crops due to flooding and cold temperatures	8/21/2023 1:16 PM
152	Hurricane Power Outage Power outages following storms in 2011.	8/21/2023 1:12 PM
153	Flooding Hurricane I work as an architect. People have lost property and we have lost affordable housing from storms and floods. Residents haven't been able to get to jobs due to winter weather.	8/21/2023 1:12 PM
154	Heat Air conditioning system in my store failed and the heat was unbearable.	8/21/2023 1:10 PM
155	Hurricane Power Outage many, but what comes to mind is the power outages that storm cause, increase of invasive species, drought affecting surrounding nature, etc.	8/21/2023 1:10 PM
156	Hurricane Power Outage Thunderstorms fill storm sewer and overflows into my yard, multiple times. Nearby tornado once brought down trees in my yard causing some damage to my property and power outage	8/21/2023 1:10 PM
157	Power Outage Power loss after Superstorm Sandy.	8/21/2023 1:07 PM
158	Driving was difficult during a thunderstorm.	8/21/2023 1:07 PM
159	Flooding Area where we parked our cars flooded above the wheel base, resulting in the insurance carrier totaling the vehicles, which were fairly new. Flooding under cottage, carrying debris underneath.	8/21/2023 1:07 PM

160	Hurricane Power Outage power loss during winter storm	8/21/2023 1:07 PM
161	Flooding I live in a city with a CSO system and have had water back up from pipes into my home during heavy rains.	8/21/2023 1:06 PM
162	Hurricane October 2011 storm	8/21/2023 10:27 AM
163	I had to put on my skirt so I would fit in with the other people that were panicking from an IMPENDING disaster. which did not materialize.	8/21/2023 9:07 AM
164	Flooding Mad River floods regularly and Waterbury and DEEP never do required maintenence.	8/21/2023 7:26 AM
165	Hurricane Power Outage When Hurricane Isaias hit Connecticut and Eversource took two weeks to restore power. I had to have my wedding reception powered by generators, which were extremely hard to find during a long duration power outage. There was one gas station within 10 miles that had gas (and power). In addition to needing a portable restroom, because the well water pump would not work during the power outage.	8/19/2023 6:45 PM
166	Multiple times thru 1995 thru 2021	8/19/2023 4:25 PM
167	Power Outage Power outage lasted almost 5 days after Sandy.	8/18/2023 9:22 PM
168	Flooding Widespread flooding dumping large amounts of trees into the rivers and LIS; resulting in above-average levels of hazards to navigation on the water and trashing the beaches.	8/18/2023 12:30 PM
169	We had a pipe burst in 2014 or so when it got to minus 10 degrees.	8/17/2023 1:35 PM
170	Hurricane hurricane sandy	8/16/2023 4:43 PM
171	The blizzard of 2013, 3 feet of snow	8/16/2023 4:16 PM
172	Flooding In April 2010, there was an extreme amount of rain in a short time. It left 1 1/2 feet of water in my basement (losing the entire finished basement, appliances, etc), and 3 feet of water in my back yard. FEMA came to help because I couldn't use my water or septic system. I now need flood insurance, even though none of my neighbors do. I'm in the lowest area of my neighborhood.	8/16/2023 7:14 AM
173	Flooding Extreme amount of rain in a short amount of time in April 2010 led to flooding of my basement and almost 3 feet of water in my backyard turning it into a "pond." FEMA helped me because I lost everything in my finished basement and couldn't use my well or septic.	8/15/2023 9:32 AM
174	Heat Power Outage I spent many years living either without electricity or A/C or heat due to poverty. Not being able to escape freezing cold or getting heat stroke is not easy to survive through and I still have anxiety about being in such situations again.	8/14/2023 9:35 PM
175	Flooding Just last December the flooding was so bad that I could not leave my home. RT 136, a state highway was impassable for emergency vehicles. Many tried to drive in the water and just got stuck.	8/14/2023 3:50 PM
176	Flooding Hurricane Power Outage TS Isaias with power outages. Hurricanes and other storms with power outages, flooding and sheltering of residents.	8/14/2023 9:37 AM
177	Restrictions on water use. Private wells running dry	8/13/2023 11:29 PM
178	Flooding Hurricane Power Outage Severe storms flooded causeway for up to 24 hours Falling trees due to storm caused power outage for 1-2 days	8/11/2023 9:36 PM
179	Hurricane Power Outage Tropical Storm Isiahs brought alot of trees and wires down in our area and at one point we had 13 streets completely blocked and non-accessible to our emergency vehicles. Many of our residents were without power and water for quite a few days.	8/11/2023 11:03 AM
180	Flooding Heat Power Outage We have had massive flooding and have had to pay thousands for mold mitigation, destroyed items, and demolition of interior areas. The cold and heat have impacted our electricity bills, which twice were over $700 a month. We have lost power from both snowstorms and thunderstorms. With 2 elderly, health at risk family members, we have no choice but to address these issues. We plan for seasonal issues because we know how much they have negatively affected our family. It's hard to fully prepare for no power as my mother is on oxygen 24/7. I worry about each environmental emergency and if we will be able to recover from the damages and keep my family safe and healthy.	8/11/2023 7:48 AM

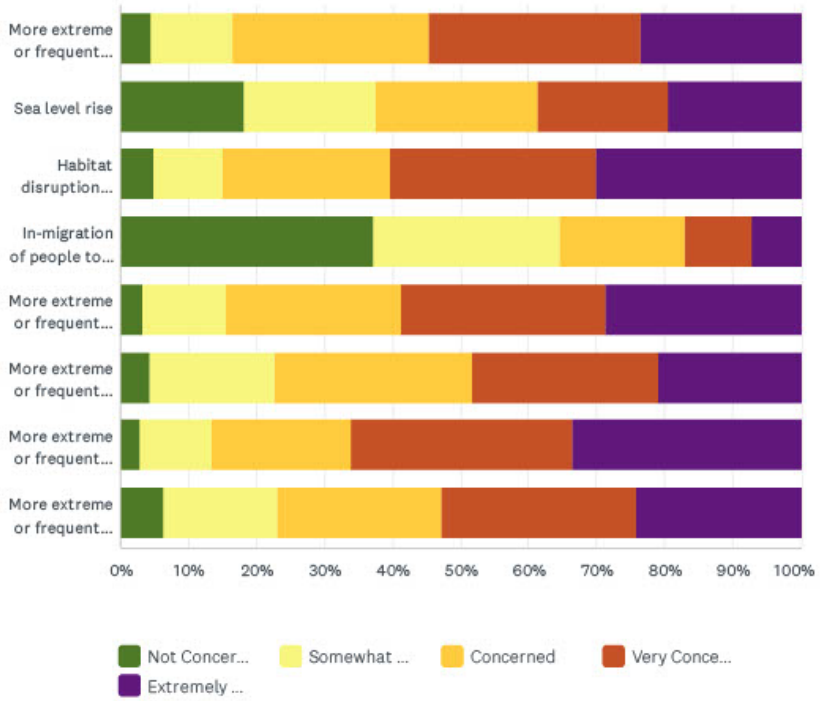
181	Trees from the surrounding forest fell on my house causing severe roof damage	8/10/2023 5:47 PM
182	Flooding Power Outage Flooding and power failure from extreme weather.	8/10/2023 2:29 PM
183	Hurricane Power Outage Power loss for extended periods during winter and tropical events	8/10/2023 10:48 AM
184	Hurricane Hurricane Sandy	8/10/2023 6:56 AM
185	Hurricane Power Outage Storm Sandy. Power outages for more than 72 hours.	8/9/2023 8:18 PM
186	Flooding Hurricane Storm/ Flooding caused over 50 calls for service in less than an hour for a small fire department.	8/9/2023 10:27 AM
187	Hurricane Downed trees in my yard from hurricane	8/9/2023 9:22 AM
188	Flooding Heat Power Outage 1. This year and last year heavy rain caused the road in front of my home to flood making it impassable. Both times cars were stuck (not mine). 2. Last year's 90+ hot august resulted in highest electric bill I've ever had. 3. My partner works on a farm that was effected by the drought last year.	8/9/2023 9:08 AM
189	Flooding Hurricane Flooding following several tropical storms/hurricanes that have made response to emergencies very difficult/not possible.	8/9/2023 8:13 AM
190	Hurricane October storm storm	8/8/2023 3:09 PM
191	Hurricane Power Outage lack of power for 10 days during a tropical storm	8/8/2023 2:42 PM
192	Heat Hurricane Power Outage After one particularly bad winter storm we lost power and heat for 6 days. Our road did not get plowed for several days.	8/8/2023 12:48 PM
193	Flooding Flooding of Property	8/8/2023 8:34 AM
194	Heat Hurricane Power Outage Tropical storms, Hurricanes, Blizzard conditions and extreme cold. It has effected power, heat, drinking water, etc	8/8/2023 8:24 AM
195	Hurricane Hurricane damage to my property and home (Hurricane Sandy).	8/7/2023 4:56 PM
196	Heat Extreme Heat has caused me to reduce the time I spend outside.	8/7/2023 3:48 PM
197	Hurricane Past hurricanes & tropical storms	8/7/2023 10:17 AM
198	Flooding Power Outage Most recently when a series of heavy rains occurred causing channel erosion requiring repair to and construction upgrades to handle flow of stormwater. Periods of extremely heavy snow fall causing power outages as a result of damage to substations.	8/7/2023 9:47 AM
199	May 2018 macroburst.	8/7/2023 9:46 AM
200	Hurricane Power Outage tropical storm- long term power outages	8/7/2023 9:40 AM
201	Hurricane Power Outage Hurricane or extreme winter Nor'Easter storms that result in long term (>2days) power outages have the most impact here.	8/7/2023 9:22 AM
202	Flooding Excessive rains caused flooding in our basement causing damage and loss of work to address.	8/7/2023 9:17 AM
203	Hurricane a number of storms and 2 tornados that touched down here	8/7/2023 9:09 AM
204	Flooding flooding in July of this year caused some road washouts.	8/7/2023 8:37 AM
205	Hurricane Super Storm Sandy,	8/7/2023 7:43 AM
206	Flooding Hurricane Power Outage I was in the hospital for 8 days during Hurricane Sandy before and after my son was born so I wasn't able to be at home dealing with downed trees, flooding basement and downed powerlines & the power outtage. Good thing the hospital had power as I had severe complications and almost died. Other times heavy snow storms such as in the fall and winter of 2011 when we had no power and it was soo cold. Being stranded without power is enough of a problem due to downed trees crossing the roads but having to get through it in very cold temperatures is even worse.	8/4/2023 4:41 PM
207	Microburst in Souther New Milford	8/4/2023 3:13 PM

208	Significant Erosion and road/bridge/culvert damage	8/4/2023 2:16 PM
209	Hurricane Power Outage October 2011 early snow storm. No power for a week	8/4/2023 12:34 PM
210	Flooding Hurricane Power Outage Early October snow storm a few years ago lost power for over a week. Lost power during flood heavy rains in recent past so purchased a generator	8/4/2023 11:10 AM
211	Hurricane Power Outage Road closures and power outages from storms, fallen debris, ice events.	8/4/2023 9:54 AM
212	Hurricane Hurricane or other storm damage and the protracted recovery time.	8/3/2023 5:37 PM
213	Flooding Severe thunderstorm which cause local flooding	8/3/2023 3:39 PM
214	Flooding Floods that damaged my home	8/3/2023 3:14 PM
215	Hurricane 2011 and 2012 when tropical storm Irene and superstorm Sandy came in.	8/3/2023 1:31 PM
216	Power Outage The heavy thunderstorms cause potentially unsafe conditions with trees and power lines. Extreme cold makes it difficulyt to keep homes warm.	8/3/2023 11:41 AM
217	Heat Hurricane Power Outage Without power for prolonged period during winter storm and during a tropical storm/hurricane. Downed trees in yard during storm events - common in CT. Unable to get gas during power outage events. Asthma triggered during extreme heat and smoke events.	8/3/2023 11:38 AM
218	Hurricane Power Outage Tropical Storm Sandy and the Frankenstorm. Out of power for a week in both instances.	8/3/2023 10:17 AM
219	Power Outage October 2011 snowstorm caused significant tree damage and excessive power outage	8/2/2023 10:02 PM
220	Flooding Hurricane Hurricane caused flooding to my basement. Local roads flooded	8/2/2023 2:20 PM
221	Hurricane Hurricane Sandy and Irene	8/2/2023 12:26 PM
222	Flooding My driveway was completely washed out a few weeks ago due to flooding off of route 45 in warren/cornwall. It looks like an earthquake hit it. We are not able to leave our home with our car. The only reason the damage happened was due to route 45 not being properly maintained, as it literally broke (crumbled down) and allowed for masses of flood water to wash out our driveway, in addition to other yard damage. The DOT says it is our responsibility to fix our driveway, but this was ONLY due to the state road. If lightening struck our driveway, that would be a different story. We have spoken with our town selectman, and reached out to Maria hom, Chris Murphy, and Jahana Hayes. They claim they do not have the money. I am truly at a loss. We cannot afford this, no one is taking accountability, and we cannot drive out of our home. I cannot go to the pharmacy, I cannot go to the grocery store. My father is sick with cancer. This is not my fault, yet I am being penalized. In addition to no one fixing our driveway, the DOT has not told us how they will fix route 45 so that this NEVER happens again. If I could build a wall or even an irrigation system for runoff, I would, but it is a STATE road. Even if we somehow manage to fix our driveway, it is likely this will happen again as climate change has shown increased dramatic weather patterns.	8/2/2023 11:59 AM
223	Flooding Constant flooding of the Connecticut river, leading to repeated flooding of Route 17A and the Portland Fairgrounds in Portland and closures of the two cross-river ferry boat services.	8/2/2023 11:51 AM
224	Flooding The road my house is on floods constantly and has washed out	8/2/2023 11:34 AM
225	Flooding Hurricane The back-to back storms in October 201?. Easter weekend rain/flooding 200?	7/24/2023 4:19 PM
226	Power Outage Due to extreme weather I have been without power for periods of time due to downed trees. I have dealt with extreme cold causing some piping in my basement to temporarily freeze.	7/20/2023 9:06 AM
227	Heat Hurricane Power Outage Severe storms - wind causing fallen trees and downed power lines causing long service interruptions/outages. Without power: no running water, heat, or air conditioning and loss of foods/medicine due to no refrigeration.	7/19/2023 2:38 PM
228	Hurricane I've been lucky in that no hurricanes have hit my community while I've been here, but I am aware that one will eventually and that I could see damage to my home which will be	7/19/2023 2:15 PM

	a big financial hit.	
229	Power Outage It was winter weather but we lost electricity for days regularly	7/19/2023 9:03 AM
230	Flooding Heat flooding in our basement from extreme downpours. Dead trees and shrubs from droughts also. I live in an area that suffers from the Heat Island affect. it is always 5 to 10 degrees hotter in my community due to the built environment- radiant health and the loss of tree canopy	7/17/2023 1:32 PM
231	Flooding I am currently being impacted by all the rain. Our homes are not equipped for this much rain fall in such a short period of time and the amount of rainfall.	7/14/2023 12:46 PM

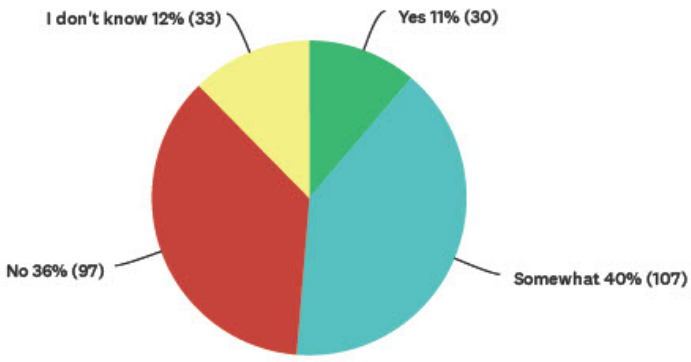
Q5 How concerned are you about each of the following climate-related impacts affecting your community?

Answered: 285 Skipped: 2



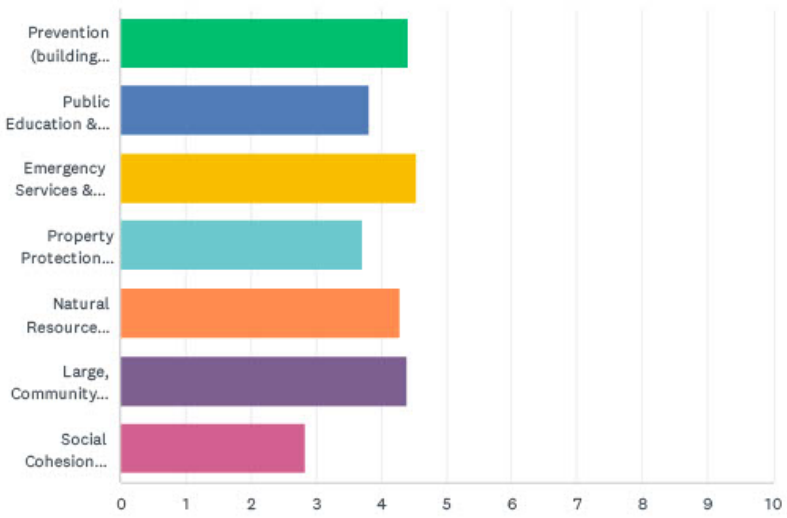
Q6 Do you feel that your community is adequately resilient (prepared for natural hazards or disasters)?

Answered: 267 Skipped: 20



Q7 Many community activities can reduce the risk from natural hazards. Please rank the following activity categories in order of what you consider most important (1) to least important (7).

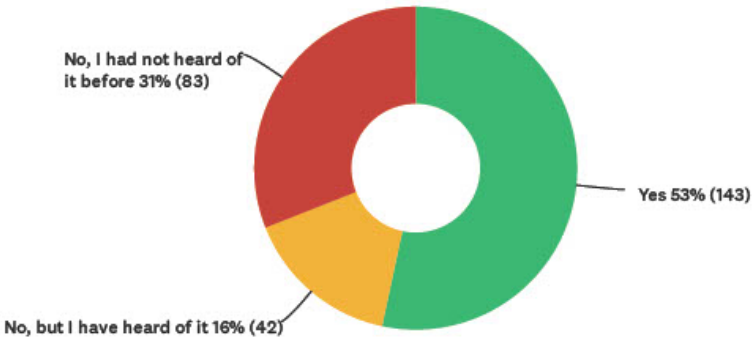
Answered: 265 Skipped: 22



	1 - MOST	2	3	4	5	6	7 - LEAST	TOTAL	SCORE
Prevention (building codes, zoning regulations, etc.)	15% 39	21% 55	14% 38	17% 45	15% 41	9% 25	8% 22	265	4.41
Public Education & Awareness (workshops, websites, etc.)	13% 35	12% 33	13% 35	12% 33	16% 43	17% 46	15% 40	265	3.82
Emergency Services & Preparedness (generators, safe rooms, etc.)	19% 50	16% 42	19% 51	18% 49	11% 28	9% 25	8% 20	265	4.55
Property Protection (floodproofing, hurricane windows, relocation, etc.)	9% 25	13% 35	12% 31	16% 42	18% 49	17% 46	14% 37	265	3.71
Natural Resource Protection (habitat restoration, green space, etc.)	20% 52	17% 44	12% 33	11% 29	14% 38	15% 41	11% 28	265	4.28
Large, Community Structural Projects (stormwater infrastructure, flood control, etc.)	20% 54	14% 37	18% 47	15% 40	11% 30	9% 25	12% 32	265	4.40
Social Cohesion Projects (resilience hubs, community services, etc.)	4% 10	7% 19	11% 30	10% 27	14% 36	22% 57	32% 86	265	2.83

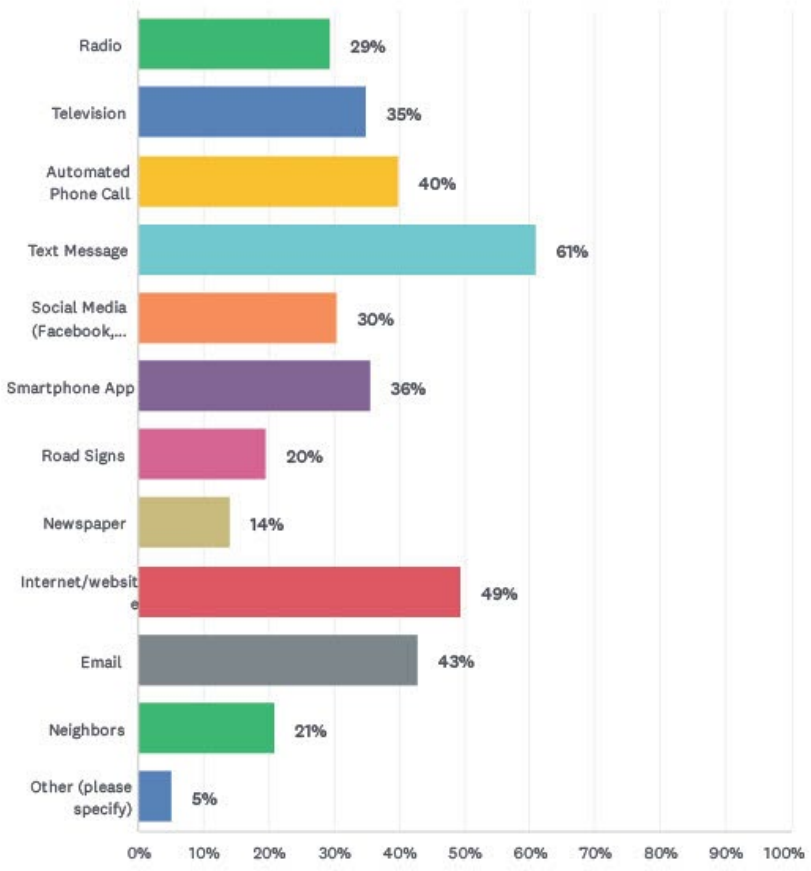
Q8 Have you signed up for CT Alert, Connecticut's emergency alert and notification system?

Answered: 268 Skipped: 19



Q9 How do you receive alerts and information about natural hazards? Please select all that apply.

Answered: 269 Skipped: 18



#	OTHER (PLEASE SPECIFY)	DATE
1	Alexa	8/29/2023 3:19 PM
2	Town sends text & phone alerts.	8/28/2023 11:51 PM
3	Environmental groups- preparing for nd, science behind, and recommended actions. Politicized opinions are hampering needed action! We need mandated extensive, science based education programs that begin in elementary school as an educated public is needed to vote for better policies and protective measures.	8/21/2023 7:40 PM
4	Weather app and Mayor's alert list	8/21/2023 2:40 PM
5	push notifications from apps such as the Weather Channel	8/21/2023 2:18 PM

6	EBS	8/21/2023 1:49 PM
7	People talking with one another.	8/21/2023 1:47 PM
8	NOAA website	8/21/2023 1:26 PM
9	Amazon Alexa	8/21/2023 1:14 PM
10	There is an old hermit that has an "end of days" sign. He walks up and down Main Street	8/21/2023 9:39 AM
11	demhs	8/7/2023 9:12 AM
12	NWS Chat 2.0	8/3/2023 11:04 AM
13	Seeing massive damage to my property	8/2/2023 12:01 PM
14	Android's built-in public safety alert system	8/2/2023 11:59 AM

Q10 In your opinion, what hazard mitigation actions or projects should your local government do to reduce or eliminate the risk of natural hazard damages in your neighborhood or community?

Answered: 223 Skipped: 64

#	RESPONSES	DATE
1	More permeable services in urban areas, improved stormwater management practices	9/3/2023 1:51 PM
2	Trees Tree Trimming, flood mitigation	9/1/2023 3:52 PM
3	Continue to investigate/invest in living shorelines. Do this in conjunction with the neighboring communities. Proactively, continue to improve and manage flood waters.	9/1/2023 10:23 AM
4	Heat improve resiliency of infrastructure against storm and extreme weather events (i.e. stormwater infrastructure during flooding events, reducing heat island effect in densely populated areas). improve natural resources that mitigate extreme weather damage (i.e. protecting and enhancing coastal marshland habitats)	8/31/2023 11:56 AM
5	Local utility systems to prevent power outages.	8/30/2023 9:43 PM
6	Assessment of where natural hazards are likely to happen, like flood prone areas given higher & faster rain events.	8/30/2023 5:59 PM
7	Planning infrastructure and sustainability project; public education and planning; reduction of fossil fuels and increase in green energy uses	8/30/2023 4:50 PM
8	Trees Focus on cutting down diseased trees and improving storm drainage. In addition, should provide incentives to residents to improve measures that reduce carbon emissions.	8/30/2023 4:22 PM
9	Trees Cut down trees along road easements that if the trees fell, they would hit houses.	8/30/2023 2:37 PM
10	More sure power lines (?). Ability for people to re-gain power after a bad storm	8/30/2023 12:53 PM
11	Planning Trees Appropriate tree removal; Adequate storm water runoff; Wild fire prevention and response planning	8/30/2023 12:52 PM
12	reduce combined sewer overflows	8/30/2023 12:36 PM
13	Solar There is much that could be accomplished. Rainbow Dam should be removed from the Farmington River. Windsor officials should require installation of active and passive solar power at all Town of Windsor buildings where possible, install electric vehicle charging stations at all public buildings, and other similar actions. Windsor and all Towns in CT should be aggressively switching to renewable energy technologies to mitigate some the exponentially increasing frequency and damage from natural hazards created by combustion of fossil fuels that is a result of human-induced climate change.	8/30/2023 10:56 AM
14	Educate, ensure natural resource protection is in place.	8/29/2023 10:00 PM
15	hurricane and flood mitigation	8/29/2023 9:28 PM
16	not sure	8/29/2023 9:10 PM
17	Planning Plan for extremely heavy rain and/or snow	8/29/2023 8:20 PM
18	Solar Preserve more open space; allow public forests to grow into Old Growth to increase carbon storage, retain and filter water and cool air, preserve and enhance healthy soils and biodiversity; increase size of culverts under roads and bridges; require more pervious surfaces in developed areas; require more solar panels over impervious areas (rooftops, parking lots) and provide community solar opportunities; require 25' minimum vegetated buffer between drainage areas and water bodies.	8/29/2023 4:16 PM
19	Trees stop tearing down trees	8/29/2023 4:01 PM

20	Replace aging infrastructure of power supply and roads/bridges	8/29/2023 3:19 PM
21	Elevation shore up our beaches with sand and natural plantings along dunes to prevent erosion	8/29/2023 12:59 PM
22	Sewer/stormwater mitigation by installation of underground cisterns and associated piping. Flood barriers.	8/29/2023 12:42 PM
23	Flood control, building codes, public education	8/29/2023 12:34 PM
24	Elevation Solar Establish central hardened and resilient town facility powered by solar and back-up generators, w food and supplies. Then establish "satellite" private homes so equipped to provide similar services. In our town of 1200, should be easy to be prepared. Recommend for all CT towns.	8/29/2023 12:10 PM
25	Increase storm drain capacity, create cooling centers	8/29/2023 10:56 AM
26	More community awareness	8/29/2023 10:56 AM
27	Drainage infrastructure improvements	8/29/2023 10:33 AM
28	Trees NO DEVELOPMENT ALONG SHORE; SHORELINE HABITAT TO REDUCE FLOODING; TREE PLANTING	8/29/2023 10:12 AM
29	Planning Be planning for extreme weather events - rainfall, flooding, storm damage at levels not experienced in recent past.	8/29/2023 10:07 AM
30	Acquisition Projects Planning New Haven is planning to build out the coastal Long Wharf district, adding places to live and work. This area should be preserved as a buffer for the city, highway and railroad.	8/29/2023 9:52 AM
31	Flood control trough improved drainage, zoning restriction & bridge clearance improvements.	8/28/2023 11:51 PM
32	Flood mitigation- improved drainage	8/28/2023 9:56 PM
33	Regulations and zoning and special grants to encourage green space, resource protection, wildlife protection, infrastructure resilience	8/28/2023 4:52 PM
34	Protect coastal ecosystems, restrict building along coastline, floodplain management	8/28/2023 12:29 PM
35	Acquisition Projects Move all houses out of floodplains, require riparian set backs, enlarger culverts and bridges to allow for natural flows, divert stormwater into bioswales and wetlands	8/28/2023 8:28 AM
36	They should conduct a professional survey to determine a list of things that can be done and work on the most beneficial to the least and complete the list.	8/28/2023 12:12 AM
37	Public education	8/27/2023 7:24 PM
38	Prohibit construction in high risk areas, relocate those already there.	8/26/2023 11:13 PM
39	Plane crashes in neighborhoods around airport Terrified of that	8/26/2023 12:42 PM
40	Trees Keep drains cleared (but also believe the community should aid), hazard tree removal (one area in particular always gets hit hard), workshops on preparedness incase of emergency, education on what to do and the potentials on risk mitigation, create a (possible volunteer) group to help with the recovery post/during emergency	8/25/2023 8:09 PM
41	Stop new building on wetlands. Restore all wetland habitats. Stop water use for lawns. Encourage planting natives which are more drought resilient, and can absorb heavy rainfall. Woodland management. Deconstruct all dams.	8/25/2023 8:05 PM
42	Woodland management. Stop building on wetlands. Dam destruction.	8/25/2023 8:00 PM
43	Forest management to improve canopy and groundcover health. Dam deconstruction and wetland restoration to slow runoff and increase soil absorption.	8/25/2023 4:42 PM
44	Trees More attention to adequate tree removal More attention to mosquito hazards	8/25/2023 4:21 PM
45	i wish I knew..but I am pretty sure our town doesn't have one...	8/25/2023 4:18 PM
46	Elevation Curb development, particularly along the shoreline. Plant up the shores of all waterways to decrease erosion. Get rid of all dams. Ban vehicle idling.	8/25/2023 4:06 PM

47	They should modify the poorly engineered, totally inadequate storm sewer located near my house.	8/25/2023 4:06 PM
48	Stormwater control, Emergency preparedness	8/25/2023 8:37 AM
49	Education	8/24/2023 10:04 PM
50	take climate change seriously and do more for mitigation, not just adaptation	8/24/2023 5:35 PM
51	Trees Tree removal. Zoning regulations to prohibit new development in the flood zone areas. Relocate key infrastructure to outside the flood zone. Inform the community of new laws, policies and procedures regarding hazard mitigation actions and projects.	8/24/2023 3:01 PM
52	Increase green spaces at flood prone areas	8/24/2023 3:00 PM
53	Make changes on Rt 84 near Danbury/Newtown to ease traffic problems in times of emergencies	8/24/2023 2:48 PM
54	yes	8/24/2023 2:15 PM
55	Do not know what could be done.	8/24/2023 2:00 PM
56	Trees Cut down more tree limbs. I've requested certain trees that belong to the Town of Litchfield that are near our property be removed and I've been told they are not a priority. These are dead trees within 10 feet of power lines.	8/24/2023 1:50 PM
57	Prevention lead by more green infrastructure projects.	8/24/2023 9:49 AM
58	Education/community involvement	8/24/2023 8:27 AM
59	Solar end reliance on fossil fuels, become energy independent with solar & storage & microgram protect trailer park	8/23/2023 10:53 PM
60	Invest more into preparation, especially if it is known a storm, etc. is coming.	8/23/2023 3:30 PM
61	hire competent humans!	8/23/2023 1:47 PM
62	stop development in floodplains, install more green infrastructure to deal with flooding and poor drainage.	8/23/2023 1:16 PM
63	Reduce waste water contamination of beaches following severe storms	8/23/2023 11:21 AM
64	Managed retreat, significant restoration of natural and ecologically significant habitat, restoration of riparian corridors. Coordinated socially driven emergency management procedures focusing on vulnerable residents. Restoration of tree canopy and implementation of green infrastructure	8/23/2023 9:18 AM
65	Acquisition Projects Harwinton has an alert system via phones. when the power goes out, phones do, too. Winsted uses radio for their alerts. I would be likely to use the radio rather than the phone.	8/23/2023 8:43 AM
66	Trees 1. Educate people on why they should stop certain practices in coastal areas: Building more docks, applying lawn chemicals near water bodies (or anywhere!), taking down trees and shrubs to improve water views, and building as close as possible to water bodies. In other words, our collective real estate "ego" projects need to go out of fashion in favor of land use practices that favor coastal preservation. 2. Override "grandfathered" zoning regulations that permit the bad practices outlined in point 1, above. I have seen these used time and time again to create unwise developments. 3. Rethink hardscaping. Pervious driveway and parking lot surfaces are available today. Yet parking lot after parking lot is installed in our coastal community without regard for these potential assets. The principles of storm water conveyance are well understood in by civil engineers and landscape architects, as well as other disciplines. Use these principles! Make them part of municipal code! 4. Adopt the principles of the Depave Movement. See Depave.org for more information. 5. Lower the parking requirements associated with commercial zoning, particularly in coastal areas. 6. Permit more accessory dwelling units and in-home apartments. 7. Rethink the role of trees in coastal resiliency. They are vastly misunderstood, with most people thinking they are there only for appearances and for summer shade. We need to devote more budget--and more education--to trees and their value. Plant native trees! Not the popular flowering fruit trees that break in the first major storm. 8. Present a vision of an attractive future that incorporates these and other resiliency ideas, and specifically abandons some of the bad practices of today.	8/23/2023 7:53 AM

67	Improve water drainage and beachfront protection	8/22/2023 7:49 PM
68	support the permanent protection of wetlands, riparian zones, and forest blocks	8/22/2023 3:56 PM
69	Stormwater infrastructure improvements to Country Club Road, Torrington, CT	8/22/2023 3:44 PM
70	Stormwater evaluation and sump pump installations. Reduce combined sewer and stormwater outflow. Assess contributing watercourses for flooding and imagine daylighting and reducing watercourse constraints without property damage. Stormwater retention and greenspace allocation to reduce impervious cover.	8/22/2023 2:06 PM
71	Heat Trees Beach erosion mitigation. LID and stormwater projects. Tree canopy restoration, utility companies and road owners(DOT/towns) clear trees or trim them to death creating heat islands which are most likely to affect vulnerable populations. Utility companies should create redundancies to iliminate long outages seen in Hurricane Sandy, and consider moving wires underground as wind damage is a leading hazard. Moving wires underground also has additional benefits including increased property value, increased wages (confined work is paid at a higher rate), and increased space for cyclists and pedestrians.	8/22/2023 1:20 PM
72	Trees dangerous tree removal, clear waterways including small brooks, improve firefighting abilities, make sure grocery stores and gas stations have generators, maintain communications during power outages, support local ambulances.	8/22/2023 1:17 PM
73	Remove homes & businesses from areas likely to be destroyed by storms & SLR	8/22/2023 12:36 PM
74	Move habitation away from the coast whenever possible. Increase the density of development in urbanized areas, discouraging sprawl and suburbanization.	8/22/2023 12:29 PM
75	I don't know.	8/22/2023 11:46 AM
76	local governments need to coordinate. bad weather does not follow town lines. this needs to be regional/state/multi-state	8/22/2023 11:45 AM
77	Improve flood resilience and mitigation; improve emergency preparedness and establish an emergency alert system for the region.	8/22/2023 11:21 AM
78	No increase in population in areas that require evacuation through flood hazards.	8/22/2023 11:08 AM
79	Heat Ensure Emergency Services are adequately equipped to handle storm events. Have shelters in place. Provide cooling centers for seniors. Provide adequate protection to critical infrastructure to extreme events such as hurricanes, blizzards, heatwaves.	8/22/2023 10:38 AM
80	Emergency management, disaster shelters, community emergency food supply.	8/22/2023 10:16 AM
81	Education	8/22/2023 9:55 AM
82	While the ability to respond to is key for life saving intervention, prevention needs to be a priority. There needs to be a focus on high risk areas in economically distressed communities. There needs to be a shift from band-aid solutions for short term impacts to significant community and infrastructure changes.	8/22/2023 9:47 AM
83	Offer robust social services -- cooling centers, informational materials on home resiliency projects (including information on how to fund these projects). Upgrade stormwater systems.	8/22/2023 9:38 AM
84	More green storm water and flood prevention infrastructure Underground power and telecom transmission!!!!!!! Integrate into separated bike and pedestrian paths and green drainage systems Restore large floodplains in riverine and coastal zones, restore anadromous fish populations for food security	8/22/2023 9:18 AM
85	Planning Invest in green infrastructure. Less planning more implementation	8/22/2023 9:04 AM
86	Trees Keep storm drains clear. Reduce paved surfaces. Tree trimming. Do not introduce more paved surfaces, which heighten runoff and storm drain overload.	8/22/2023 8:43 AM
87	Preserve and enhance coastal marshes, native vegetation and structures that mitigate storm effects. Promote micro grids and other technologies that keep power and communication lines open.	8/22/2023 8:42 AM
88	Infrastructure upgrades and improved zoning regulations.	8/22/2023 8:28 AM
89	Make sure that emergency responder facilities are not vulnerable to hazards. Practice	8/22/2023 8:24 AM

	emergency response drills and forge relationships with diverse agencies state and local agencies responsible for response and recovery.	
90	Maintain email alert system and include text option, support Inland Wetlands Commission, support reducing carbon emissions,	8/22/2023 7:58 AM
91	The state should take over veg management. The utilities should not be responsible for this.	8/22/2023 7:56 AM
92	Planning Place electric underground. End sprawl in each town. Retain areas (large & small) that sequester carbon. Have effective mass transit, local in each town & connect them. Town planning for less driving. More electric fueling sites for e cars.	8/22/2023 3:58 AM
93	create a stormwater authority	8/22/2023 12:22 AM
94	Trees Enact and enforce state-level zoning restrictions for construction along the waterways aka stopping Tweed Airport expansion, and condo construction, etc. Reduce the tree cutting along highways (which supports clean air as well as reducing flooding/icing). Proactively protect and expand (old growth) forests and undeveloped lands. Trees, water, soil, air <= cultivating these treasures will keep us safer.	8/21/2023 8:12 PM
95	Education- science based that helps the majority of people (forget the deniers of climate change- they are engulfed in a cult of anti intellectualism). Mandate public notification of every town's risks and recommendations from an expert- not the local elected town officials who are not qualified to do these assessments.	8/21/2023 7:40 PM
96	Solar More community based renewal energy sources, to make us less reliant on Eversource, because we have at least a half dozen outages each year. A town based alert system would also help.	8/21/2023 7:10 PM
97	Upgrade storm water system capacity Minimize rainwater incursion to sanitary sewer system. Provide zoning and wetlands officials realistic assessments and maps of flood areas.	8/21/2023 6:26 PM
98	First do no harm to our existing powerful resilience network found in nature. Intact ecosystems will create a more resilient system. Projects around reducing natural disaster risk should consider this natural system as well. Emergency preparedness education and systems being in place would make me feel safer	8/21/2023 6:20 PM
99	Nature based solutions: healthy soils across all landscapes, no net loss of forest (not just core forest). Protect watersheds, air sheds, and food sheds.	8/21/2023 5:34 PM
100	My community is on the CT River so I would say flood mitigation is first and foremost. I'm not an expert so I would defer to experts for the kinds of mitigation that would do the most good for the most people.	8/21/2023 5:26 PM
101	Acquisition Projects First, adopt and enforce zoning ordinances that require Green building techniques, prohibit construction in floodplains, and protect wetlands. Second adopt and enforce regulations that preserve large tracts of forest. Third, identify areas that can be marooned in major flood events and work on infrastructure to make sure everyone always has a way out. Fourth, take climate change seriously and educate, educate, educate.	8/21/2023 4:59 PM
102	Flood control and regular water control from heavy thunderstorms.	8/21/2023 4:49 PM
103	Trees We could be planting more trees than the city of New London currently removes each year, and we could focus on neighborhoods that are more vulnerable to climate injustice. We could install rain gardens at all schools and public buildings, and in all parks, to help educate our small town about what responsible storm water management looks like and how it works; currently the stormwater management authority actually wastes public money on concrete projects, when the reality is we want to restore pre-development hydrology to the landscape to facilitate water infiltration into the soil rather than runoff into public water bodies, which is currently what the state DOT and city do in all of their backward projects. We could improve the quality and quantity of long-term bicycle parking throughout the city of New London, including adequate long-term (i.e. covered) bike parking at all city buildings, schools, parks, libraries, grocery stores, and relevant transportation locations - this would help reduce our emissions while building social and infrastructural resiliency. There are road projects in New London every day where someone, some utility, or some other city or state contractor is cutting the street or sidewalk open and they make a huge mess, and they fail to improve walkability, bikeability, or expand our tree canopy, and they should be hitting each of those benchmarks for improvement everytime they cut open a sidewalk or street. It's as if there are no climate hazards ahead, so they keep building and working like it's still 1950. Current DOT	8/21/2023 4:28 PM

	project just installed a ton of storm drains around Briggs STreet and Williams STreet near Interstate 95 and all of those stormdrains facilitate the rapid mixing of polluted runoff with our precious coastal waters and it's practically criminal behavior!	
104	infrastructure improvements to reduce/mitigate flooding	8/21/2023 4:22 PM
105	Solar encourage greater use of solar power, storage batteries, being thoughtful about whether to allow more building in flood-prone areas, I'm sure there are additional things I am just not thinking of.	8/21/2023 4:18 PM
106	Erosion control. Control building in flood areas	8/21/2023 4:03 PM
107	Erosion and flooding	8/21/2023 3:59 PM
108	Improve water drainage under railroad overpasses at Cross Lane and Four Mile River Road	8/21/2023 3:43 PM
109	Zoning requirements - don't let people build in dangerous locations. Road/access projects. Resiliency hubs and education to support residents. Organizing & training volunteers to help.	8/21/2023 3:35 PM
110	Keep storm drains clear, responsible land use regulations	8/21/2023 3:17 PM
111	Stormwater control Electric grid hardening	8/21/2023 3:08 PM
112	Elevation Support utilities in their efforts to upgrade services to be more resilient, even when this means a rate increase. Elevate local codes to reduce development in risk prone areas. For example, flood risk areas are no longer consistent with recent weather experience. They need to be expanded. Granby has many acres of protected forest land, which is a very good thing. However, fire protection needs to be demonstrably ready to respond to wildfires like we have seen elsewhere.	8/21/2023 3:07 PM
113	Improve-Provide More Education: Habitat Restoration Zoning Regulations to reduce the clearing of land for development	8/21/2023 2:53 PM
114	limit further development of my community - KEEP THE GREEN SPACE AND NATURAL WOODLANDS!	8/21/2023 2:50 PM
115	I'd like to see Connecticut become much more progressive with regard to prevention. Too many DEEP and DPH programs have not integrated climate resiliency into their projects/programs.	8/21/2023 2:47 PM
116	Trees More tree removing	8/21/2023 2:45 PM
117	The funding for storm water detection and retention systems.	8/21/2023 2:43 PM
118	Stop all but the most essential fossil fuel use. Divest their $ as well from FF companies and those that insure them	8/21/2023 2:40 PM
119	Solar Be prepared for, and welcoming to, immigrants from places affected by climate change. This is very important. Build community resilience—help neighbors get to know each other. Maybe through grants to neighborhood associations for them to host regular neighborhood get-togethers. Restore and preserve habitat! Help residents prepare their yards for drought and excessive rain. (And prepare public places for those events as well). Continue statewide electrification and solar, to reduce our carbon footprint and slow climate change. Emergency services are good, but they were last on my list because if towns help people take care of themselves and each other, they are less likely to need services. Services should still be available for unhoused people and folks who really need it.	8/21/2023 2:40 PM
120	Solar Trees flood control install microgrids to supply emergency power replace trees	8/21/2023 2:36 PM
121	Trees Stronger wetland/watercourse protections, additional stormwater GSI along major tpn corridors (High Ridge, Long Ridge roads), increased tree preservation and planting for UHI and C capture	8/21/2023 2:33 PM
122	Building (historic as well as new) audits, trainings in fire management, other protocol for local residents- even for immigrants.	8/21/2023 2:30 PM
123	Force local GOVERNMENTS to practice Stewardship	8/21/2023 2:25 PM
124	Dedicated cooling centers, drainage improvements, reduce amount of impervious surfaces, "rain" gardens	8/21/2023 2:23 PM

125	Planning Trees Restrict tree removals by developers and homeowners, prepare a tree maintenance and planting plan, require permeable surfaces, rain gardens, green roofs etc on all new developments	8/21/2023 2:20 PM
126	Screen culverts and bridges for risk of failure; there are multiple dams in our community - should make sure they are inspected regularly and the public understands the potential hazards.	8/21/2023 2:18 PM
127	don't know	8/21/2023 2:12 PM
128	Acquisition Projects Elevation Heat Solar Trees • Ensure that new solar systems can sustain homes and businesses when the power goes out. Most small photovoltaic arrays are wired to disconnect when the grid is down, meaning they provide little to no benefit in terms of resilience. This is a missed opportunity. • Ensure that gas stations have backup power, whether generators or solar, for power outages. Lack of access to fuel vastly exacerbates the disruption of extreme weather. The state could incentivize gas stations to have backup power by allowing those that do to raise their rates modestly during power outages. • Provide solar or battery backup for key traffic signals. Loss of power to traffic signals compounds the mobility challenges (e.g., blocked roads) that storms cause. • Create minimum setbacks from surface waters. CT is the only state in New England/NY that has no state-level minimum required setback from waterbodies and courses. This is not only bad for water quality; it is also bad from a risk management perspective (since these areas are more likely to flood). • Require greater freeboard in the state building code. 2 feet above base flood elevation is recommended and should be the minimum in areas that are flood-prone. • Replace dying trees. Invasive species are causing mass die-offs, reducing the biodiversity of the state's forests and decreasing their resilience to extreme weather. The state should protect forest biodiversity – what about flying crop dusters that spread disease-resistant elm and chestnut seeds? These could help replace the hemlocks, ashes, and beeches we are losing now. • Adopt California plumbing fixture efficiency standards, as Maine and NY have done. Also adopt California pressure-regulated irrigation spray head (sprinkler) standards, as Vermont has done. These will save water, diminishing the impact of droughts. • Identify and take actions that the state can take to earn local government additional points under FEMA's Community Rating System. This will reduce flood risk – and flood insurance premiums under the NFIP. • Support residential and business flood mitigation at the state level. Other states have done this with great success (using FEMA programs), but to date CT has not. The lack of state support means the effort falls entirely to local governments and property owners. Moving people out of harm's way – whether through elevation or relocation – is in the state's interest, since the state will be called on to rescue them post-disaster if they are not moved. The state took action when foundations began to crumble; why should it not do the same when first floors get flooded? • Develop swimming areas to address extreme heat (and provide transit to/from them). The state has more boat launches than it has swimming areas, even though there are far more swimmers than there are boat owners. Perhaps swimming can be added at boat launch areas?	8/21/2023 2:10 PM
129	Trees Trimming back trees and brush from power lines and roads. Brush is covering a lot of road signs.	8/21/2023 2:09 PM
130	Flood mitigation	8/21/2023 1:59 PM
131	Forrest maintenance, storm drain maintenance, man-made reef building, energy grid reliance (creating a green energy grid for town use)	8/21/2023 1:57 PM
132	Give residents MRE's to keep in their basement	8/21/2023 1:49 PM
133	I am concerned about the numerous dams on the West River - I do not know anything about their condition, but they are old, and they are upstream from a large community that would be severely impacted by a failure.	8/21/2023 1:48 PM
134	Acquisition Projects Attempt to out think, out last and out do Mother Nature. Good Luck!	8/21/2023 1:47 PM
135	Acquisition Projects Standards for new construction - esp moving critical systems out of lowest levels and reducing embedded carbon.	8/21/2023 1:43 PM
136	Solar Study adequacy of stream-road crossings. Engage community volunteers to remove invasive plants. Install batteries at public buildings with solar modules. Promote solar+battery installations at small business clusters that provide necessary public services. Recover wasted water used for flushing water mains and testing water pressure to prevent drought shortages. Do a study or hazards particular to our town.	8/21/2023 1:39 PM

137	Retreat; green infrastructure; cool corridors; white building standards; PLEASE INVEST PARTICULARLY IN DISADVANTAGED COMMUNITIES. Research has repeatedly shown they are less resilient than more affluent communities. Give them the attention they deserve, as community members have less ability to move/change their circumstances than those that have more money and resources available to them.	8/21/2023 1:37 PM
138	Consider hazard mitigation in zoning and building approvals.	8/21/2023 1:37 PM
139	enforce regulations; update building codes; identify most vulnerable areas and act to reduce risk	8/21/2023 1:34 PM
140	Bridge,infrastucture repair	8/21/2023 1:28 PM
141	my community is pretty hazard safe, we are not on the shore, and fairly undeveloped watershed that protects us from flooding- to protect from from things we cannot control- like tornados and temperature- we should do our part to move away from carbon sources of energy and fuel, and we should provide refuge areas for other communities that aren't so safe from hazards	8/21/2023 1:27 PM
142	Heat Planning Reduce impermeable surfaces, encourage rain gardens (and discourage lawns that do not help much with reducing carbon; know where the repetitive hazards are and plan to mitigate them; improve public transit, use public funds to expand green energy and transit, prepare accessible sites for temporary housing for those who need cooling or heating centers; incentives for reducing your reliance on fossil fuels and improving your carbon footprint	8/21/2023 1:26 PM
143	Better water conservation programs. More $ devoted to energy efficiency programs as well as outreach to educate people on EE.	8/21/2023 1:24 PM
144	Reduce impervious surfaces, natural resource protection, upgrade drainage systems	8/21/2023 1:20 PM
145	Trees We are rural community with little infrastructure or government. Water flow and downed trees are the biggest	8/21/2023 1:20 PM
146	provide resources/suggestions of actions you can take as a individual to help	8/21/2023 1:18 PM
147	Bolster its prevention needs in zoning and ordinance. Ensure emergency shelters are available and reasonably prepared	8/21/2023 1:16 PM
148	Improve drainage	8/21/2023 1:14 PM
149	Private and public property damage prevention	8/21/2023 1:13 PM
150	Elevation Protect the electrical grid from failure, stock up on transformers, coordinate with utility company & Public works dept.	8/21/2023 1:13 PM
151	stop building in flood zones	8/21/2023 1:11 PM
152	Heat Heat shelters, improved SW management, coastal resilience projects	8/21/2023 1:10 PM
153	flood control	8/21/2023 1:10 PM
154	Green infrastructure projects Community resilience projects	8/21/2023 1:07 PM
155	Acquisition Projects Planning Provide affordable insurance plan to purchase in case of damages due to natural disaster.	8/21/2023 10:44 AM
156	Focus on preplanning. Stop reallocating set aside funds for infrastructure improvement projects and get projects completed.	8/21/2023 10:31 AM
157	Reduce the requirements for volunteers. State legislators are very helpful when it comes to ideas on how to spend money. There is no more money. new flash.	8/21/2023 9:39 AM
158	Acquisition Projects Elevation Planning Trees Tree maintenance: state and local govt lobby/work with insurers to provide cost effective homeowner /business owner coverage to maintain trees as well as coverage for removing downed and damaged trees after storms. Towns need to do better with roadway tree maintenance, broken large hanging limbs after storm, more expert tree wardens on municipal workforce / shared service by neighboring communities. Towns need to update regs and plans of development for new accelerating hazards. Also enforce todays zoning rules to force property owners to clean up after storms… but people need help bc tree work is expensive, dangerous and often not covered by	8/21/2023 7:53 AM

	insurance. Towns update aging drainage and regularly clean and maintain gutters and brush along roads. In neighborhoods: enforce zoning and wetlands regs in residential areas without waiting for neighbors' complaints — surveillance is key to keeping neighborhoods safe. Parking lots: don't allow developers to create massive parking lots that negatively impact run off and drainagE — better, greener designs and maintenance needed and better. public transit to reduce size of parking lots. Limit new retail commercial development until existing empty spaces are rehabbed and filled. Bring back schools as shelters... there's one in every neighborhood in most towns; post-storm or before, we should be able to seek refuge in the closest school / municipal building.. walking if needed. Support Red Cross and other emergency response agencies to maintain/resume a local presence, including public education on seasonal hazards prep for homeowners, seniors, families, emergency kit prep, volunteer opportunities to safely help community after / before storms. Support existing / return of local AM radio, including community support to keep stations local and viable to ensure reliable public communication channels when power is out. Reliance on cell and internet tech is proving problematic. Towns lead by example on hazard mitigation and environmentally sound designs and actions in public spaces. Regular curbside pick up for lawn garden debris to facilitate homeowner maintaining property.	
159	Elevation Trees Maintenance on Mad River must be done. Trees fallen across river mustn't be ignored. Yearly maintenance has never been done. City must stop building in flood plains. Flood zone has been increased to an A from a B because follow up from Mad River widening has been ignored even though it has been brought to their attention.	8/21/2023 7:50 AM
160	Prevent major power outages by mantaining/cutting down overgrown tress, that threaten power lines, major roads, and critical facilities.	8/19/2023 6:47 PM
161	Flood prevention.	8/19/2023 4:30 PM
162	Trees Actively trim trees along roads and power lines.	8/18/2023 9:26 PM
163	Trees More regular hazard tree evaluation and removal	8/18/2023 12:31 PM
164	Trees We already have resources to remove downed trees from windstorms.	8/17/2023 1:38 PM
165	Trees trim/cut down dead trees bury power lines	8/16/2023 4:46 PM
166	Public awareness/preparedness education/training	8/16/2023 4:19 PM
167	Establish, or notify the public if there is already an emergency shelter in case of a major storm that is likely to cause structural damage. For example, I live on a ground floor apartment, no basement and no bathtub and would not know what to do in the case of a tornado and my neighbors are all disabled or elderly in the same situation. Examine older buildings to ensure they are structurally sound and inspect foundations. Ensure that local forests are preserved and not harmed by any kind of industrial runoff or waste. In my town they dump construction trash in the woods and no one seems to care.	8/14/2023 9:42 PM
168	Acquisition Projects Planning Comply with our MS4 permit & enforce regulation of CAM and wetland regulations in coastal flood zones. Specifically Norwalk CT has stated that Wilson Point, a private property association, does not require review or permits to fill in tidal wetlands, add outflows to LI Sound, new storm drains and hundreds of feet of new drainage from fertilized lawns on Nathan Hale Drive in the coastal flood zone. It has been pointed out to the City that the State Hazard Mitigation Plan requires review of new coastal drainage in the flood zone, but no one enforced and now flooding is worse than ever. Basically by filling tidal wetlands a public nuisance was created and the City does nothing, says it is private property, suggests civil action. (?!) My local government needs to learn coastal flood zone regulations and enforce them. This can start with complying with our MS4 and making the annual SWMP an iterative process as it is meant to be. All the city has to do is read the MS4 permit and build some municipal capacity.	8/14/2023 4:27 PM
169	Public education Flood control	8/14/2023 9:42 AM
170	More drills to test systems so they can be improved	8/13/2023 11:32 PM
171	having a flexible policy that can respond to specific needs in a faster pace	8/11/2023 9:57 PM
172	Acquisition Projects Elevation Heat Planning We have a brook that floods every year. I have never seen any city workers ever cleaning the debris or assessing the impact to our neighborhood, nor have they communicated with us on any plans, both for prevention or mitigation of the water damage. Also, after we were snowed in from the big storm, our	8/11/2023 8:08 AM

	neighborhood had to shovel ourselves out and support each other for heat and food. As we had no power. There was never any follow up on how the city addressed our community's needs and ways to be better prepared. It feels like we are on our own if something bad happens.	
173	prevent development in flood zones, make infrastructure resilient, encourage sustainability	8/10/2023 2:33 PM
174	More Public education	8/10/2023 10:49 AM
175	Trees Ensure trees are trimmed (but not decimated like DOT did to trees along I94 in Fairfield); enlist citizens to clear storm drains located near their properties.	8/9/2023 8:22 PM
176	Address common flood zone hazards.	8/9/2023 10:30 AM
177	Acquisition Projects Purchase properties in the riverine or coastal flood zones to convert to passive open space.	8/9/2023 9:59 AM
178	Education	8/9/2023 9:25 AM
179	Separate combined sewer systems in hartford. Fix drainage issues. Bury all telecommunication and electrical cables.	8/9/2023 9:24 AM
180	Provide better education and preparation guidance in advance of storms as well as more information for recovery after a significant event	8/9/2023 8:14 AM
181	More training, public seminars and awareness programs	8/8/2023 3:11 PM
182	Acquisition Projects Flooding is my biggest concern. We have experienced washed out roads and bridges here. So mitigation and being ahead of these issues, is what we're most interested in	8/8/2023 2:52 PM
183	Protect natural resources such as shoreline, wetlands, green spaces. Keep a tighter rein on industrial pollution and sprawl.	8/8/2023 12:53 PM
184	Maintain Detention/Retention Basin Study our four dams to see if we can lower before a storm	8/8/2023 8:40 AM
185	Storm water mitigation.	8/7/2023 4:57 PM
186	Elevation Trees Plant trees, remove invasive species, raise roads, improve stormwater drainage	8/7/2023 3:53 PM
187	Trees The most important project in rural areas is to protect power and utility lines from falling trees and limbs. More proactive work is necessary.	8/7/2023 10:33 AM
188	Improve stormwater mangement. Repair/replace ageing crossings/bridges over water courses.	8/7/2023 9:57 AM
189	Trees Continue hazardous tree/vegetation near power lines.	8/7/2023 9:54 AM
190	Trees storm water management/drainage. Tree trimming in prone outage areas.	8/7/2023 9:42 AM
191	Acquisition Projects Elevation Trees Raise road elevations, build seawalls, purchase or take by eminent domain properties regularly flooding. Harden Community infrastructure with generators, tree trimming ect.	8/7/2023 9:38 AM
192	Strengthen State Statues and local regulations for construction near shorelines to reduce impacts from sea level rise and flooding.	8/7/2023 9:26 AM
193	put more monies in the Emergency department budget	8/7/2023 9:12 AM
194	Public awarness	8/7/2023 7:47 AM
195	Trees Generators, roof brackets, drainage projects, trees touching any power lines prohibited	8/5/2023 6:51 PM
196	Flooding issues in New Haven, lots of pollution and unregulated industries hurting residents.	8/4/2023 8:28 PM
197	Acquisition Projects Heat Have a preparedness event -- could have it at the library over the course of a month (not just a 1-day or couple hour event) where people could go in to get (purchase or get for free depending on availability and/or income qualification) items that people should have in their homes to prepare for an emergency WHEN THERE IS NO EMERGENCY HAPPENING -- they should get the stuff ahead of time. If the stuff can't be obtained there, recommendations could be provided as to where to buy the items and which items in the case that the wrong one could be unsafe. The same distribution place like the library could provide guides for what to do when faced with different types of emergencies we	8/4/2023 4:55 PM

	could face here in CT and where to go to get relevant help in our areas. This could be especially helpful to people who are new to the area. Also, provide guidance for people who live in their own home vs an apartment as people may not be able to do the same thing in an apartment as someone who is in a home and it might depend on the ownership or the configuration of the unit. For ex. I now live in an apartment on the 2nd & 3rd floor. I do not have a wood stove so in a power outtage in cold weather I don't know what to do that would be safe -- some people might try unsafe methods for heating their home and it could prove disastrous. I used to live in a house with a wood stove so I would just use that to heat the home but I can't do that anymore since I don't have a wood stove.	
198	Planning Long Term planning Table Top Exercises for extreme events continued communication	8/4/2023 3:16 PM
199	Flood and damage mitigation.	8/4/2023 2:18 PM
200	Flood control Emergency Shelters	8/4/2023 12:36 PM
201	Increase natural resources to help guard against coastlines and floodways. Prevent development in these flood zones. Reclaim property in flood zones into natural spaces. It will make the area more attractive and be the most resilient sustainable form of protection.	8/4/2023 9:59 AM
202	Flood control measures; heavy rain damage; beach erosion.	8/3/2023 5:40 PM
203	Work on the infrastructure and communicate with the public the necessary steps to take and where they could find help.	8/3/2023 3:43 PM
204	Acquisition Projects Acquire fool prone properties in harms way.	8/3/2023 3:17 PM
205	Elevation Planning Sign up for alerts, help make a "GO kit" and educate residents of the importance of having a plan to evacuate and/or help other residents evacuate when the need arise.	8/3/2023 1:38 PM
206	Storm surge barriers near rivers that drain into the Sound Return populated areas that are heavily damaged to open spaces and parks. Remove impermeable surfaces and replace with permaculture systems. Update sewage systems along rivers and sound to prevent groundwater and freshwater contamination. Review transportation infrastructure projects to ensure they are prepared for large disruption events.	8/3/2023 11:45 AM
207	Trees Move power and utility lines to underground lines, this will prevents trees from having an impact on power servces.	8/3/2023 11:43 AM
208	localized flood prevention	8/3/2023 11:04 AM
209	Important to provide mitigation measures for homes in flood zones.	8/3/2023 10:23 AM
210	Solar Microgrids, utility scale battery, flood prevention, drainage improvements, green buffers between farms and other lands	8/2/2023 10:04 PM
211	Trees cut down more trees to keep power safe and roads clear	8/2/2023 12:27 PM
212	Be responsible for damage caused due to poor construction, maintenance, etc. Of STATE OWNED AND RUN ROADS AND LANDS.	8/2/2023 12:01 PM
213	Increase robustness of utilities: including electric, water/sewer, internet, 911 dispatching and emergency radio, and cellular. Ensure long-term viability of the water supply an anticipation of increased scarcity due to drought conditions. Better protections for workers who are forced to stay home during natural disasters. Increase robustness of roadway and mass transit systems in the face of increased probability of extreme weather events and flooding.	8/2/2023 11:59 AM
214	My local government of Middletown should not allow building on the wetlands across the street	8/2/2023 11:36 AM
215	Education the the public and support, including proper resources, for local responders. Additionally, review and update as needed local land use rules.	7/24/2023 4:22 PM
216	Trees Properly maintain trees located near and around power lines. Improve the critical infrastructure resiliency to better withstand storms and extreme weather such as moving power lines underground or better maintaining roadways and bridges.	7/20/2023 9:15 AM
217	In collaboration with the Power Utility company change local zoning requirements so that any powerlines that do not exist is a flood zone are placed underground; and enforce this retroactively over a defined span of time for compliance by the utility company.	7/19/2023 2:44 PM

218	prepare for sea level rise, including flooding.	7/19/2023 2:25 PM
219	Need to address road flooding in severe storms. Also develop a program to get air conditioning to low-income households.	7/19/2023 2:17 PM
220	More green infrastructure to disconnect contiguous impervious surfaces, resulting in high storm flows. Additionally, actively un-develop the coastline and install living coastlines to build resilience.	7/19/2023 1:17 PM
221	Acquisition Projects Inspect what is in place so that it functions as expected in an emergency. A disaster is not the time to find out. Having underground fires in Hartford because of long deferred maintenance does not inspire confidence.	7/19/2023 9:11 AM
222	Trees invest in flood control infrastructure, reduce energy costs and plant more trees	7/17/2023 1:35 PM
223	Planning Pause the plans for new large structural buildings until the City/State knows the impact it will have. And once they know, if it's not recommended, the project should be rejected.	7/14/2023 12:50 PM

Q11 Please provide any additional comments, questions, or feedback to be addressed as Connecticut updates its Natural Hazard Mitigation Plan.

Answered: 94 Skipped: 193

#	RESPONSES	DATE
1	Our state needs to continue to work with all communities to provide the most effective solutions. We should also liaison with neighboring states to ensure the most impactful actions will be applied to the NE region.	9/1/2023 10:23 AM
2	Education is key. Connecticut has been lucky to not have hugely devastating events but there is the possibility that will happen. CT residents need to understand the possibilities and what is needed to avoid and/or recover from a natural disaster like a flood or large wildfire.	8/30/2023 5:59 PM
3	suggest developing lively educational tools - videos and media messages that encourage knowledge, preparedness and action	8/30/2023 4:50 PM
4	My community's government does not provide consistent info or warnings re: severe weather events, or timely notice of road closures due to flooding, for example. I see other communities doing a better job.	8/30/2023 2:47 PM
5	As a shoreline community, what can be done locally to stop climate change? The country needs to act to reduce the impact of the fossil fuel industry. Especially the use of fossil fuels in Asia, which heats the air that impacts North America's weather.	8/30/2023 2:37 PM
6	We must get less CO2 emissions in the air. Somehow.	8/30/2023 12:53 PM
7	Wrt power outages, identify / list sources of gasoline for portable generators within the community - Provide dedicated power to gas stations	8/30/2023 12:52 PM
8	protect trees from damage by utilities and plant more trees expand park dept staffing begin putting power cables underground add more bioswales reduce air pollution with more mass transit infrastructure	8/30/2023 12:36 PM
9	Our community is planning but at a slow pace. Funding is needed now	8/29/2023 9:28 PM
10	We should put more emphasis on trying to stop the climate and biodiversity crisis. All areas of government should be united in this effort. Right now, vast numbers of healthy trees are being cut by D.o.T. when state goals say we should increase the amount of trees. Our state government should require renewable energy use rather than fossil fuels. We should repurpose unused office space and already developed areas into needed housing. All packaging should be recycled, and the companies selling items in this packaging should provide a large part of funding this recycling. Thank you for collecting these comments.	8/29/2023 4:16 PM
11	would love to be involved or educated in any way	8/29/2023 4:01 PM
12	Inform public of climate risks in vulnerable areas (rivers, sea shore); require insurance firms to incorporate climate risk in rates; adopt the strictest vehicle emission standards; provide additional incentives for EV and solar adoption; implement community solar sites.	8/29/2023 12:34 PM
13	Thank you for working on an updated plan and actions!	8/29/2023 10:07 AM
14	Climate mitigation planning should be more integrative. New Haven wants to build out the coastal Long Wharf district as they see this development as increasing the city's tax base. There are no incentives by and for keeping this area as relatively undeveloped to provide a buffer for the I-95 and the railroads, which it could do. Local town decisions on development are usually evaluated for local benefits and rarely consider regional and climate-change implications.	8/29/2023 9:52 AM
15	Continue project's & regulations to reduce CO2 emissions	8/28/2023 11:51 PM
16	Storm drainage improvements	8/28/2023 9:56 PM
17	We need riparian setback regulations and DOT needs to capture more of it's road runoff	8/28/2023 8:28 AM

	including bridge drainage polluting our waterways.	
18	Storage of hazardous household materials should be more actively regulated on flood-prone areas.	8/26/2023 11:13 PM
19	Road racing is now a hazard to all	8/26/2023 12:42 PM
20	Educate property owners about keeping resources on site. Slow down and absorb water (smaller lawns; more diverse species).	8/25/2023 4:42 PM
21	Our town is TERRIBLE at providing emergency information. When there was a hurricane possibly coming and Old Saybrook went house to house telling people to evacuate, Old Lyme sent a fire truck on the main road with a loud speaker that no one could hear. So we have no information about whether to evacuate or where to evacuate to.	8/25/2023 4:18 PM
22	As we begin to prepare for drought, we should also be protecting surficial potential aquifer areas for use in the future as a water source, not just municipal aquifer areas. There is a practice in CT of gravel being removed from potential aquifer area and then unsuitable soil is used to fill these areas. This practice should be regulated, currently it is not.	8/25/2023 8:37 AM
23	Share it on social media!	8/24/2023 3:01 PM
24	n/a	8/24/2023 2:48 PM
25	n/a	8/24/2023 2:15 PM
26	Definitely ensure that natural hazard mitigation is abundantly available to the public.	8/24/2023 2:00 PM
27	Farmers within immediate floodplains should not be routinely compensated for crop loss. That's what a flood plain is for.	8/24/2023 1:50 PM
28	Make sure to get involved in ALL towns in CT... not just ones with high population. Rural towns are forgotten about.	8/23/2023 3:30 PM
29	Continued private development of properties in flood hazard areas undermines resilience. If such development cannot be prohibited, it should be barred from receiving any post-disaster aid or being rebuilt after a hazard loss.	8/23/2023 1:16 PM
30	Nature based solutions should be prioritized above hard infrastructure solutions. Managed retreat should also be considered. Looking at resilience capacity through an access to capital, financing and funding to address vulnerabilities. A lot of the pieces included above are siloed, neglecting the important connections between issues and how each of them if employed correctly could create the same outcomes, it depends more on what people in communities are willing to implement. We need greater direction on what threats need to be addressed and how these are going to be further impacting our communities in the next 50 years, with some sort of cost approximation to inform and guide decision making	8/23/2023 9:18 AM
31	Kathy Connolly, Old Saybrook, 860-510-2136	8/23/2023 7:53 AM
32	Nature based solutions and fund those organizations that are the stewards of that land... Land Trusts!	8/22/2023 3:56 PM
33	State should mandate City of Torrington use State/Federal funds to correct flooding issue on Country Club Road. Flooding occurs near school bus stops and is a public health and safety issue.	8/22/2023 3:44 PM
34	The level of development in CT is so unsustainable. We will reach many more dire situations in various forms particularly for built out communities systemically denied resources. Outdated stormwater system management should be prioritized among all infrastructure improvements for the health and safety of CT communities.	8/22/2023 2:06 PM
35	CT has very different weather patterns and hazards along the shore, we have not seen signficant snow in ages, but flooding and storm surge are big concerns. I am also concerned with housing affordability as climate change migrants come to CT; the rate of cost burdened individuals is very high in CT. Affordable housing and vulnerable populations are concentrated in urban places which will be disproportionately burdened by hazards from heat and cold, poor transit service (<.5 mi coverage and >30 minute headways) contributes to both the hazards(CO2, PM2.5) and lack of affordability.	8/22/2023 1:20 PM
36	Preserve coastline, replant and rewild the natural environment, promote urban living, meet our	8/22/2023 12:29 PM

	climate goals.	
37	Consider using State-owned properties for stormwater hazard mitigation, then Town properties rather than piecemeal approaches by individual owners.	8/22/2023 11:08 AM
38	None	8/22/2023 10:38 AM
39	Improve infrastructure. Climate is self regulating and cyclical. We need to adapt to word changes and stop acting like it's something new and apocalyptic!	8/22/2023 10:16 AM
40	We need a hard look at costs of keep power lines above ground and maintaining dams and levees vs best practices that are being trialed in other countries	8/22/2023 9:18 AM
41	Far too many plans sit on shelves without implementation. This NEEDS to change if we are going to make any progress.	8/22/2023 9:04 AM
42	We should not allow development in high-risk areas near shoreline and rivers. We must discourage building in high-risk areas, and certainly not replace housing and other buildings damaged in these areas. We must anticipate sea level continuing to rise and the loss of habitable property that entails.	8/22/2023 8:43 AM
43	The state program that allowed towns to 'group buy' solar panels in 2015 was an excellent step forward to decentralize the power grid - bring it back and promote similar community group actions where residents can 'group buy' resilience infrastructure.	8/22/2023 8:42 AM
44	POVERTY is the greatest threat to community preparedness. People with means will jump in their Tesla and go stay at a Marriott until the storm passes (or whatever). We can easily & proactively support individuals and families with educational offerings and tools like make-a-go-bag events. Also look to food justice -- supporting farms & urban agriculture, so people have locally available quality food sources.	8/21/2023 8:12 PM
45	A media campaign in needed to inform voters of state and local risks, proposals and mitigation strategies. DON'T allow building or rebuilding in high risk areas! Climate change is accelerating- sea level rise, ocean acidification, extreme drought, wildfires, and stronger storms are already upon us. Habitat loss, extinctions, loss of crops, loss of clean water is/will lead to more deaths, mass migration and wars worldwide.	8/21/2023 7:40 PM
46	Town neighborhoods are already seeing stormwater flowing out of storm drains during extreme rain events. Our sewer system has seen its capacity challenged during extreme rain events due to various ways storm water enters the sanitary sewer system.	8/21/2023 6:26 PM
47	CT is way behind in looking at soil health as a key resource when looking at resiliency. We need to understand the connection to food supply, water supply, forest health and community health. The plan should address food supply and call for a statewide food system plan that includes looking at soil health.	8/21/2023 5:34 PM
48	The goal should be to prevent further construction that goes against the reason for resiliency and adaptation (prevent further damage). After that, agressively take action to make a community prepared for a dangerous climatic future -- so always preserve exsiting potable sources of groundwater, improve infrastructure to reduce contaminant runoff, agressively get the community to make water conservation a way of life not a unique event.	8/21/2023 4:59 PM
49	We know what are our major sources of carbon emissions, it's time to reduce them at all costs, and begin building a better, more resilient society now.	8/21/2023 4:28 PM
50	Mitigations measures need to be practical and affordable.	8/21/2023 4:22 PM
51	I would love a resource that would help me assess my own risks in my own home. What should I do to be more "hazard ready?"	8/21/2023 3:35 PM
52	None	8/21/2023 3:17 PM
53	More micro grid and distributed generation	8/21/2023 3:08 PM
54	I have asked for a copy of the Granby Emergency Response Plan to help me in my preparations, but been rebuffed. Town officials say sharing their Emergency Response Plan is a security issue. This not right. Citizens need to know how our public servants perceive the natural hazards we face and how they plan to protect us.	8/21/2023 3:07 PM
55	Limit the development in CT	8/21/2023 2:50 PM

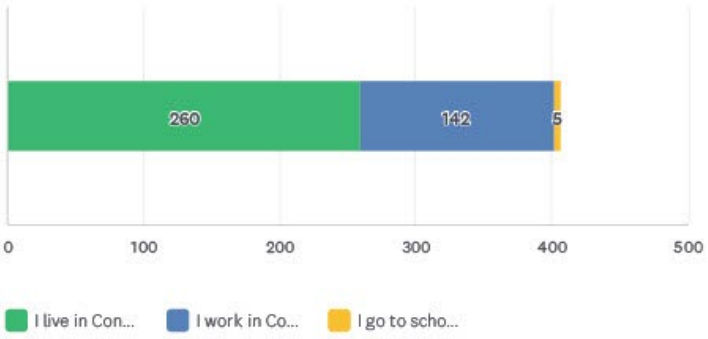
56	Centering health is a strategy that can cut through the partisan noise that comes with proposing progressive climate policy changes. It's also important than the general public understands how their health is being and can be further impacted by climate change.	8/21/2023 2:47 PM
57	Please hold public consultation meetings in every county for giving opportunity to major part of population to voice their opinion- for their own safety and resilience.	8/21/2023 2:30 PM
58	Only the local government through agro ecological practice can miticate the own ecological system. Need to held local government accountable!!!	8/21/2023 2:25 PM
59	Actions should be uniform with few to no exceptions across the state. Local zoning should reflect emminent or anticipated hazards more likely to occur in that location.	8/21/2023 2:23 PM
60	These issues cannot be led to municipalities. The onslaught of tree felling by Eversource, DOT, Metro North etc demands a state solution.	8/21/2023 2:20 PM
61	Consider ways to help residents improve resiliency in their own homes, as well as community centers for those who would benefit from that type of support.	8/21/2023 2:18 PM
62	Connecticut is not the south, and even though the climate is warming, this will remain a heating-dominated state, and extreme cold will continue to be a greater threat to life and property than extreme heat. Much of the public or media focus on extreme heat may result from the shift in the US population south; however, extreme heat is not the greatest risk in CT. While it is a growing problem, it must be put in perspective with other, greater risks (extreme cold, flooding, etc.) In resilience, household preparedness is often forgotten. Households that use little and generate their own energy, and that have adequate supplies of food and water, can survive a disruption well. State policies to date have left households out of the equation; this needs to change -- perhaps beginning with an emphasis on distributed generation and energy (including thermal) storage.	8/21/2023 2:10 PM
63	Utilize smart phones, sirens, even code the sirens for certain emergencies. Post signs for evacuation routes. Store emergency food and water. MREs with long shelf life.	8/21/2023 2:09 PM
64	Thank you for addressing	8/21/2023 1:43 PM
65	Please allow for municipalities to provide direct feedback on the plan prior to its finalization.	8/21/2023 1:37 PM
66	Thank you for the important work you do	8/21/2023 1:26 PM
67	Increased wetland and farmland protection	8/21/2023 1:20 PM
68	I think our shoreline should not have so much infrastructure and should not be rebuilt if it fails.	8/21/2023 1:20 PM
69	Glad this is happening!	8/21/2023 1:18 PM
70	I strongly do not favor spending for mitigation. Funds should be spent on prevention.	8/21/2023 1:16 PM
71	A plan for safe mass evacuation / strategies / routes out of danger / hazard area via highways / parkway to avoid grid lock.	8/21/2023 1:13 PM
72	prioritize infrastructure projects over emissions, adapt and mitigate instead of trying to prevent air emissions	8/21/2023 1:11 PM
73	Prioritizing nature based solutions would be great.	8/21/2023 1:10 PM
74	There is NO need for additional consultants to be brought in for additional funds which are used to create new requirements to comply with. Government needs to be reduced by 20 percent tomorrow, not next week..... good luck. You have lost CT, MA and RI in their entirety. better not to ask. Joel	8/21/2023 9:39 AM
75	Waterbury has to be held accountable for increasing flooding by poor planning. The state should stop ignoring cities creating more flooding by poor planning. The cities and the state should be held accountable.	8/21/2023 7:50 AM
76	Actively restore shoreline to protect from storm surge.	8/18/2023 9:26 PM
77	As we just saw in Hawaii, it is impossible to predict what the hazard will be, but even if it is a predicted storm, wind and moving water make reaching emergency situations a lot more challenging. Norwalk doesn't think about coastal issues because few of us are affected by the rising sea levels. The Western COG POCD requires lifecycle cost analysis if a new road or sewer is going in with a new building yet Norwalk is building a new school, with new roads,	8/14/2023 4:27 PM

	sewer lines, in the coastal flood zone!! CIRCA has warned Norwalk to prepare for 3-4 ft higher water, but only those of us who have lived on the coast for decades know the risk is very real that water will inundate many homes, many residential neighborhoods. Today there are no signs and while predictable roads now flood every full moon, people still ruin their cars by driving through sea water. Evacuation routes are not enough. STOP the increase in density in the coastal flood zones across Western CT. It is highly disappointing and should concern whoever is reading this, that recent consultant studies about increasing density with Norwalk's new zoning rules (yes we all understand why more apts are needed, just not in the flood zone) have just left out, ignored, existing TOXIC WASTE sites that have not been remediated. These are known, yet forgotten by Commissions advising lay people appointed by the Mayor. Education is listed as low priority in Norwalk, just look at Stormwater Managment Plans. Education has to be critical because people need to work together if anything happens.	
78	Approval and permitting process appears too lengthy and slow	8/11/2023 9:57 PM
79	I believe there should be a way to share information with all residents, as well as collect input on how things can be improved. But then they might have to be held responsible and do something...and that costs money.	8/11/2023 8:08 AM
80	Continue to keep educating the public - have zoom classes- update website etc	8/9/2023 9:25 AM
81	1. Locations that flood: Directly in front of The Hartford Insurance Company Building on Collins St in Hartford. 2. Just before the onramp to 84 West from Walnut St (Heading East) in Hartford.	8/9/2023 9:24 AM
82	Small towns need to do more. Not planning for helping their communities.	8/8/2023 3:11 PM
83	Funding, Planning and Training	8/8/2023 8:40 AM
84	Provide additional funding for projects that qualify as hazard mitigation.	8/7/2023 9:57 AM
85	Evacuation routes, coordination and implementation.	8/7/2023 9:54 AM
86	N/A	8/7/2023 9:38 AM
87	I think an influx of people coming to CT for its climate resilient traits could serve the state well. It should prepare for this.	8/4/2023 9:59 AM
88	None	8/3/2023 5:40 PM
89	Educate communities about flooding, beach erosion and lack of emergency responders "during" a traumatic natural event.	8/3/2023 1:38 PM
90	My driveway was completely washed out a few weeks ago due to flooding off of route 45 in warren/cornwall. It looks like an earthquake hit it. We are not able to leave our home with our car. The only reason the damage happened was due to route 45 not being properly maintained, as it literally broke (crumbled down) and allowed for masses of flood water to wash out our driveway, in addition to other yard damage. The DOT says it is our responsibility to fix our driveway, but this was ONLY due to the state road. If lightening struck our driveway, that would be a different story. We have spoken with our town selectman, and reached out to Maria hom, Chris Murphy, and Jahana Hayes. They claim they do not have the money. I am truly at a loss. We cannot afford this, no one is taking accountability, and we cannot drive out of our home. I cannot go to the pharmacy, I cannot go to the grocery store. My father is sick with cancer. This is not my fault, yet I am being penalized. In addition to no one fixing our driveway, the DOT has not told us how they will fix route 45 so that this NEVER happens again. If I could build a wall or even an irrigation system for runoff, I would, but it is a STATE road. Even if we somehow manage to fix our driveway, it is likely this will happen again as climate change has shown increased dramatic weather patterns.	8/2/2023 12:01 PM
91	Consider managed retreat as a long-term strategy.	8/2/2023 11:59 AM
92	Connecticut is one of heavily forested states compared to population. They should enforce the utility companies to better maintain the growth around the powerlines and when able move them underground.	7/20/2023 9:15 AM
93	Tap representatives to communicate. Gary Turco is fantastic about communicating with his constituents.	7/19/2023 9:11 AM
94	There needs to be more awareness in state and city government.	7/14/2023 12:50 PM

Connecticut Natural Hazard Mitigation Public Survey

Q12 Please select all that apply:

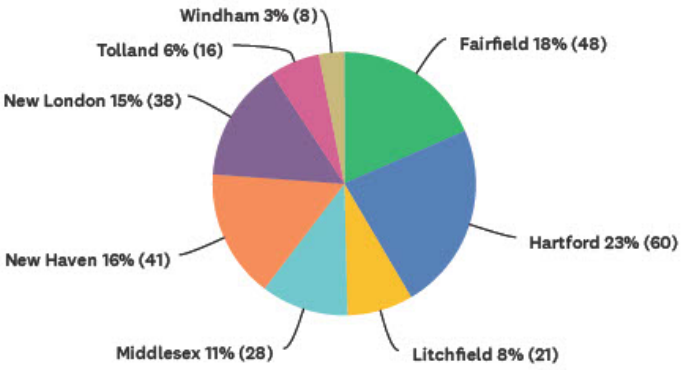
Answered: 267 Skipped: 20



ANSWER CHOICES	RESPONSES	
I live in Connecticut.	97.38%	260
I work in Connecticut.	53.18%	142
I go to school in Connecticut.	1.87%	5
Total Respondents: 267		

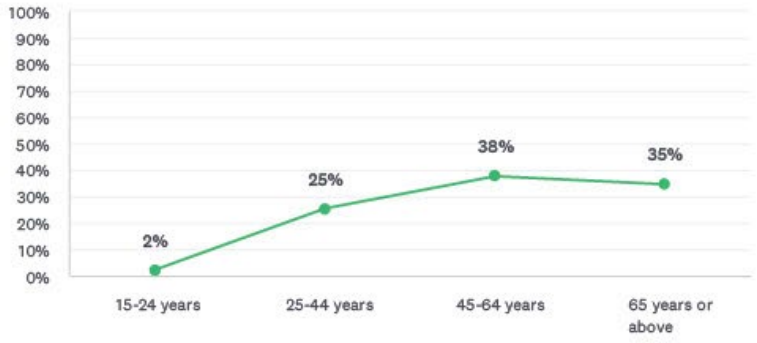
Q13 Which county do you live/work/go to school in?

Answered: 260 Skipped: 27



Q14 What is your age?

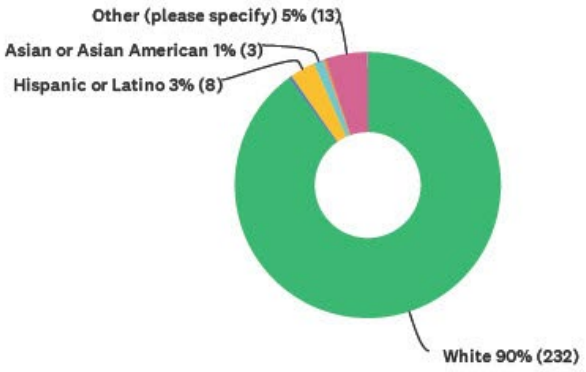
Answered: 263 Skipped: 24



BASIC STATISTICS				
Minimum	Maximum	Median	Mean	Standard Deviation
2.00	5.00	4.00	4.05	0.83

Q15 How would you describe your ethnicity?

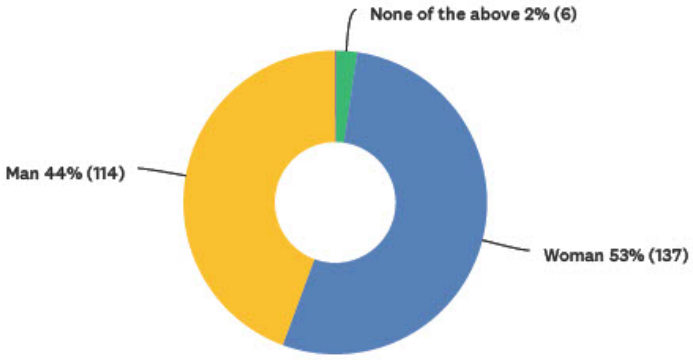
Answered: 258 Skipped: 29



#	OTHER (PLEASE SPECIFY)	DATE
1	human	8/30/2023 12:38 PM
2	Pict	8/25/2023 8:08 PM
3	Sephardic Jewish	8/22/2023 11:47 AM
4	none of the above	8/22/2023 11:10 AM
5	Human	8/22/2023 10:17 AM
6	Polish	8/22/2023 9:19 AM
7	Prefer not to answer	8/21/2023 3:19 PM
8	Italian	8/21/2023 2:27 PM
9	Human	8/21/2023 1:51 PM
10	Middle class guy that carries everyone else. MAN: he, him, his; in case your first guess was off.	8/21/2023 9:43 AM
11	Do not want to shrae	8/8/2023 3:13 PM
12	How does this pertain?	7/20/2023 9:17 AM
13	White is not an ethnicity- Hispanics and Latinos can be Asian, black or White	7/17/2023 1:36 PM

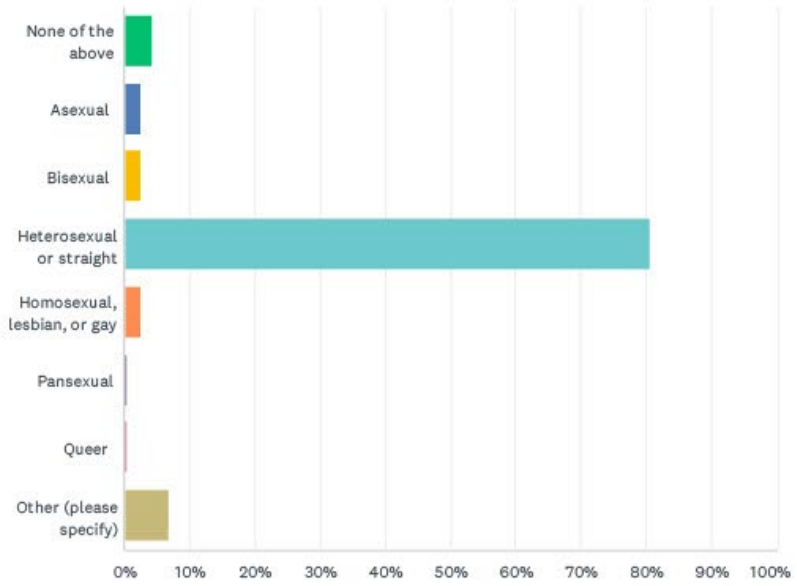
Q16 How would you describe your gender identity?

Answered: 257 Skipped: 30



Q17 How would you describe your sexual orientation?

Answered: 238 Skipped: 49



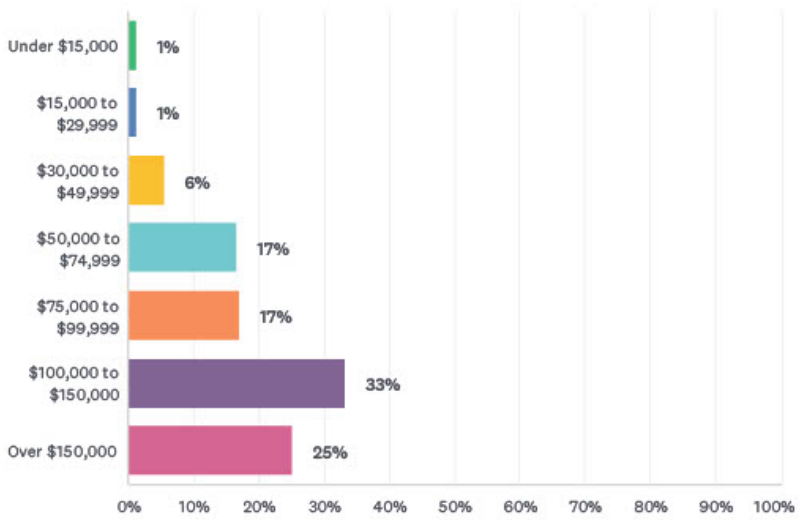
ANSWER CHOICES	RESPONSES	
None of the above	4.20%	10
Asexual	2.52%	6
Bisexual	2.52%	6
Heterosexual or straight	80.67%	192
Homosexual, lesbian, or gay	2.52%	6
Pansexual	0.42%	1
Queer	0.42%	1
Other (please specify)	6.72%	16
TOTAL		238

#	OTHER (PLEASE SPECIFY)	DATE
1	Unsure	8/22/2023 2:06 PM
2	that is private	8/22/2023 12:30 PM
3	none of the above	8/22/2023 11:10 AM
4	Why does this even matter????!!!	8/22/2023 3:59 AM

5	Prefer not to answer	8/21/2023 3:19 PM
6	What does this have to do with hazard mitigation	8/21/2023 2:11 PM
7	I am not going to answer this question.	8/21/2023 2:03 PM
8	You're a loser for asking this question	8/21/2023 1:51 PM
9	Not applicable.	8/21/2023 1:38 PM
10	AND very boring. Not sympathetic with many people because it is not my business either. I just don't carry a flag begging for attention.	8/21/2023 9:43 AM
11	Why is this relevant??	8/9/2023 8:23 PM
12	Do not want to share	8/8/2023 3:13 PM
13	Give me a break. This info is not germane !	8/7/2023 10:38 AM
14	NA	8/2/2023 12:27 PM
15	How does this pertain?	7/20/2023 9:17 AM
16	not your business	7/17/2023 1:36 PM

Q18 How would you describe your household income in 2022?

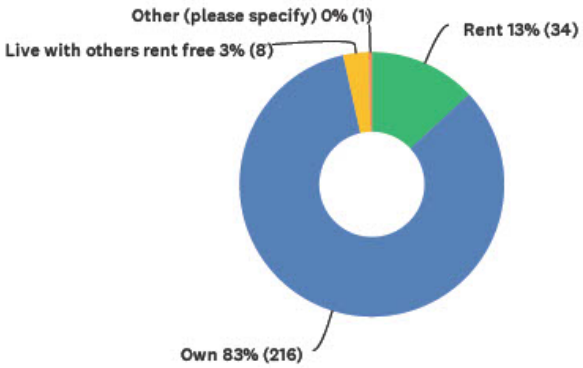
Answered: 235 Skipped: 52



Connecticut Natural Hazard Mitigation Public Survey

Q19 Do you rent or own your primary residence?

Answered: 259 Skipped: 28



#	OTHER (PLEASE SPECIFY)	DATE
1	Stick to your topic.... not social studies	8/7/2023 10:38 AM

1.6.4 Online Outreach

1.6.4.1 Email

From: Dumais, Kenneth
To: Payne, Jade
Subject: FW: CT HMP Advertisements
Date: Monday, August 7, 2023 9:35:28 AM

[CAUTION] External Email. DO NOT click links or open attachments unless expected. Please use the "Phish Alert" button to report all suspicious emails.

From: Caplet, Mike <Mike.Caplet@ct.gov>
Sent: Friday, August 4, 2023 11:32 AM
To: Dumais, Kenneth <Kenneth.Dumais@ct.gov>
Subject: RE: CT HMP Advertisements

All set, thanks!

Mike Caplet
Regional Coordinator, DEMHS Region 4
WebEOC Admin Lead
Office: (860) 465-5460
Cellular: (860) 250-3449
24 Hour Pager: 8607080756@usamobility.net
Email: mike.caplet@ct.gov

State of Connecticut
Department of Emergency Services & Public Protection
Division of Emergency Management & Homeland Security
15B Old Hartford Road | Colchester, CT 06415

www.ct.gov/demhs

From: Dumais, Kenneth <Kenneth.Dumais@ct.gov>
Sent: Friday, August 4, 2023 9:27 AM
To: Kenny, Robert <Robert.Kenny@ct.gov>; Field, John <John.Field@ct.gov>; Caplet, Mike <Mike.Caplet@ct.gov>; Velardi, Nicole <Nicole.Velardi@ct.gov>
Cc: Alexander, Ian <Ian.Alexander@ct.gov>; Bobula, Kendall <Kendall.Bobula@ct.gov>
Subject: FW: CT HMP Advertisements

Good morning everyone,

Would you mind sharing with your EMDs and planning folks in the regions?

From: Dumais, Kenneth
To: Payne, Jade
Subject: FW: CT HMP Advertisements
Date: Monday, August 7, 2023 9:35:16 AM

[CAUTION] External Email. DO NOT click links or open attachments unless expected. Please use the "Phish Alert" button to report all suspicious emails.

From: Field, John <John.Field@ct.gov>
Sent: Friday, August 4, 2023 9:30 AM
To: Dumais, Kenneth <Kenneth.Dumais@ct.gov>; Kenny, Robert <Robert.Kenny@ct.gov>; Caplet, Mike <Mike.Caplet@ct.gov>; Velardi, Nicole <Nicole.Velardi@ct.gov>
Cc: Alexander, Ian <Ian.Alexander@ct.gov>; Bobula, Kendall <Kendall.Bobula@ct.gov>
Subject: RE: CT HMP Advertisements

For you, absolutely

John Field
CT DESPP- DEMHS
Region 5 Coordinator
(203) 591-3509 office
(860) 250-2535 cell

From: Dumais, Kenneth <Kenneth.Dumais@ct.gov>
Sent: Friday, August 4, 2023 9:27 AM
To: Kenny, Robert <Robert.Kenny@ct.gov>; Field, John <John.Field@ct.gov>; Caplet, Mike <Mike.Caplet@ct.gov>; Velardi, Nicole <Nicole.Velardi@ct.gov>
Cc: Alexander, Ian <Ian.Alexander@ct.gov>; Bobula, Kendall <Kendall.Bobula@ct.gov>
Subject: FW: CT HMP Advertisements

Good morning everyone,

Would you mind sharing with your EMDs and planning folks in the regions?

Thanks,
Ken

1.6.4.2 Social Media Posts




Jade Payne ▸ Fairfield County Happenings - Connecticut
· 15h ·
Hey everyone, the State is doing an update of the State Hazard Mitigation Plan and is looking for public input on concerns about flooding and other hazards.
Is there a road that always floods? Has your house faced repeated flooding when it rains? We want to hear about it!
Fill out this survey to provide your input for consideration in the 2023 Hazard Mitigation Plan: https://www.surveymonkey.com/r/CT-HMP-2023
For more information on the Connecticut Hazard Mitigation Plan update,... See more
Help Connecticut become resilient to disasters.
Take the Natural Hazard Mitigation Public Survey.
Scan with your phone's camera
https://www.surveymonkey.com/r/CT-HMP-2023
Like
Comment
Share

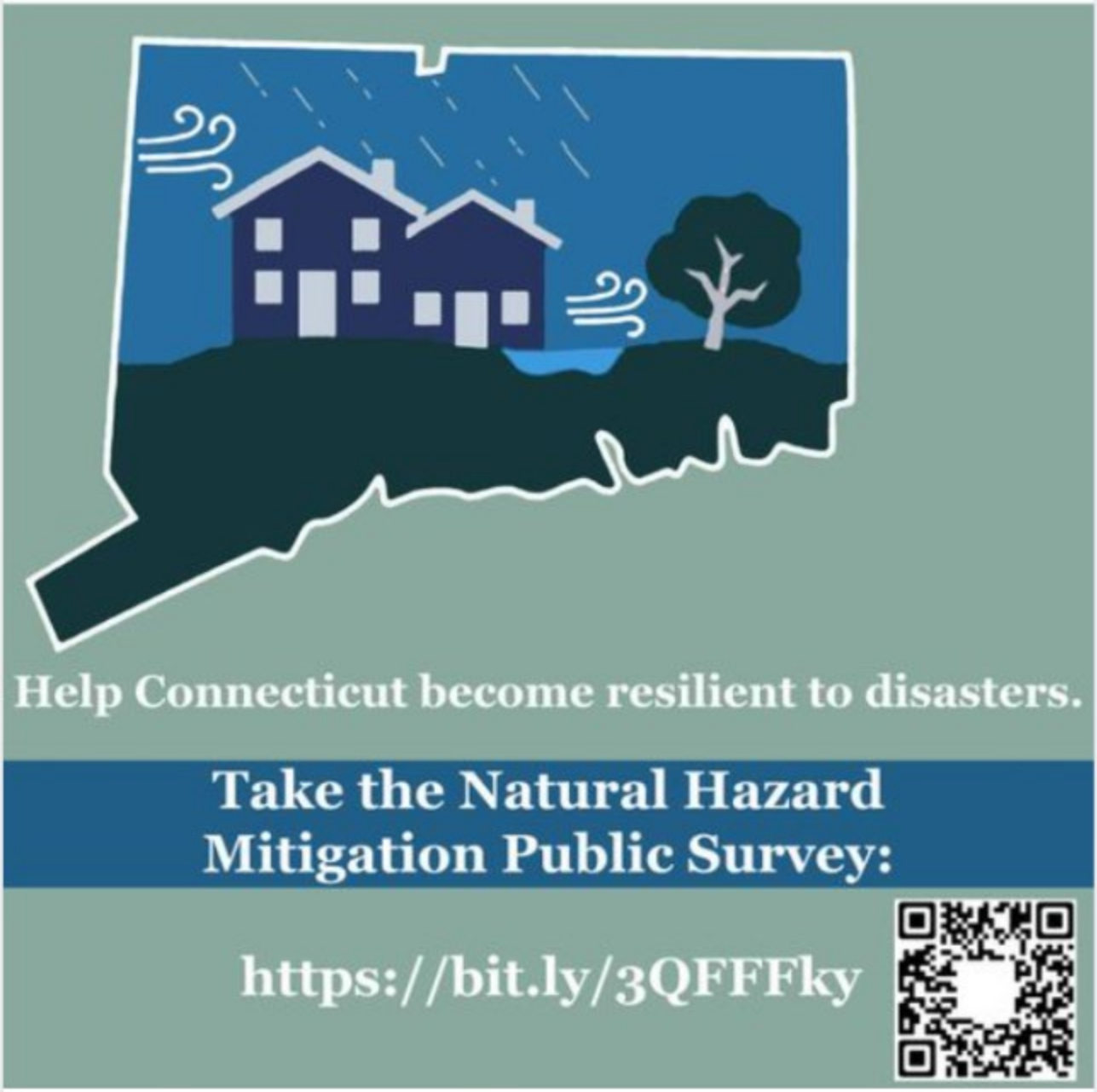

Jade Payne ▸ New Haven County Happenings - Connecticut
· 15h ·
Hey everyone, the State is doing an update of the State Hazard Mitigation Plan and is looking for public input on concerns about flooding and other hazards.
Is there a road that always floods? Has your house faced repeated flooding when it rains? We want to hear about it!
Fill out this survey to provide your input for consideration in the 2023 Hazard Mitigation Plan: https://www.surveymonkey.com/r/CT-HMP-2023
For more information on the Connecticut Hazard Mitigation Plan update,... See more
Help Connecticut become resilient to disasters.
Take the Natural Hazard Mitigation Public Survey.
Scan with your phone's camera
https://www.surveymonkey.com/r/CT-HMP-2023
Like
Comment
Share
Write a public comment...

Chesterfield Fire Co. PIO
3d ·

The State of Connecticut Division of Emergency Management and Homeland Security is updating The State's Natural Hazard Mitigation Plan and needs public comments!

Let your ideas be heard regarding Connecticut's hazards & resiliency.

Take The Survey Here: https://bit.ly/3QFFFky



Like Comment Share

Write a comment...


Jade Payne ▸ Hartford County Happenings - Connecticut
15h
Hey everyone, the State is doing an update of the State Hazard Mitigation Plan and is looking for public input on concerns about flooding and other hazards.
Is there a road that always floods? Has your house faced repeated flooding when it rains? We want to hear about it!
Fill out this survey to provide your input for consideration in the 2023 Hazard Mitigation Plan: https://www.surveymonkey.com/r/CT-HMP-2023
For more information on the Connecticut Hazard Mitigation Plan update,... See more
Help Connecticut become resilient to disasters.
Take the Natural Hazard Mitigation Public Survey.
Scan with your phone's camera
https://www.surveymonkey.com/r/CT-HMP-2023
Like
Comment
Share
Write a public comment...

CT EVENTS

Jade Payne
Just now ·

Hey everyone, the State is doing an update of the State Hazard Mitigation Plan and is looking for public input on concerns about flooding and other hazards.

Is there a road that always floods? Has your house faced repeated flooding when it rains? We want to hear about it!

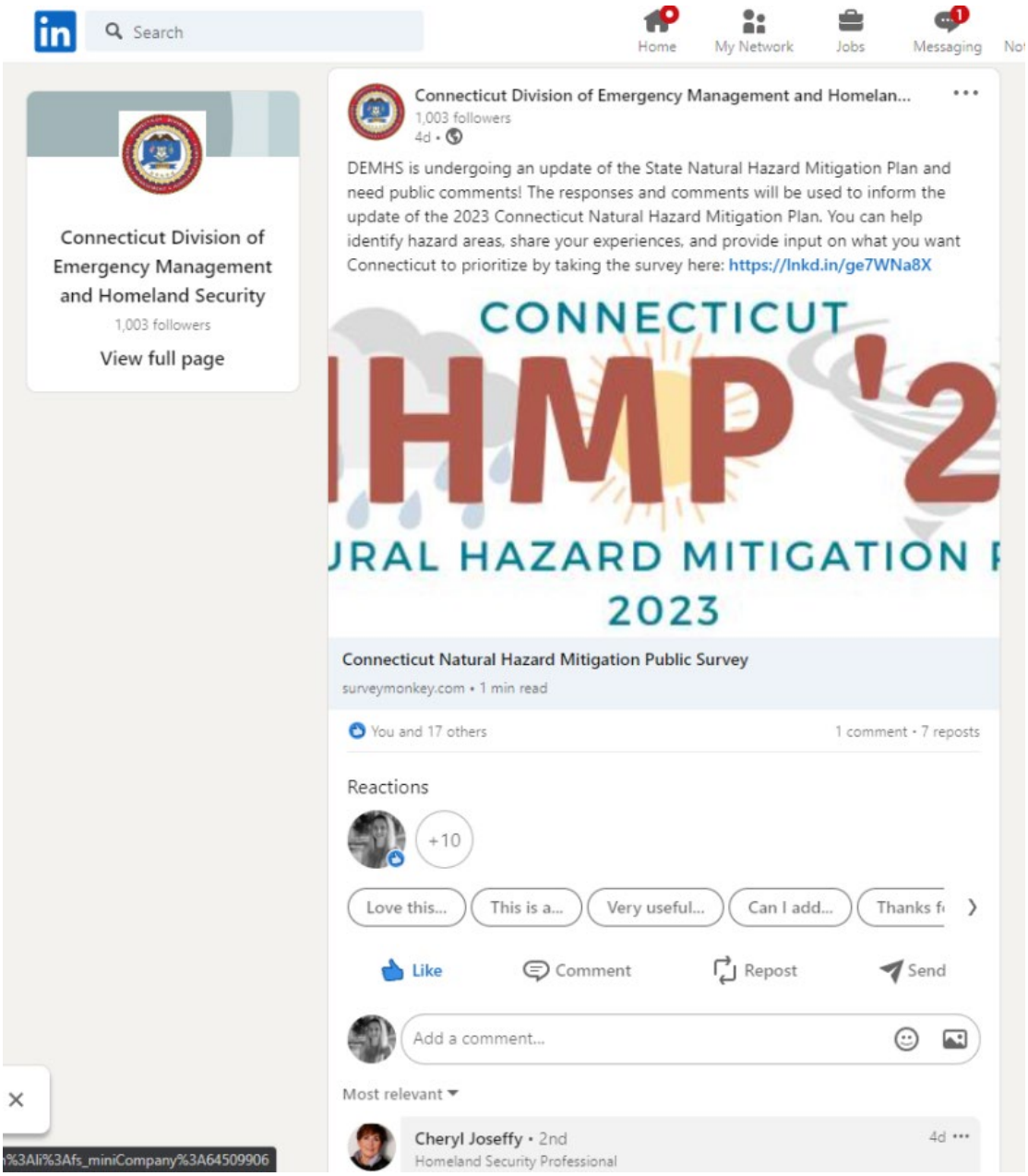
Fill out this survey to provide your input for consideration in the 2023 Hazard Mitigation Plan: https://www.surveymonkey.com/r/CT-HMP-2023

For more information on the Connecticut Hazard Mitigation Plan update.... **See more**

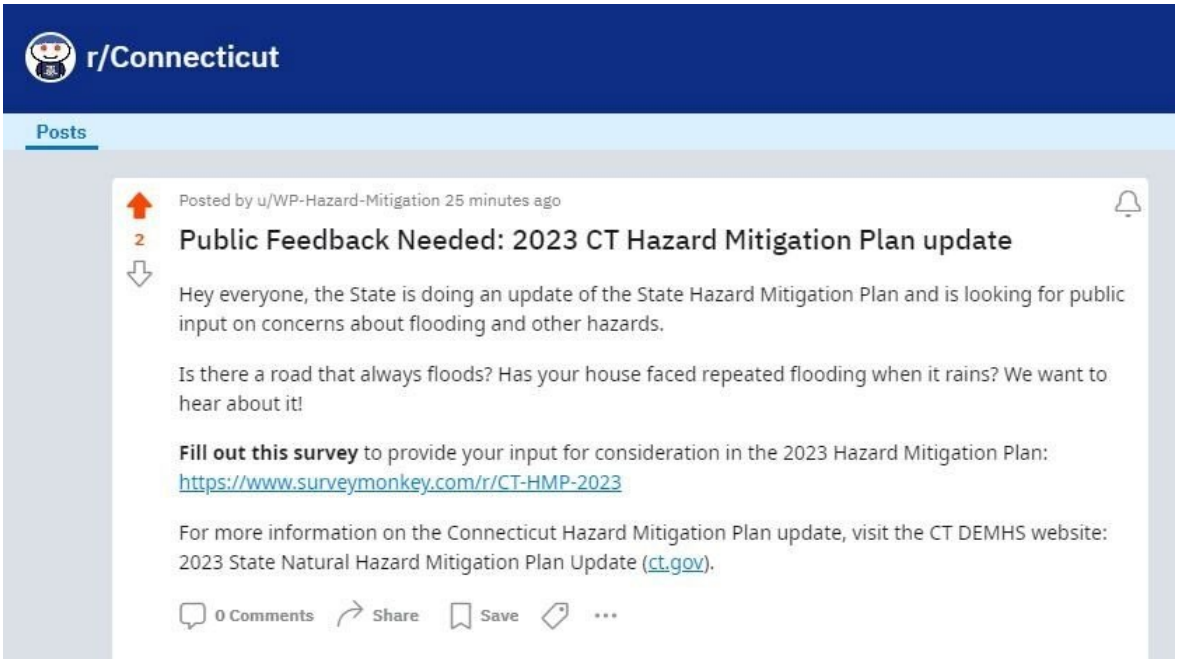


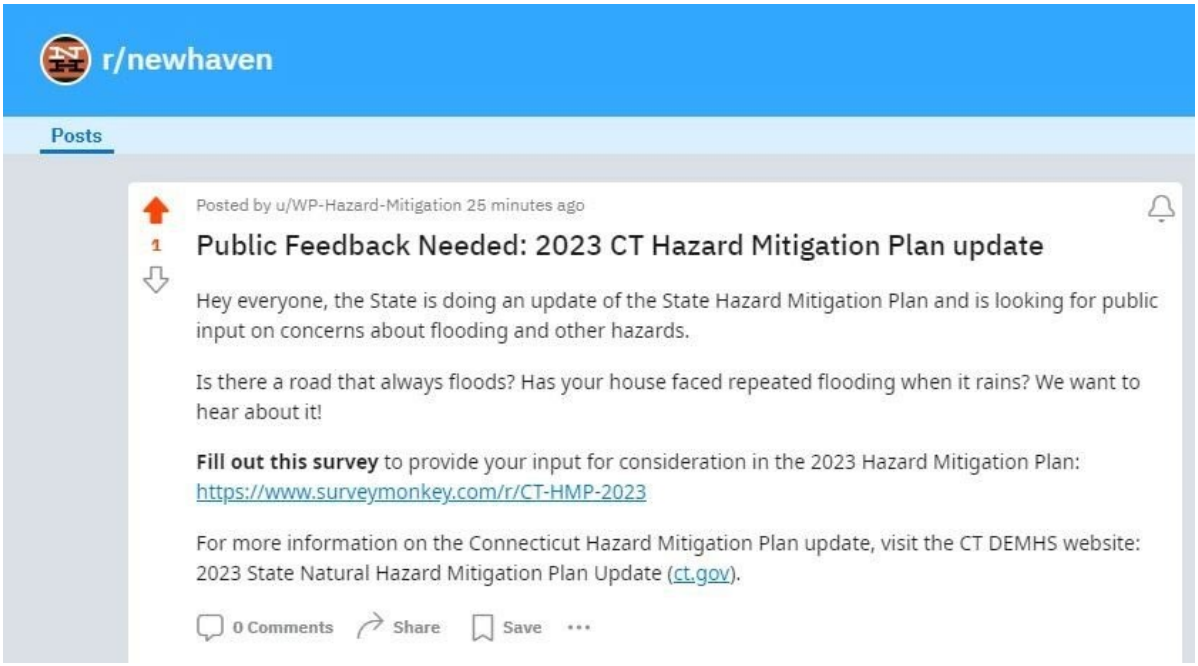

Jade Payne ▸ Litchfield County Happenings - Connecticut
· 15h ·
Hey everyone, the State is doing an update of the State Hazard Mitigation Plan and is looking for public input on concerns about flooding and other hazards.
Is there a road that always floods? Has your house faced repeated flooding when it rains? We want to hear about it!
Fill out this survey to provide your input for consideration in the 2023 Hazard Mitigation Plan: https://www.surveymonkey.com/r/CT-HMP-2023
For more information on the Connecticut Hazard Mitigation Plan update.... See more
Help Connecticut become resilient to disasters.
Take the Natural Hazard Mitigation Public Survey.
Scan with your phone's camera
https://www.surveymonkey.com/r/CT-HMP-2023
Like
Comment
Share


Jade Payne ▸ New London County Happenings - Connecticut
· 15h ·
Hey everyone, the State is doing an update of the State Hazard Mitigation Plan and is looking for public input on concerns about flooding and other hazards.
Is there a road that always floods? Has your house faced repeated flooding when it rains? We want to hear about it!
Fill out this survey to provide your input for consideration in the 2023 Hazard Mitigation Plan: https://www.surveymonkey.com/r/CT-HMP-2023
For more information on the Connecticut Hazard Mitigation Plan update,... See more
Help Connecticut become resilient to disasters.
Take the Natural Hazard Mitigation Public Survey.
Scan with your phone's camera
https://www.surveymonkey.com/r/CT-HMP-2023
Like
Comment
Share


Search
Home
My Network
Jobs
Messaging
Connecticut Division of Emergency Management and Homeland Security
1,003 followers
View full page
Connecticut Division of Emergency Management and Homelan...
1,003 followers
4d •
DEMHS is undergoing an update of the State Natural Hazard Mitigation Plan and need public comments! The responses and comments will be used to inform the update of the 2023 Connecticut Natural Hazard Mitigation Plan. You can help identify hazard areas, share your experiences, and provide input on what you want Connecticut to prioritize by taking the survey here: https://lnkd.in/ge7WNa8X
CONNECTICUT
HMP '2
URAL HAZARD MITIGATION P
2023
Connecticut Natural Hazard Mitigation Public Survey
surveymonkey.com • 1 min read
You and 17 others
1 comment • 7 reposts
Reactions
+10
Love this...
This is a...
Very useful...
Can I add...
Like
Comment
Repost
Send
Add a comment...
Most relevant
Cheryl Joseffy • 2nd
Homeland Security Professional
4d


r/BridgeportCT
Posts
Posted by u/WP-Hazard-Mitigation just now
1
Public Feedback Needed: 2023 CT Hazard Mitigation Plan update
Hey everyone, the State is doing an update of the State Hazard Mitigation Plan and is looking for public input on concerns about flooding and other hazards.
Is there a road that always floods? Has your house faced repeated flooding when it rains? We want to hear about it!
Fill out this survey to provide your input for consideration in the 2023 Hazard Mitigation Plan: https://www.surveymonkey.com/r/CT-HMP-2023
For more information on the Connecticut Hazard Mitigation Plan update, visit the CT DEMHS website: 2023 State Natural Hazard Mitigation Plan Update (ct.gov).
0 Comments
Share
Save


r/Connecticut
Posts
Posted by u/WP-Hazard-Mitigation 25 minutes ago
2
Public Feedback Needed: 2023 CT Hazard Mitigation Plan update
Hey everyone, the State is doing an update of the State Hazard Mitigation Plan and is looking for public input on concerns about flooding and other hazards.
Is there a road that always floods? Has your house faced repeated flooding when it rains? We want to hear about it!
Fill out this survey to provide your input for consideration in the 2023 Hazard Mitigation Plan: https://www.surveymonkey.com/r/CT-HMP-2023
For more information on the Connecticut Hazard Mitigation Plan update, visit the CT DEMHS website: 2023 State Natural Hazard Mitigation Plan Update (ct.gov).
0 Comments
Share
Save


r/newhaven
Posts
Posted by u/WP-Hazard-Mitigation 25 minutes ago
1
Public Feedback Needed: 2023 CT Hazard Mitigation Plan update
Hey everyone, the State is doing an update of the State Hazard Mitigation Plan and is looking for public input on concerns about flooding and other hazards.
Is there a road that always floods? Has your house faced repeated flooding when it rains? We want to hear about it!
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https://www.surveymonkey.com/r/CT-HMP-2023
For more information on the Connecticut Hazard Mitigation Plan update, visit the CT DEMHS website: 2023 State Natural Hazard Mitigation Plan Update (ct.gov).
0 Comments
Share
Save


r/NewLondonCounty
Posts
Posted by u/WP-Hazard-Mitigation 18 minutes ago
1
Public Feedback Needed: 2023 CT Hazard Mitigation Plan update
Hey everyone, the State is doing an update of the State Hazard Mitigation Plan and is looking for public input on concerns about flooding and other hazards.
Is there a road that always floods? Has your house faced repeated flooding when it rains? We want to hear about it!
Fill out this survey to provide your input for consideration in the 2023 Hazard Mitigation Plan:
https://www.surveymonkey.com/r/CT-HMP-2023
For more information on the Connecticut Hazard Mitigation Plan update, visit the CT DEMHS website: 2023 State Natural Hazard Mitigation Plan Update (ct.gov).
0 Comments
Share
Save

Explore

Settings

Tweet

CT Emergency Management & Homeland Security
@CTDEMHS

DEMHS is updating the State Natural Hazard Mitigation Plan & needs public comments! Let your ideas be heard regarding CT's hazards & resiliency.

See the announcement on our website:
statics.teams.cdn.office.net/evergreen-asse...

The direct link to the survey can be found here:
survey123.arcgis.com/share/68f3c176...



DEEP and Governor Ned Lamont

10:59 AM · Aug 3, 2023 · 5,046 Views

10 Retweets 14 Likes

Mike Caplet
Regional Coordinator, DEMHS Region 4
WebEOC Admin Lead
Office: (860) 465-5460
Cellular: (860) 250-3449
24 Hour Pager: 8607080756@usamobility.net
Email: mike.caplet@ct.gov

State of Connecticut
Department of Emergency Services & Public Protection Division of Emergency Management & Homeland Security 15B Old Hartford Road | Colchester, CT 06415

https://nam02.safelinks.protection.outlook.com/?
url=http%3A%2F%2Fwww.ct.gov%2Fdemhs&data=05%7C01%7Cjpayne%40Dewberry.com%7C8221290463434144cae808db9d9df45b%7C84b7f537fb7642b2ac1b415a5597766c%7C0%7C0%7C6382

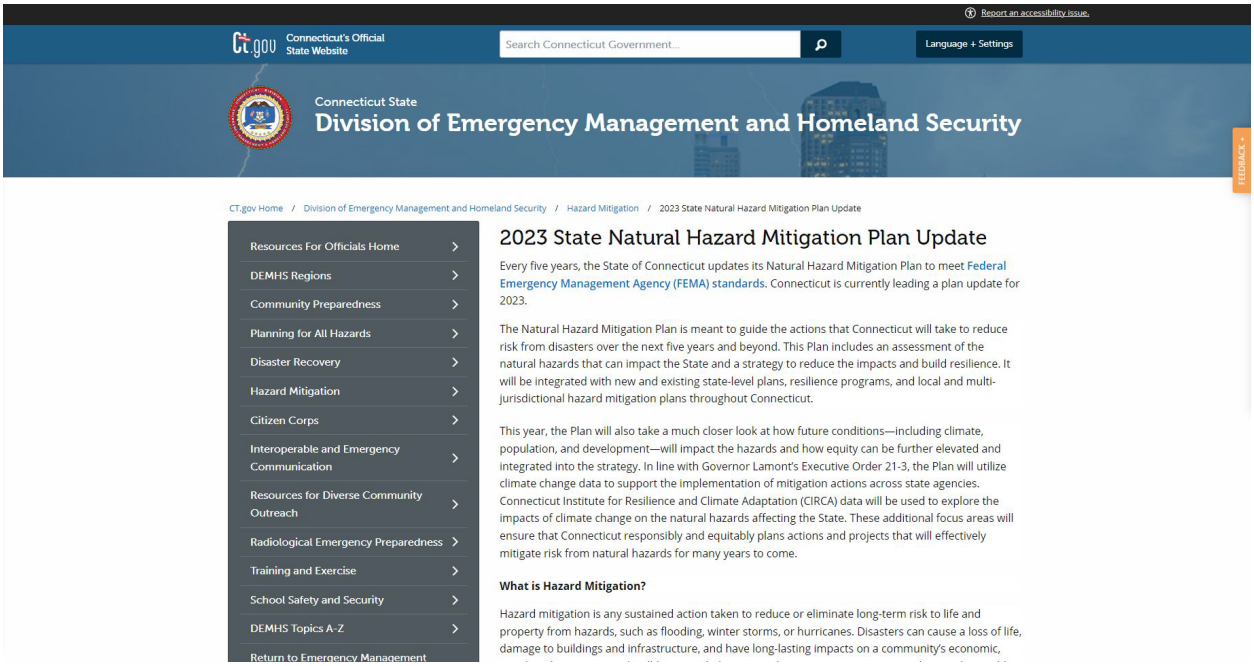
-----Original Message-----
From: Chesterfield Fire Co <steven.frischling@chesterfieldfirecompany.org>
Sent: Tuesday, August 15, 2023 10:26 AM
To: Caplet, Mike <Mike.Caplet@ct.gov>
Subject: Re: DEMHS Hazard Mitigation Survey

EXTERNAL EMAIL: This email originated from outside of the organization. Do not click any links or open any attachments unless you trust the sender and know the content is safe.

I got it shared on Instagram by Connecticut_Community, which has 889,000 followers. Hopefully that helps get you some return on the survey.

Steven Frischling
Public Information Officer
Chesterfield Fire Company
1(860)326-9708
PIO@chesterfieldfirecompany.org

1.6.5 Project Webpage



School Safety and Security

DEMHS Topics A-Z

Return to Emergency Management Home

Search Division of Emergency Management and Homeland Security

by Keyword

Hazard mitigation is any sustained action taken to reduce or eliminate long-term risk to life and property from hazards, such as flooding, winter storms, or hurricanes. Disasters can cause a loss of life, damage to buildings and infrastructure, and have long-lasting impacts on a community's economic, social, and environmental well-being. To help prevent this, mitigation actions are taken, such as public education and outreach programs, elevating buildings above potential floodwaters, or strengthening building codes to ensure new buildings can withstand hurricane-force winds.

The purpose of mitigation planning is to both protect people and structures from damage and to minimize the costs of disaster response and recovery. Connecticut is focused on proactive hazard mitigation planning to reduce risk and create a safer, more disaster-resilient community

Planning Process

Connecticut's hazard mitigation planning process has six steps:

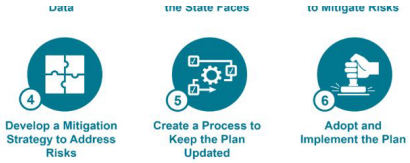


Get Involved

Public participation is critical for a successful natural hazard mitigation plan. The valuable knowledge from Connecticut residents and businesses helps to produce a plan that reflects what matters most to people living and working throughout the state.

FEEDBACK

TOP



Get Involved

Public participation is critical for a successful natural hazard mitigation plan. The valuable knowledge from Connecticut residents and businesses helps to produce a plan that reflects what matters most to people living and working throughout the state.

Opportunities to provide information, input, and feedback will be available throughout the planning process. You can get involved by participating in the following:

1. Take the Public Hazard Mitigation Survey
2. Explore some of the natural hazard risk areas in Connecticut and tell us about natural hazard problems areas you've noticed
3. Sign up for notifications about news and updates regarding the NHMP, including upcoming ways to get involved

Other Resources

1. CT HMP 2023 - Kickoff Presentation
2. CT HMP 2023 - Kickoff Meeting Notes

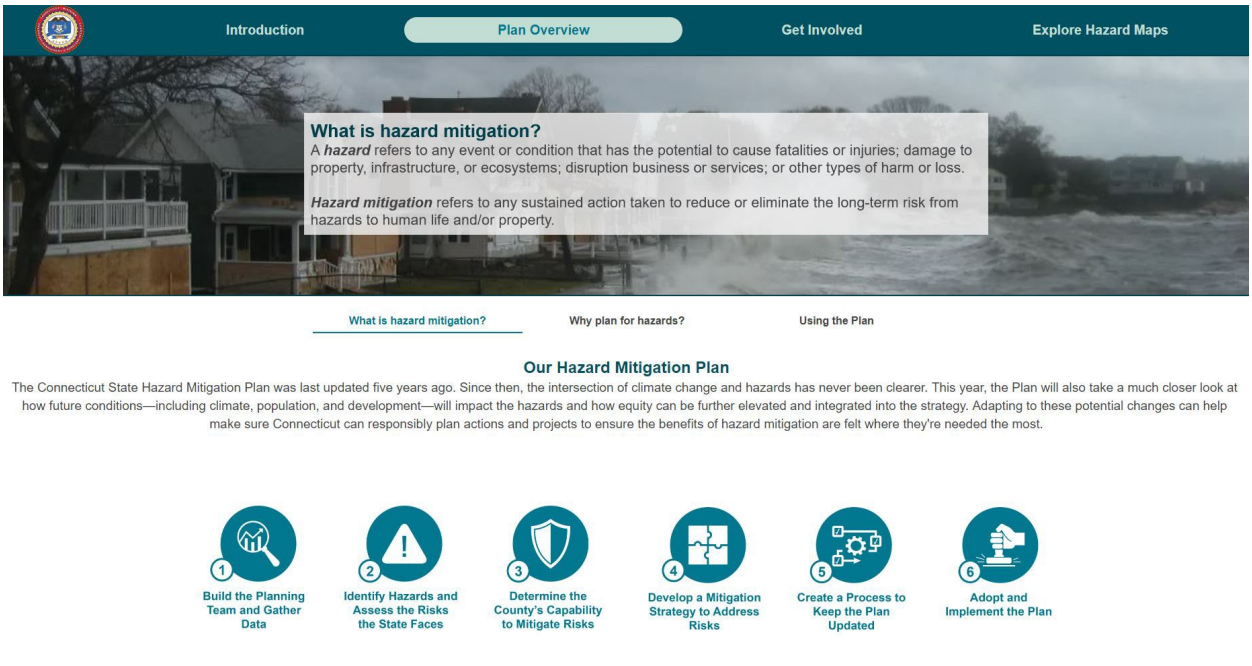
FEEDBACK

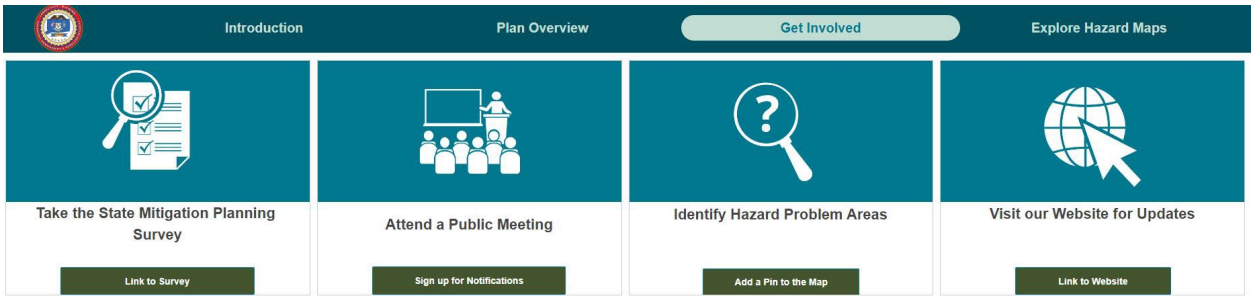
TOP

POLICIES ACCESSIBILITY ABOUT CT DIRECTORIES SOCIAL MEDIA FOR STATE EMPLOYEES UNITED STATES FULL. CONNECTICUT FULL. Connecticut
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1.6.6 Connecticut Natural Hazard Mitigation Plan Experience

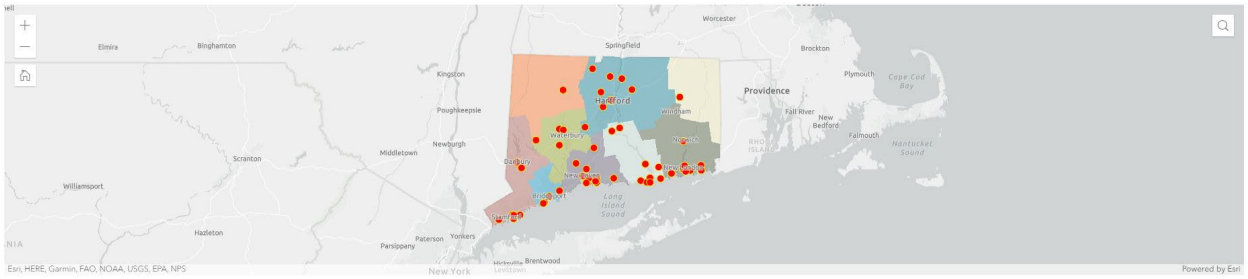


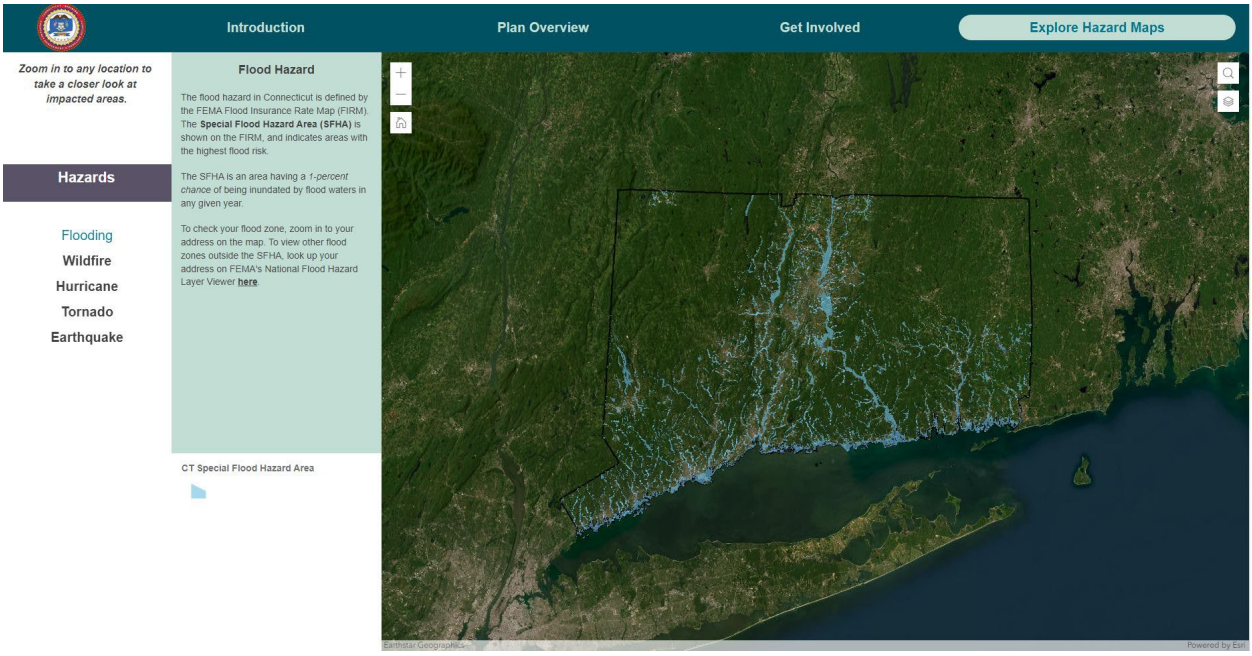




Community Hazard Problem Areas

View the hazard problem areas that the Connecticut community has identified on the map below, then **add your own pins to the map**.





2 | Planning Context Appendix

2.1 Local Hazard Mitigation Plan Status Table

Table 1. Local Hazard Mitigation Plan Status

County	COG	Community or Tribe	2013 HMP Type	2013 Approval	2013 Expiration	2018 HMP Type	2018 Approval	2018 Expiration	Current Plan Type	Current Approval	Current Expiration	Current Status
Tolland	CRCOG	Andover	MJ	9/24/2008	9/24/2013	MJ	12/5/2014	12/5/2019	MJ	Nov-19	Nov-24	Active
Hartford	CRCOG	Avon	MJ	9/24/2008	9/24/2013	MJ	12/5/2014	12/5/2019	MJ	Nov-19	Nov-24	Active
Hartford	CRCOG	Berlin	MJ	6/15/2011	6/15/2016	MJ	9/13/2016	9/13/2021	MJ	Nov-19	Nov-24	Active
Hartford	CRCOG	Bloomfield	MJ	9/24/2008	9/24/2013	MJ	12/5/2014	12/5/2019	MJ	Nov-19	Nov-24	Active
Tolland	CRCOG	Bolton	MJ	9/24/2008	9/24/2013	MJ	12/5/2014	12/5/2019	MJ	Nov-19	Nov-24	Active
Hartford	CRCOG	Canton	MJ	9/24/2008	9/24/2013	MJ	12/5/2014	12/5/2019	MJ	Nov-19	Nov-24	Active
Tolland	CRCOG	Columbia	MJ	2/16/2007	2/16/2012	MJ	1/11/2016	1/11/2021	MJ	Nov-19	Nov-24	Active
Tolland	CRCOG	Coventry	MJ	2/16/2007	2/16/2012	MJ	1/11/2016	1/11/2021	MJ	Nov-19	Nov-24	Active
Hartford	CRCOG	East Granby	MJ	9/24/2008	9/24/2013	MJ	12/5/2014	12/5/2019	MJ	Nov-19	Nov-24	Active
Hartford	CRCOG	East Hartford	MJ	9/24/2008	9/24/2013	MJ	12/5/2014	12/5/2019	MJ	Nov-19	Nov-24	Active
Hartford	CRCOG	East Windsor	MJ	9/24/2008	9/24/2013	MJ	12/5/2014	12/5/2019	MJ	Nov-19	Nov-24	Active
Tolland	CRCOG	Ellington	MJ	9/24/2008	9/24/2013	MJ	12/5/2014	12/5/2019	MJ	Nov-19	Nov-24	Active
Hartford	CRCOG	Enfield	MJ	9/24/2008	9/24/2013	MJ	12/5/2014	12/5/2019	MJ	Nov-19	Nov-24	Active
Hartford	CRCOG	Farmington	MJ	9/24/2008	9/24/2013	MJ	12/5/2014	12/5/2019	MJ	Nov-19	Nov-24	Active
Hartford	CRCOG	Glastonbury	MJ	9/24/2008	9/24/2013	MJ	12/5/2014	12/5/2019	MJ	Nov-19	Nov-24	Active
Hartford	CRCOG	Granby	MJ	9/24/2008	9/24/2013	MJ	12/5/2014	12/5/2019	MJ	Nov-19	Nov-24	Active
Hartford	CRCOG	Hartford	MJ	9/24/2008	9/24/2013	MJ	12/5/2014	12/5/2019	MJ	Nov-19	Nov-24	Active
Tolland	CRCOG	Hebron	MJ	9/24/2008	9/24/2013	MJ	12/5/2014	12/5/2019	MJ	Nov-19	Nov-24	Active
Hartford	CRCOG	Manchester	MJ	9/24/2008	9/24/2013	MJ	12/5/2014	12/5/2019	MJ	Nov-19	Nov-24	Active
Tolland	CRCOG	Mansfield	MJ	2/16/2007	2/16/2012	MJ	1/11/2016	1/11/2021	MJ	Nov-19	Nov-24	Active
Hartford	CRCOG	Marlborough	MJ	9/24/2008	9/24/2013	MJ	12/5/2014	12/5/2019	MJ	Nov-19	Nov-24	Active

Hartford	CRCOG	New Britain	MJ	6/15/2011	6/15/2016	MJ	9/13/2016	9/13/2021	MJ	Nov-19	Nov-24	Active
Hartford	CRCOG	Newington	MJ	9/24/2008	9/24/2013	MJ	12/5/2014	12/5/2019	MJ	Nov-19	Nov-24	Active
Hartford	CRCOG	Plainville	MJ	6/15/2011	6/15/2016	MJ	9/13/2016	9/13/2021	MJ	Nov-19	Nov-24	Active
Hartford	CRCOG	Rocky Hill	MJ	9/24/2008	9/24/2013	MJ	12/5/2014	12/5/2019	MJ	Nov-19	Nov-24	Active
Hartford	CRCOG	Simsbury	MJ	9/24/2008	9/24/2013	MJ	12/5/2014	12/5/2019	MJ	Nov-19	Nov-24	Active
Tolland	CRCOG	Somers	MJ	9/24/2008	9/24/2013	MJ	12/5/2014	12/5/2019	MJ	Nov-19	Nov-24	Active
Hartford	CRCOG	South Windsor	MJ	9/24/2008	9/24/2013	MJ	12/5/2014	12/5/2019	MJ	Nov-19	Nov-24	Active
Hartford	CRCOG	Southington	MJ	6/15/2011	6/15/2016	MJ	9/13/2016	9/13/2021	MJ	Nov-19	Nov-24	Active
Tolland	CRCOG	Stafford	-	-	-	MJ	12/5/2014	12/5/2019	MJ	Nov-19	Nov-24	Active
Hartford	CRCOG	Suffield	MJ	9/24/2008	9/24/2013	MJ	12/5/2014	12/5/2019	MJ	Nov-19	Nov-24	Active
Tolland	CRCOG	Tolland	MJ	9/24/2008	9/24/2013	MJ	12/5/2014	12/5/2019	MJ	Nov-19	Nov-24	Active
Tolland	CRCOG	Vernon	MJ	9/24/2008	9/24/2013	MJ	12/5/2014	12/5/2019	MJ	Nov-19	Nov-24	Active
Hartford	CRCOG	West Hartford	MJ	9/24/2008	9/24/2013	MJ	12/5/2014	12/5/2019	MJ	Nov-19	Nov-24	Active
Hartford	CRCOG	Wethersfield	MJ	9/24/2008	9/24/2013	MJ	12/5/2014	12/5/2019	MJ	Nov-19	Nov-24	Active
Tolland	CRCOG	Willington	MJ	2/16/2007	2/16/2012	MJ	1/11/2016	1/11/2021	MJ	Nov-19	Nov-24	Active
Hartford	CRCOG	Windsor	MJ	9/24/2008	9/24/2013	MJ	12/5/2014	12/5/2019	MJ	Nov-19	Nov-24	Active
Hartford	CRCOG	Windsor Locks	MJ	9/24/2008	9/24/2013	MJ	12/5/2014	12/5/2019	MJ	Nov-19	Nov-24	Active
Fairfield	MetroCOG	Bridgeport	MJ	1/29/2007	1/29/2012	MJ	7/22/2014	7/22/2019	MJ	Jul-19	Jul-24	Active
Fairfield	MetroCOG	Easton	MJ	1/29/2007	1/29/2012	MJ	7/22/2014	7/22/2019	MJ	Jul-19	Jul-24	Active
Fairfield	MetroCOG	Fairfield	MJ	1/29/2007	1/29/2012	MJ	7/22/2014	7/22/2019	MJ	Jul-19	Jul-24	Active
Fairfield	MetroCOG	Monroe	MJ	1/29/2007	1/29/2012	MJ	7/22/2014	7/22/2019	MJ	Jul-19	Jul-24	Active
Fairfield	MetroCOG	Stratford	MJ	1/29/2007	1/29/2012	MJ	7/22/2014	7/22/2019	MJ	Jul-19	Jul-24	Active
Fairfield	MetroCOG	Trumbull	MJ	1/29/2007	1/29/2012	MJ	7/22/2014	7/22/2019	MJ	Jul-19	Jul-24	Active
Windham	NECCOG	Ashford	MJ	-	40955	MJ	2/1/2016	2/1/2021	MJ	2015	2020	Inactive
Windham	NECCOG	Brooklyn	-	-	-	MJ	2/1/2016	2/1/2021	S	2015	2020	Inactive
Windham	NECCOG	Canterbury	-	-	-	MJ	2/1/2016	2/1/2021	S	2015	2020	Inactive
Windham	NECCOG	Chaplin	MJ	2/16/2007	40955	MJ	2/1/2016	2/1/2021	S	2015	2020	Inactive
Windham	NECCOG	Eastford	-	-	-	MJ	2/1/2016	2/1/2021	S	2015	2020	Inactive
Windham	NECCOG	Hampton	MJ	2/16/2007	40955	MJ	2/1/2016	2/1/2021	S	2015	2020	Inactive
Windham	NECCOG	Killingly	-	-	-	MJ	2/1/2016	2/1/2021	S	2015	2020	Inactive
Windham	NECCOG	Plainfield	-	-	-	MJ	2/1/2016	2/1/2021	S	2015	2020	Inactive

Windham	NECCOG	Pomfret	-	-	-	MJ	2/1/2016	2/1/2021	S	2015	2020	Inactive
Windham	NECCOG	Putnam	-	-	-	MJ	2/1/2016	2/1/2021	S	2015	2020	Inactive
Windham	NECCOG	Scotland	MJ	2/16/2007	40955	MJ	2/1/2016	2/1/2021	S	2015	2020	Inactive
Windham	NECCOG	Sterling	-	-	-	MJ	2/1/2016	2/1/2021	S	2015	2020	Inactive
Windham	NECCOG	Thompson	-	-	-	MJ	2/1/2016	2/1/2021	S	2015	2020	Inactive
Tolland	NECCOG	Union	-	-	-	MJ	2/1/2016	2/1/2021	S	2015	2020	Inactive
New London	NECCOG	Voluntown	MJ	10/24/2012	43032	MJ	2/1/2016	2/1/2021	S	2015	2020	Inactive
Windham	NECCOG	Woodstock	-	-	-	MJ	2/1/2016	2/1/2021	S	2015	2020	Inactive
New Haven	NVCOG	Ansonia	MJ	2/14/2013	43145	MJ	2/13/2013	2/13/2018	MJ	Jan-22	Jan-27	Active
New Haven	NVCOG	Beacon Falls	S	4/10/2009	41739	S	1/5/2016	1/5/2021	MJ	Jan-22	Jan-27	Active
Litchfield	NVCOG	Bethlehem	S	4/10/2009	4/10/2014	S	11/9/2015	11/9/2020	MJ	Jan-22	Jan-27	Active
Hartford	NVCOG	Bristol	MJ	6/15/2011	6/15/2016	MJ	9/13/2016	9/13/2021	MJ	Jan-22	Jan-27	Active
New Haven	NVCOG	Cheshire	S	5/23/2008	41417	S	12/19/2014	12/19/2019	MJ	Jan-22	Jan-27	Active
New Haven	NVCOG	Derby	MJ	2/14/2013	43145	MJ	2/13/2013	2/13/2018	MJ	Jan-22	Jan-27	Active
New Haven	NVCOG	Middlebury	S	5/29/2009	41788	S	12/30/2014	12/30/2019	MJ	Jan-22	Jan-27	Active
New Haven	NVCOG	Naugatuck	S	9/9/2009	41891	S	3/2/2015	3/2/2020	MJ	Jan-22	Jan-27	Active
New Haven	NVCOG	Oxford	S	4/6/2007	41005	S	8/19/2014	8/19/2019	MJ	Jan-22	Jan-27	Active
Litchfield	NVCOG	Plymouth	MJ	6/15/2011	6/15/2016	MJ	9/13/2016	9/13/2021	MJ	Jan-22	Jan-27	Active
New Haven	NVCOG	Prospect	S	8/6/2008	41857	S	2/26/2015	2/26/2020	MJ	Jan-22	Jan-27	Active
New Haven	NVCOG	Seymour	MJ	2/14/2013	43145	MJ	2/13/2013	2/13/2018	MJ	Jan-22	Jan-27	Active
Fairfield	NVCOG	Shelton	MJ	2/14/2013	2/14/2018	MJ	2/13/2013	2/13/2018	MJ	Jan-22	Jan-27	Active
New Haven	NVCOG	Southbury	S	4/10/2009	41739	S	12/30/2014	12/30/2019	MJ	Jan-22	Jan-27	Active
Litchfield	NVCOG	Thomaston	S	4/10/2009	4/10/2014	S	2/9/2015	2/9/2020	MJ	Jan-22	Jan-27	Active
New Haven	NVCOG	Waterbury	S	12/10/2007	41253	S	2/27/2015	2/27/2020	MJ	Jan-22	Jan-27	Active
Litchfield	NVCOG	Watertown	S	4/6/2007	4/6/2012	S	6/2/2014	6/2/2019	MJ	Jan-22	Jan-27	Active
New Haven	NVCOG	Wolcott	S	9/30/2008	41547	S	2/26/2015	2/26/2020	MJ	Jan-22	Jan-27	Active
Litchfield	NVCOG	Woodbury	S	4/6/2007	4/6/2012	S	6/3/2014	6/3/2019	MJ	Jan-22	Jan-27	Active
Litchfield	NHCOG	Barkhamsted	MJ	2/27/2007	2/27/2012	MJ	8/30/2016	8/30/2021	Expired	Expired	Expired	Active
Hartford	NHCOG	Burlington	MJ	6/15/2011	6/15/2016	MJ	9/13/2016	9/13/2021	Expired	Expired	Expired	Active
Litchfield	NHCOG	Canaan	-	-	-	S	1/30/2015	1/30/2020	Expired	Expired	Expired	Active
Litchfield	NHCOG	Colebrook	MJ	2/27/2007	2/27/2012	MJ	8/30/2016	8/30/2021	Expired	Expired	Expired	Active

Litchfield	NHCOG	Cornwall	-	-	-	S	12/2/2014	12/2/2019	Expired	Expired	Expired	Active
Litchfield	NHCOG	Goshen	MJ	2/27/2007	2/27/2012	MJ	8/30/2016	8/30/2021	Expired	Expired	Expired	Active
Hartford	NHCOG	Hartland	MJ	2/27/2007	2/27/2012	MJ	8/30/2016	8/30/2021	Expired	Expired	Expired	Active
Litchfield	NHCOG	Harwinton	MJ	2/27/2007	2/27/2012	MJ	8/30/2016	8/30/2021	Expired	Expired	Expired	Active
Litchfield	NHCOG	Kent	-	-	-	S	12/19/2014	12/19/2019	Expired	Expired	Expired	Active
Litchfield	NHCOG	Litchfield	MJ	2/27/2007	2/27/2012	MJ	8/30/2016	8/30/2021	Expired	Expired	Expired	Active
Litchfield	NHCOG	Morris	MJ	2/27/2007	2/27/2012	MJ	8/30/2016	8/30/2021	Expired	Expired	Expired	Active
Litchfield	NHCOG	New Hartford	MJ	2/27/2007	2/27/2012	MJ	8/30/2016	8/30/2021	Expired	Expired	Expired	Active
Litchfield	NHCOG	Norfolk	MJ	2/27/2007	2/27/2012	MJ	8/30/2016	8/30/2021	Expired	Expired	Expired	Active
Litchfield	NHCOG	North Canaan	-	-	-	S	1/30/2015	1/30/2020	Expired	Expired	Expired	Active
Litchfield	NHCOG	Roxbury	-	-	-	S	12/18/2014	12/18/2019	Expired	Expired	Expired	Active
Litchfield	NHCOG	Salisbury	-	-	-	S	1/30/2015	1/30/2020	Expired	Expired	Expired	Active
Litchfield	NHCOG	Sharon	-	-	-	S	1/14/2015	1/14/2020	Expired	Expired	Expired	Active
Litchfield	NHCOG	Torrington	MJ	2/27/2007	2/27/2012	MJ	8/30/2016	8/30/2021	Expired	Expired	Expired	Active
Litchfield	NHCOG	Warren	-	-	-	S	1/15/2015	1/15/2020	Expired	Expired	Expired	Active
Litchfield	NHCOG	Washington	-	-	-	S	2/23/2015	2/23/2020	Expired	Expired	Expired	Active
Litchfield	NHCOG	Winchester	MJ	2/27/2007	2/27/2012	MJ	8/30/2016	8/30/2021	Expired	Expired	Expired	Active
Middlesex	RiverCOG	Chester	MJ	1/18/2007	40926	S	9/2/2014	9/2/2019	MJ	May-21	May-26	Active
Middlesex	RiverCOG	Clinton	MJ	1/18/2007	40926	S	8/28/2014	8/28/2019	MJ	May-21	May-26	Active
Middlesex	RiverCOG	Cromwell	-	-	-	MJ	8/20/2014	8/20/2019	MJ	May-21	May-26	Active
Middlesex	RiverCOG	Deep River	MJ	1/18/2007	40926	S	9/2/2014	9/2/2019	MJ	May-21	May-26	Active
Middlesex	RiverCOG	Durham	-	-	-	MJ	8/20/2014	8/20/2019	MJ	May-21	May-26	Active
Middlesex	RiverCOG	East Haddam	-	-	-	MJ	8/20/2014	8/20/2019	MJ	May-21	May-26	Active
Middlesex	RiverCOG	East Hampton	-	-	-	MJ	8/20/2014	8/20/2019	MJ	May-21	May-26	Active
Middlesex	RiverCOG	Essex	MJ	1/18/2007	40926	S	6/23/2014	6/23/2019	MJ	May-21	May-26	Active
Middlesex	RiverCOG	Haddam	-	-	-	MJ	8/20/2014	8/20/2019	MJ	May-21	May-26	Active
Middlesex	RiverCOG	Killingworth	MJ	1/18/2007	40926	S	6/16/2014	6/16/2019	MJ	May-21	May-26	Active
New London	RiverCOG	Lyme	MJ	1/18/2007	40926	S	8/20/2014	8/20/2019	MJ	May-21	May-26	Active
Middlesex	RiverCOG	Middlefield	-	-	-	MJ	8/20/2014	8/20/2019	MJ	May-21	May-26	Active
Middlesex	RiverCOG	Middletown	-	-	-	MJ	8/20/2014	8/20/2019	MJ	May-21	May-26	Active
New London	RiverCOG	Old Lyme	MJ	1/18/2007	40926	S	8/22/2014	8/22/2019	MJ	May-21	May-26	Active

Middlesex	RiverCOG	Old Saybrook	MJ	1/18/2007	40926	S	6/2/2014	6/2/2019	S	Oct-19	Oct-24	Active
Middlesex	RiverCOG	Portland	-	-	-	MJ	8/20/2014	8/20/2019	MJ	May-21	May-26	Active
Middlesex	RiverCOG	Westbrook	MJ	1/18/2007	40926	S	9/2/2014	9/2/2019	S	Dec-19	Dec-24	Active
New London	SCCOG	Bozrah	MJ	10/24/2012	43032	MJ	APA 11/17		MJ	Mar-23	Mar-28	Active
New London	SCCOG	Colchester	MJ	10/24/2012	43032	MJ	APA 11/17		MJ	Mar-23	Mar-28	Active
New London	SCCOG	East Lyme	MJ	10/24/2012	43032	MJ	APA 11/17		MJ	Mar-23	Mar-28	Active
New London	SCCOG	Franklin	MJ	10/24/2012	43032	MJ	APA 11/17		MJ	Mar-23	Mar-28	Active
New London	SCCOG	Griswold	MJ	10/24/2012	43032	MJ	APA 11/17		MJ	Mar-23	Mar-28	Active
New London	SCCOG	Groton (City)	MJ	10/24/2012	43032	MJ	APA 11/17		MJ	Mar-23	Mar-28	Active
New London	SCCOG	Groton (Town)	MJ	10/24/2012	43032	MJ	APA 11/17		MJ	Mar-23	Mar-28	Active
New London	SCCOG	Lebanon	MJ	2/16/2007	40955	MJ	APA 11/17		MJ	Mar-23	Mar-28	Active
New London	SCCOG	Ledyard	MJ	10/24/2012	43032	MJ	APA 11/17		MJ	Mar-23	Mar-28	Active
New London	SCCOG	Lisbon	MJ	10/24/2012	43032	MJ	APA 11/17		MJ	Mar-23	Mar-28	Active
Unaffiliated	SCCOG	Mashantucket Pequot Tribal Nation	MJ	10/24/2012	43032	MJ	APA 11/17		MJ	Mar-23	Mar-28	Active
Unaffiliated	SCCOG	Mohegan Tribe	MJ	10/24/2012	43032	MJ	APA 11/17		MJ	Mar-23	Mar-28	Active
New London	SCCOG	Montville	MJ	10/24/2012	43032	MJ	APA 11/17		MJ	Mar-23	Mar-28	Active
New London	SCCOG	New London	MJ	10/24/2012	43032	MJ	APA 11/17		MJ	Mar-23	Mar-28	Active
New London	SCCOG	North Stonington	MJ	10/24/2012	43032	MJ	APA 11/17		MJ	Mar-23	Mar-28	Active
New London	SCCOG	Norwich	MJ	10/24/2012	43032	MJ	APA 11/17		MJ	Mar-23	Mar-28	Active
New London	SCCOG	Preston	MJ	10/24/2012	43032	MJ	APA 11/17		MJ	Mar-23	Mar-28	Active
New London	SCCOG	Salem	MJ	10/24/2012	43032	MJ	APA 11/17		MJ	Mar-23	Mar-28	Active
New London	SCCOG	Sprague	MJ	10/24/2012	43032	MJ	APA 11/17		MJ	Mar-23	Mar-28	Active
New London	SCCOG	Stonington (Borough)	MJ	10/24/2012	43032	MJ	APA 11/17		MJ	Mar-23	Mar-28	Active
New London	SCCOG	Stonington (Town)	MJ	10/24/2012	43032	MJ	APA 11/17		MJ	Mar-23	Mar-28	Active
New London	SCCOG	Waterford	MJ	10/24/2012	43032	MJ	APA 11/17		MJ	Mar-23	Mar-28	Active
Windham	SCCOG	Windham	MJ	2/16/2007	40955	MJ	APA 11/17		MJ	Mar-23	Mar-28	Active
New Haven	SCRCOG	Bethany	MJ	-	-	MJ	6/24/2014	6/24/2019	MJ	Jan-23	Jan-28	Active
New Haven	SCRCOG	Branford	MJ	-	-	MJ	6/24/2014	6/24/2019	MJ	Jan-23	Jan-28	Active

New Haven	SCRCOG	East Haven	S	6/4/2012	42890	S	6/4/2012	6/4/2017	MJ	Jan-23	Jan-28	Active
New Haven	SCRCOG	Guilford	S	7/17/2012	42935	S	7/19/2012	7/19/2017	MJ	Jan-23	Jan-28	Active
New Haven	SCRCOG	Hamden	MJ	-	-	MJ	6/24/2014	6/24/2019	MJ	Jan-23	Jan-28	Active
New Haven	SCRCOG	Madison	MJ	-	-	MJ	6/24/2014	6/24/2019	MJ	Jan-23	Jan-28	Active
New Haven	SCRCOG	Meriden	S			S	5/28/2013	5/28/2018	MJ	Jan-23	Jan-28	Active
New Haven	SCRCOG	Milford	S	8/13/2007	41134	S	9/16/2013	9/16/2018	MJ	Jan-23	Jan-28	Active
New Haven	SCRCOG	New Haven	S	8/2/2011	42584	S	4/14/2017	4/14/2022	MJ	Jan-23	Jan-28	Active
New Haven	SCRCOG	North Branford	MJ	-	-	MJ	6/24/2014	6/24/2019	MJ	Jan-23	Jan-28	Active
New Haven	SCRCOG	North Haven	MJ	-	-	MJ	6/24/2014	6/24/2019	MJ	Jan-23	Jan-28	Active
New Haven	SCRCOG	Orange	MJ	-	-	MJ	6/24/2014	6/24/2019	MJ	Jan-23	Jan-28	Active
New Haven	SCRCOG	Wallingford	MJ	-	-	MJ	6/24/2014	6/24/2019	MJ	Jan-23	Jan-28	Active
New Haven	SCRCOG	West Haven	MJ	-	-	MJ	6/24/2014	6/24/2019	MJ	Jan-23	Jan-28	Active
New Haven	SCRCOG	Woodbridge	MJ	-	-	MJ	6/24/2014	6/24/2019	MJ	Jan-23	Jan-28	Active
Fairfield	WestCOG	Bethel	-	-	-	S	1/13/2016	1/13/2021	MJ	8/16/2021	8/16/2026	Active
Litchfield	WestCOG	Bridgewater	-	-	-	S	3/26/2015	3/26/2019	MJ	8/16/2021	8/16/2026	Active
Fairfield	WestCOG	Brookfield	-	-	-	S	12/14/2014	12/14/2019	MJ	8/16/2021	8/16/2026	Active
Fairfield	WestCOG	Danbury	S	4/3/2012	4/3/2017	S	3/8/2017	3/8/2022	MJ	8/16/2021	8/16/2026	Active
Fairfield	WestCOG	Darien	MJ	6/9/2011	6/9/2016	MJ	5/12/2016	5/12/2021	MJ	8/16/2021	8/16/2026	Active
Fairfield	WestCOG	Greenwich	MJ	6/9/2011	6/9/2016	MJ	5/12/2016	5/12/2021	MJ	8/16/2021	8/16/2026	Active
Fairfield	WestCOG	New Canaan	MJ	6/9/2011	6/9/2016	MJ	5/12/2016	5/12/2021	MJ	8/16/2021	8/16/2026	Active
Fairfield	WestCOG	New Fairfield	S	8/23/2011	8/23/2016	S	1/30/2017	1/30/2022	MJ	8/16/2021	8/16/2026	Active
Litchfield	WestCOG	New Milford	-	-	-	S	1/5/2016	1/5/2021	MJ	8/16/2021	8/16/2026	Active
Fairfield	WestCOG	Newtown	-	-	-	S	8/7/2015	8/7/2020	MJ	8/16/2021	8/16/2026	Active
Fairfield	WestCOG	Norwalk	MJ	6/9/2011	6/9/2016	MJ	5/12/2016	5/12/2021	MJ	8/16/2021	8/16/2026	Active
Fairfield	WestCOG	Redding	-	-	-	S	8/6/2015	8/6/2020	MJ	8/16/2021	8/16/2026	Active
Fairfield	WestCOG	Ridgefield	-	-	-	S	2/2/2016	2/2/2021	MJ	8/16/2021	8/16/2026	Active
Fairfield	WestCOG	Sherman	S	7/18/2011	7/18/2016	S	3/13/2017	3/13/2022	MJ	8/16/2021	8/16/2026	Active
Fairfield	WestCOG	Stamford	MJ	6/9/2011	6/9/2016	MJ	5/12/2016	5/12/2021	MJ	8/16/2021	8/16/2026	Active
Fairfield	WestCOG	Weston	MJ	6/9/2011	6/9/2016	MJ	5/12/2016	5/12/2021	MJ	8/16/2021	8/16/2026	Active
Fairfield	WestCOG	Westport	MJ	6/9/2011	6/9/2016	MJ	5/12/2016	5/12/2021	MJ	8/16/2021	8/16/2026	Active

Fairfield	WestCOG	Wilton	MJ	6/9/2011	6/9/2016	MJ	5/12/2016	5/12/2021	MJ	8/16/2021	8/16/2026	Active

2.3 HMGP Administration Plan

See separate document.

3 | Risk Assessment Appendix

3.1 Changes from 2019 Plan

The 2023 plan updates content from the 2019 loss estimation and vulnerability analysis, which is built upon analyses from previous plans. The following are the major changes in the 2023 plan update from the 2019 plan.

- Added hazard profiles for extreme cold and extreme heat.
- New section for climate change impacts on each hazard. Expanded climate change data from the 2019 plan to further describe how climate change will impact the location, intensity, frequency, and duration of each hazard.
- Integrates data at the Council of Government level, in addition to county level data in the vulnerability assessment.
- Uses Hazus-MH v6.0 for the vulnerability and exposure analyses of flooding, tropical cyclone, and earthquake.
- Incorporates an analysis of community lifeline exposure to hazards.
- Utilizes National Risk Index expected annual loss and risk for a loss analysis.
- To account for future development, building permit data was used in the vulnerability assessment.
- Created hazard one-pagers to summarize key findings from hazard sections.
- Updated hazard history.
- Updated hazard ranking methodology.

A comparison of the 2019 and 2023 Risk Assessment methodology is shown in Table 2.

Table 2. Risk Assessment methodology comparison

Hazard	2019 Methods	2023 Methods
Dam Failure	Location - Dam locations Frequency - Historic annualized events using data from National Performance Dams	Location - Dam locations - Inundation areas Frequency - Historic annualized events using data from NPDP; CT DEEP;

Hazard	2019 Methods	2023 Methods
	Program (NPDP); NCEI; Association of State Dam Safety Officials; FEMA Disaster Declarations - Climate impact narrative Exposure & Loss Estimation - # dams per hazard classification - State assets (# + $) within dam inundation areas - Critical facilities (# + $) within dam inundation areas - Population within dam inundation areas Changes in Development - Conditions narrative (population & development)	Association of State Dam Safety Officials; FEMA Disaster Declarations Exposure - # dams per hazard classification - State assets (#) within dam inundation areas - Critical facilities (#) within dam inundation areas - Population within dam inundation areas (all & socially vulnerable) - CCVI Social Sensitivity map Loss Estimation - Value of structures in inundation areas Future Conditions - Population projections - Development projections Climate change projections
Drought	Location - Climate divisions map Frequency - Historic annualized events using data from NCEI; FEMA Disaster Declarations; USDA drought-related declarations - Climate impact narrative & projections Exposure & Loss Estimation - Annualized insured crop losses - USDA agricultural exposure (farm #, crop $, farm acres) Changes in Development	Location - Climate divisions map - Agricultural land map Frequency - Northeast Regional Climate Center drought records; US Drought Monitor; FEMA Disaster Declarations; USDA drought-related declarations Exposure - USDA agricultural exposure (farm #, farm acres) - Population using well water - CCVI Social Sensitivity map Loss Estimation

Hazard	2019 Methods	2023 Methods
	Conditions narrative (population & development)	- NRI expected annual agricultural loss - USDA agricultural exposure (crop $) <u>Future Conditions</u> - Population projections - Development projections Climate change projections (CMRA)
Earthquake	<u>Location</u> - Map of Quaternary Geology - USGS Connecticut seismic hazard map for 2% in 50-years PGA - Northeast Seismicity map 1975-2016, Weston Observatory <u>Frequency</u> - Historic annualized events using data from USGS National Earthquake Information Center database - Historic earthquake epicenters map - USGS earthquake magnitude probabilities - Climate impacts narrative (inconclusive) <u>Exposure & Loss Estimation</u> - Hazus scenarios (4) estimated losses (# & $) - Hazus potential fire impacts (# ignitions, # population exposed, & $ exposed structures) <u>Changes in Development</u>	<u>Location</u> - Map of quaternary geology - USGS Connecticut seismic hazard map for 2% in 50-years PGA - Northeast seismicity map 1975 – 2016, Weston Observatory <u>Frequency</u> - Historic annualized events using data from USGS National Earthquake Information Center database - Historic earthquake epicenters map - USGS earthquake magnitude probabilities <u>Exposure</u> - Hazus v6.0 scenarios (4) estimated losses (#) - Hazus v6.0 potential fire impacts (# ignitions, # population exposed) - Population in potential earthquake areas (all and socially vulnerable) <u>Loss Estimation</u> - Hazus v6.0 scenarios (4) estimated losses ($) - Hazus v6.0 potential fire impacts ($ exposed structures)

Hazard	2019 Methods	2023 Methods
	- Conditions narrative (population & development)	Future Conditions - Population projections - Development projections Climate change projections (NCA)
Extreme Cold	*Not profiled in 2019 HMP*	Location - NCEI reported cold and extreme cold events by county map Frequency - Historic event data from NCEI - NCEI State Climate Extremes data Exposure - NRI cold wave risk by county & by census tract - DOT current project boundaries map - CCVI Social Sensitivity Map Loss Estimation - NRI cold wave expected annual loss ($) Future Conditions - Population projections - Development projections Climate change projections (NCA)
Extreme Heat	*Not profiled in 2019 HMP*	Location - Average number of days >90°F by county map - Heat Severity Index map Frequency - Annualized events from NCEI Storm Events Database - Risk Factor heatwave likelihood for current conditions Exposure

Hazard	2019 Methods	2023 Methods
		- Impervious surface coverage - Tree canopy cover - Heat Severity Index - CCVI Heat Vulnerability - State-owned buildings & critical facilities exposed to extreme heat events <u>Loss Estimation</u> - Heat Wave expected annual loss (NRI) <u>Future Conditions</u> - Population projections - Development projections - Climate change projections (CMRA) - Risk Factor heatwave likelihood for future conditions - Opportunity Zones
Flood-Related	<u>Location</u> - FEMA flood zones - Coastal Barrier Resource System locations <u>Frequency</u> - Annualized events from NCEI events, FEMA Disaster Declarations - NFIP policies, claims & payments - RL/SRL summary - USGS Recurrence Intervals & probabilities (FEMA FIRMs) - Climate impact narrative <u>Exposure & Loss Estimation</u>	<u>Location</u> - FEMA flood zones - Hazus 100-year flood extent - Storm surge extent - Coastal Barrier Resource System locations <u>Frequency</u> - Annualized events from NCEI events, FEMA Disaster Declarations - NFIP policies, claims & payments - RL/SRL summary - FEMA Floodplains (100-year, 500-year) <u>Exposure</u> - State assets (#) within 100- and 500-year floodplain

Hazard	2019 Methods	2023 Methods
	- Annualized NCEI historic damages - Hazus 100-year estimated loss by county & census block - State assets (# + $) within 100- and 500-year floodplain & erosion susceptibility areas - Critical facilities (#) within SFHA, 500-year floodplain, storm surge zones, and erosion susceptibility areas Changes in Development - Conditions narrative (population & development)	- Critical facilities (#) within 100-year, 500-year floodplain, storm surge zones - Population within floodplains (all & socially vulnerable) - CCVI Flood Vulnerability Index Loss Estimation - Annualized NCEI historic damages - Hazus 100-year estimated loss by county & COG - State assets ($) within 100-year, 500-year floodplain Future Conditions - Population projections - Development projections Climate change projections (NCA, CMRA)
Sea Level Rise	Location - SLR projections (CIRCA) Frequency - Climate impact narrative Exposure & Loss Estimation - CIRCA SLR projections (1ft, 6ft) - State asset (#) intersections with various RSLR scenarios - Critical facilities (#) intersections with various RSLR scenarios Changes in Development - Conditions narrative (populations & development)	Location - SLR projections (CIRCA) Frequency - Nuisance flooding days (NOAA NWS) Exposure - CIRCA SLR projections (20 in, 3 ft, 6 ft MHHW; 20 in 100-yr storm) - State assets (#) exposed to RSLR scenarios - Critical facilities (#) exposed to RSLR scenarios - Population exposed to RSLR scenarios (all & socially vulnerable) Loss Estimation - State assets ($) exposed to RSLR scenarios

Hazard	2019 Methods	2023 Methods
		- NRI coastal flooding expected annual loss Future Conditions - Population projections - Development projections - Opportunity Zones Climate change projections (NCA, IPCC)
Thunderstorm	Location - NOAA Average # thunderstorm days map - Hail frequency map - Wind zones map Frequency - Historic wind events map - NCEI events (#, injuries, deaths, property damages, crop damages) - FEMA Disaster Declarations - Historic annualized events using data from NCEI - Climate impact narrative & projections Exposure & Loss Estimation - Annualized NCEI losses - State asset exposure (# & $) - Critical facility exposure (# & $) - Estimated losses from NOAA research paper - Farm exposure (#, acres, crop $) - State population	Location - NOAA average # thunderstorm days map - Total lightning density 2015-2020 map - Hail frequency map - Wind zones map Frequency - NCEI events (#, injuries, deaths, property damages, crop damages) - FEMA Disaster Declarations - NCEI annualized thunderstorm events Exposure - NRI Hail, Lightning, Strong Wind Risk - CCVI Social Sensitivity Loss Estimation - NRI Hail, Lightning, Strong Wind Expected Annual Loss ($) Future Conditions - Population projections - Development projections Climate change projections (NCA)

Hazard	2019 Methods	2023 Methods
	Changes in Development Conditions narrative (population & development)	
Tornado	Location - Average annual # tornadoes map Frequency - Historic tornado events map - NCEI events (#, injuries, deaths, property damages) - FEMA Disaster Declarations - NCEI historic annualized events & damages - Historic tornado frequency heat map by magnitude - Climate impact narrative Exposure & Loss Estimation - Historic tornado frequency map by magnitude - State assets (# & $) in High Tornado Probability Areas - Critical facilities (#) in High Tornado Probability Areas - Population intersecting Tornado Probability Areas Changes in Development - Conditions narrative (population & development)	Location - Total tornado events map - Tornado risk by county (NRI) Frequency - Historic tornado events map - NCEI events (#, injuries, deaths, property damages) - FEMA Disaster Declarations - NCEI historic annualized events & damages - Historic tornado frequency kernel density analysis Exposure - State assets (#) in High Tornado Probability Areas - Critical facilities (#) in High Tornado Probability Areas - Population intersecting Tornado Probability Areas (all & socially vulnerable) Loss Estimation - State assets ($) in High Tornado Probability Areas - NRI tornado expected annual loss Future Conditions - Population projections - Development projections - Opportunity Zones - Climate projections (NCA)
Tropical Cyclone	Location	Location - Historical hurricane tracks (NOAA)

Hazard	2019 Methods	2023 Methods
	- Tropical cyclone tracks map - Storm surge zones maps - Example SLOSH maps <u>Frequency</u> - Wind speeds for 100-year mean return period event map - Wind speeds for 1000-year mean return period event map - Return period in years for various hurricane categories maps - NCEI events - FEMA Disaster Declarations - Climate impact narrative <u>Exposure & Loss Estimation</u> - Hazus 100-year return period by census tract map - Hazus 1000-year return period by census tract map - Hazus losses ($) for hurricane return periods - Hazus debris (#) from wind damage per scenario - Hazus building damages ($) per scenario - Hazus sheltering needs (#) - Hazus economic losses ($) - Population intersecting Cat 1 – 4 SLOSH zones (#) <u>Changes in Development</u> - Conditions narrative (population & development)	- Storm surge flooding extents <u>Frequency</u> - NCEI reported tropical cyclones and tropical depressions - FEMA disaster declarations - NESEC reported tropical storms - Estimate return period for hurricanes on the east coast map <u>Exposure</u> - Hazus 100-year and 1,000-year MRP events maps - State assets (#) exposed to Category 1-3 strength winds (100- and 1,000-yr MRP events) - Critical facilities (#) exposed to Category 1-3 strength winds (100- and 1,000-yr MRP events) - Population associated with estimated damages of greater Than $100K for the 1,000-year storm event (all & socially vulnerable) - Hazus estimated buildings with damages for historic storm simulations - Hazus estimated sheltering needs for historic storm simulations <u>Loss Estimation</u> - State assets ($) exposed to Category 1-3 strength winds (100- and 1,000-yr MRP events) - Total estimated losses for cyclone events ($) by census tract - Hazus estimated economic losses for buildings for historic storm simulations <u>Future Conditions</u>

Hazard	2019 Methods	2023 Methods
		- Population projections - Development projections - Opportunity zones - Climate change projections (NCA, CIRCA)
Wildland Fire	<u>Location</u> - Wildland fire hazard areas map <u>Frequency</u> - Land cover map - 2013 – 2017 wildland fire events in Connecticut (NFIC) - Climate impact narrative <u>Exposure & Loss Estimation</u> - State assets (# + $) in wildland fire hazard areas - Critical facilities (#) in wildland fire hazard areas - Population intersecting wildland fire hazard areas <u>Changes in Development</u> - Conditions narrative (population & development)	<u>Location</u> - Forested land map - Wildland fire hazard areas map <u>Frequency</u> - Land cover map - 2013 – 2022 wildland fire events (NIFC) <u>Exposure</u> - Wildland fire density analysis - State assets (#) in wildland fire hazard areas - Critical facilities (#) in wildland fire hazard areas - Population intersecting wildland fire hazard areas (all & socially vulnerable) <u>Loss Estimation</u> - State assets ($) in wildland fire hazard areas - NRI wildland fire expected annual loss <u>Future Conditions</u> - Population projections - Development projections - Climate change projections (CMRA, NCA)
Winter Weather	<u>Location</u> - Narrative	<u>Location</u> - Narrative

Hazard	2019 Methods	2023 Methods
	Frequency - Annualized events from NOAA State Climate Extremes Committee records, NCEI events, FEMA Disaster Declarations - Average annualized snowfall from weather station annual snowfall values - Climate impact narrative Exposure & Loss Estimation - Annualized historic damages - State assets (# + $) within areas that see various annual snowfall - Critical facilities (#) within areas that see various annual snowfall Changes in Development - Conditions narrative (population & development)	Frequency - Annualized events from NOAA State Climate Extremes Committee records, NCEI events, FEMA Disaster Declarations - Average annualized snowfall from weather station annual snowfall values - Climate impact narrative Exposure - State assets (# + $) within areas that see various annual snowfall - Critical facilities (# + $) within areas that see various annual snowfall - Population within areas that see various annual snowfall (all & socially vulnerable) Loss Estimation - Annualized historic damages Future Conditions - Population projections - Development projections

3.3 Data Sources

Data from FEMA-approved local hazard mitigation plans were incorporated with existing statewide data sets as applicable. The following are key information sources used:

- NCEI Storm Events Database
- National Drought Mitigation Center
- NOAA National Weather Service weather station data
- National Oceanic and Atmospheric Administration (NOAA) programs
- Connecticut Office of Policy and Management (OPM)
- Connecticut Department of Transportation (CTDOT)
- Connecticut Department of Energy & Environmental Data (DEEP)
- Connecticut Institute for Resilience & Climate Adaptation (CIRCA)
- FEMA Community Lifelines
- FEMA Disaster Declarations
- FEMA Hazus-MH v6.0
- FEMA National Risk Index (NRI)
- Current hazard zone maps, including new ShakeMaps, SLOSH (Sea, Lake and Overland Surges from Hurricanes) models, and Digital Flood Data
- U.S. Forest Service
- U.S. Army Corps of Engineers
- U.S. Census 2020
- Fourth National Climate Assessment (NCA)
- Climate Mapping for Resilience and Adaptation (CMRA)

The following data limitations were identified, and strategies developed to assist in future plan updates:

- Critical facilities GIS data was compiled from various OPM and Department of Consumer Protection datasets. A more in-depth critical facilities vulnerability analysis will be completed later, and any changes to facility vulnerability will be reflected in an addendum to this plan.
- Digital Flood Insurance Rate Maps were not available for all counties.

- Information from Tribal Hazard Mitigation Plans was not included in the risk assessment.

3.3.1 State Infrastructure and Facilities Dataset

The following tables show counts of state-owned buildings and building value by county and by COG Region.

Table 3. State owned facilities and building value by county

County	Total Facilities	Building Value ($)
Fairfield	267	862,544,640
Hartford	688	2,252,966,523
Litchfield	261	63,124,650
Middlesex	312	201,148,280
New Haven	605	1,289,515,690
New London	493	430,897,119
Tolland	885	284,504,940
Windham	186	198,282,563
Total	3697	5,582,984,405

Table 4. State owned facilities and building value by COG

COG Region	Total Facilities	Building Value ($)
Capitol Region	1527	2,529,257,373
Metropolitan	69	407,525,610
Naugatuck Valley	330	638,330,700
Northeastern Connecticut	185	63,127,710
Northwest Hills	255	62,159,020
Lower Connecticut River Valley	331	205,906,409
South Central Regional	311	659,162,760
Southeastern Connecticut	485	561,293,843
Western Connecticut	204	456,220,980
Total	3697	5,582,984,405

3.3.2 Critical Facilities Dataset

The following tables show counts of critical facilities in Connecticut by county and by COG Region.

Table 5. Critical facility counts by county

County	Total Facilities
Fairfield	400
Hartford	365
Litchfield	180
Middlesex	150
New Haven	395
New London	285
Tolland	117
Windham	132
Total	2024

Table 6. Critical facility counts by COG

COG Region	Total Facilities
Capitol Region	446
Metropolitan	120
Naugatuck Valley	211
Northeastern Connecticut	125
Northwest Hills	137
Lower Connecticut River Valley	171
South Central Regional	254
Southeastern Connecticut	275
Western Connecticut	285
Total	2024

3.3.3 Declared Disasters Prior to 2019

DR-4410: On September 25-26, 2018, the State experienced a severe storm and flooding event. Widespread rainfall amounts of 4 inches or more were reported across southern

Connecticut with flash flooding resulting in numerous water rescues. The Declaration Date for this disaster is December 5, 2018.

DR-4385: On May 15, 2018, there were severe storms, tornadoes, and straight-line winds that caused damage across the State. A line of thunderstorms hit the southwest corner of the state, spawning multiple tornadoes and high winds that left two dead and hundreds of thousands without power after millions of trees were knocked down. Hundreds of homes were damaged and several state parks – Sleeping Giant, Kettletown, and Wharton Brook – were temporarily closed because of downed trees and damaged infrastructure. The Declaration Date for this disaster is August 20, 2018.

DR-4213: A potent Alberta Clipper low moved from southwestern Canada on January 24th to the Plains states and Ohio Valley on the 25th. The low then redeveloped off the Mid Atlantic coast on the 26th and rapidly intensified into a strong nor'easter, bringing heavy snow and strong winds to Southern Connecticut, with blizzard conditions in New London County. The Declaration Date for this disaster is April 8, 2015.

DR-4106 (EM-3361): Winter Storm Nemo occurred February 8th through February 11th, 2013, and hit much of the Northeast from New York to Maine, dumping around three feet of snow on Connecticut. Some called this the worst blizzard since 1888. Hamden, CT received 40 inches of snow, while the coast received about two feet of snow. It took some towns days to dig out their streets. The storm left hundreds of thousands without power throughout New England, and storm surge caused beach erosion and flooding along the coast. Roads were closed throughout the state, and 38,000 customers lost power. There were reportedly five weather related deaths in Connecticut.

DR-4087 (EM-3353): Hurricane Sandy emergency declaration on October 28, 2012, followed by a disaster declaration on October 30, 2012. Coastal residents and business owners suffered from storm surge and its damage, and more than 360,000 people were evacuated from low-lying areas along the coast from Old Saybrook to Fairfield. At least three people died in coastal towns. Inland cities and towns saw widespread power failures, with more than 600,000 people without power. A travel ban was issued on state highways, and commuter rail and Amtrak service was canceled.

DR-4046 (EM-3342): 2011 October 29-30 Storm Alfred hit the entire Northeast, but Connecticut was hit the hardest. Wind and snow knocked down five times more trees than Tropical Storm Irene. Although shoreline towns and cities largely escaped damage, upstate Connecticut was hard-hit. Significant portions of Litchfield, northern Fairfield and northern Hartford counties lost power, totaling about 880,000 people. It took more than a week to fully restore power to customers.

DR-4023 (EM-3331): Tropical Storm Irene swept across the east coast and hit Connecticut on August 28, 2011. Maximum wind gusts were 66 mph, while the average wind gust for the entire state was 52.3 mph. About "2-3 percent of trees within 50 feet of the center line of state roads were felled by the storm". This storm killed two Connecticut residents and left

hundreds of thousands of people without power. "At its peak, the tropical storm saw close to a million utility customers in the dark." Some of whom were left in the dark for more than a week. The storm was particularly devastating along the coastal towns on the Long Island Sound, as storm surge occurred during high tide. However, the storm brought trees and power lines down throughout the state.

DR-1958 This 2011 winter storm resulted in as much as two and a half feet of snow, as areas in interior southern CT saw accumulations up to 30 inches in 12 hours. Fairfield and New Haven Counties were hardest hit.7 The storm contributed to almost 60 inches of snow in January, which broke the record of 45 inches in 1945. Public transportation was suspended and airports were closed, and there were several travel bans throughout the state.

DR-1904 During the month of March three major rain events that occurred on March 12, 2010, March 23, 2010, and March 29-30, 2010, in combination caused severe flooding throughout Connecticut. The hardest hit area of the state impacted by flooding was southern Connecticut, specifically southeastern Connecticut including New London County. On April 9, 2010, Governor M. Jodi Rell requested a major disaster declaration from President Obama. The request was made for Fairfield and New London Counties. On April 12, 2010, Governor Rell amended the April 9, 2010 request for a major disaster declaration for Middlesex, New Haven and Windham Counties. A more detailed description of these events can be found in the Flood Section.

DR-1700 The floods of April 2007, also known as the 2007 April Nor'easter, was a tropical low-pressure system formed in the Atlantic Ocean off the Carolinas on Sunday, April 15, 2007, and moved slowly northward towards New England. In anticipation of this developing storm, the National Weather Service (NWS) had issued flood watches on Saturday, April 14, for all of Connecticut, and coastal flood warnings for coastal western Connecticut on April 15 and 16. High wind warnings were also posted for southeastern coastal Connecticut on April 15. Portions of Connecticut received up to eight inches of rain within a twenty-four-hour period. Wind gusts reached 60 miles per hour and downed numerous trees and power lines. Over 44,000 customers lost electricity on Monday, April 16th. Federal Disaster Aid funding issued by FEMA to Connecticut for this disaster totaled over $6.4 million dollars. More detailed information on this event can be found in the Flood Section.

DR-1619 A Presidentially Declared Disaster was issued for the events of October 14-15, 2005. FEMA designated the counties of Litchfield, New London, Tolland, and Windham as being affected by the floods. FEMA amended the disaster declaration to Hartford County on February 9, 2006. All Counties of the state were eligible to apply for assistance under the Hazard Mitigation Grant Program. More detailed information can be found in the Flood Section.

DR-1302 A major Disaster Declaration was declared on September 23, 1999, for Tropical Storm Floyd. This storm impacted almost the entire east coast, with hurricane warnings being issued from Florida to Massachusetts. In Connecticut, flooding was significant with

up to 15 inches in the Danbury area and the Connecticut River flooded portions of Hartford. Total damage was approximately $2 million.

DR-1092 The January 1996 blizzard, caused by cold air from Canada colliding with warmer winds from the Gulf of Mexico, resulted in an average of 12 to 24 inches of snowfall in Connecticut. Estimated damages in Litchfield County were $40,000.

DR-972 This winter storm produced winds up to 55 mph, and recorded a high tide in Bridgeport, CT of 10.16 feet, the third highest record in the Long Island Sound when the storm hit. The storm destroyed 26 homes and killed three people.

DR-916 In August 1991 Hurricane Bob pummeled Rhode Island, but Connecticut was affected as well. Hurricane force winds were recorded as far west as the Connecticut River, as peak winds up to 125 mph were recorded in Wethersfield, CT. Bob was also responsible for six deaths in Connecticut.

DR-837 On July 10, 1989, a tornado cut a path through western Connecticut, from Salisbury to New Haven in less than one hour. Two people were killed, 110 people were injured and sixty-seven homes were destroyed. Damages totaled $125 million (1989 dollars), and a Presidential Disaster Declaration was issued (FEMA-837-DR-CT).

DR-747 In September 1985 Hurricane Gloria, a category 2 hurricane, made landfall in Westport. It was the strongest storm to hit Connecticut in more than 30 years when it made landfall. “Strong winds and torrential rains caused heavy damage to homes and businesses along the shore, particularly in a swath from Westport to Milford.” The peak surge at New London Harbor was about 5.8 feet. “Had this occurred at high tide, flooding would have been much greater.”

DR-711 Preceded by heavy precipitation between February and April, this May 1984 storm caused severe flooding in Connecticut. The CT River in Hartford was 2 feet over the major flood threshold and the Housatonic River crested 11 feet over flood stage.

DR-661 This June 1982 storm caused massive flooding throughout Connecticut, as three to 16 inches of rain fell across the state. Flooding reached the 200- and 500-year intervals in south-central Connecticut. Damages were estimated at more than $276 million and over 15,000 homes and 400 commercial and industrial established were damaged. Additionally, state and local roads, bridges, dams, and utility infrastructure were damaged. Eleven deaths were recorded. More detailed information on this disaster can be found in the Flood Section.

DR-608 This tornado hit Windsor, Windsor Locks and Suffield in October 1979, and took apart homes and schools causing $200 million in damage. The eastern part of Bradley Airport was destroyed, in addition to the Air National Guard base and the New England Air Museum. Three people lost their lives and 500 were injured. At that time, the tornado was ranked as the 6th most costly in the United States.

DR-42 In 1955 two hurricanes impacted Connecticut within a week apart. On August 11- 12, Hurricane Connie (downgraded to a tropical storm when it passed by New England) produced four to six inches of rain throughout Connecticut. On August 18-20, 1955, Hurricane Diane (also downgraded to a tropical storm by the time it reached New England) struck and produced another ten to twenty inches of rain. Severe flooding occurred throughout Connecticut because of these two back-to-back storms and included extreme damage such as road/bridge washouts, loss of drinking water, severe damage to utility and communication infrastructures. These two events resulted in 103 fatalities, 86,000 unemployed, over 1,000 families left homeless, 2,300 requiring temporary shelter, and at least $1.5 billion in damages (1955 dollars).

DR-25 The next hurricane to strike Connecticut occurred on August 31, 1954. Hurricane Carol (naming of hurricanes began in 1950) tracked across the southeastern corner of the State. It was reported that 48 people lost their lives and property damages and losses totaled at least one billion dollars (in 1954 dollars) for the Northeast.

EM-3266 February 11-12, 2006, Nor'easter – Connecticut received record snowfall in parts of the state from this storm (second largest snowfall recorded since 1906), and received a Presidential Emergency Declaration. This storm is also known as the North American Blizzard of 2006. Governor M. Jodi Rell ordered state highways shut down to help facilitate efficient snow removal by State Department of Transportation snow removal crews.

EM-3246 Hurricane Katrina affected areas along the east coast as well, and on September 14, 2005, President Bush declared a state of emergency in Connecticut to help people evacuate from their homes. Connecticut was one of 38 states to receive an emergency declaration.

EM-3200 January 22-23, 2005, Blizzard - Connecticut received a Presidential Emergency Declaration for this storm event. NOAA analyzed this storm and ranked it a Category 4 – Crippling event on its Northeast Snowfall Impact Scale.

EM-3192 December 5-7, 2003 - Heavy snowfall amounts were recorded in parts of Connecticut including as much as twenty inches in Windham County, nineteen inches in Hartford County, and eighteen inches in Fairfield, New London, and Tolland Counties. This event received a Presidential Emergency Declaration.

EM-3176 An emergency declaration was declared on March 11, 2003, for all counties in Connecticut to cover costs of snow removal in the state due to the February 2003 storm. Also known as the "President's Day Blizzard", this storm hit several states as it moved up the east coast. New Haven received 18.5 inches of snow, Darien and New Canaan measured the most snow at 20 inches and New Fairfield recorded two feet of snow.

EM-3098: March 1993 Superstorm impacted a large area, from Florida all the way up through New England and as far west as Chicago. In Connecticut, this blizzard left 2 dead, dozens injured, and 8 to 21 inches of snow. Bradley International Airport was closed for more than 19 hours, the longest closing since 1983 at the time.

EM-3060: Blizzard of 1978 occurred on February 5, 1978; record snowfall amounts were recorded in several areas of Connecticut. The State of Connecticut was essentially shutdown for three days when Governor Grasso ordered all roads closed except for emergency travel.

3.5 Hazard History

Historical hazard events are included in this appendix. Notable historical hazard events may be found in the respective hazard sections in the Natural Hazard Mitigation Plan. Event information has been compiled from disaster declarations, event databases, hazard mitigation grant data, online research, staff and resident anecdotes, and news articles.

3.5.1 Dam Failure

Table 7 lists all of the recorded dam failure events that have occurred in Connecticut.

Table 7. Connecticut dam failure recorded events

Dam Name	Incident Date	Incident Type	Dam Type
Rocky River Main Dam	2/1/2015		Earth
Bulls Bridge	1/31/2012	Gate Failure	Concrete; Gravity
Rocky River Canal Dike	10/26/2009	Embankment Instability	Other
Rocky River Canal Dike	9/24/2008		Earth
Willimantic No. 1	5/17/2006	Penstock Rupture	
Willimantic No. 2 - Spool Dam	3/28/2006	Dam Caps Damaged	
Rocky River Main Dam	8/29/2004	Generator Overspeed	Other
Falls Village	5/24/1989	Overtopping; Failure	Concrete; Gravity
Haas Pond Dam	5/20/1984	Piping	Earth
Hempstead Pond	6/4/1982	Inflow Flood - Hydrologic Event	Earth
Urban Pond	6/4/1982	Inflow Flood - Hydrologic Event	Earth; Gravity
Johnson Pond	6/4/1982	Inflow Flood - Hydrologic Event	Earth; Stone
Gorton Pond	6/4/1982	Inflow Flood - Hydrologic Event	Stone
Jennings Pond	6/4/1982	Inflow Flood - Hydrologic Event	Earth; Masonry

Dam Name	Incident Date	Incident Type	Dam Type
Leesville Dam	6/4/1982	Inflow Flood - Hydrologic Event	Earth
Pratt Read	6/4/1982	Erosion	Earth; Masonry
Bronson Company Dam (CT 691)	6/4/1982	Inflow Flood - Hydrologic Event	Masonry
Bushy Pond (CT 391)	6/4/1982	Inflow Flood - Hydrologic Event	Masonry
C. D. Batchelor Pond	6/4/1982	Inflow Flood - Hydrologic Event	Earth; Gravity
Comstock Pond (CT 424)	6/4/1982	Inflow Flood - Hydrologic Event	Masonry
Falls River Pond (CT 884)	6/4/1982	Inflow Flood - Hydrologic Event	Masonry
Forman Pond	6/4/1982	Inflow Flood - Hydrologic Event	Earth
Ivoryton Pond (CT 882)	6/4/1982	Inflow Flood - Hydrologic Event	Earth
Lower Pond (CT 1512)	6/4/1982	Inflow Flood - Hydrologic Event	Earth
Lower Mill Pond (CT 1190)	6/4/1982	Inflow Flood - Hydrologic Event	Masonry
Main Street Pond (CT 880)	6/4/1982	Inflow Flood - Hydrologic Event	Masonry
Mansure Pond (CT 517)	6/4/1982	Inflow Flood - Hydrologic Event	Masonry
Upper Pond (CT 433)	6/4/1982	Inflow Flood - Hydrologic Event	Earth
Whalebone Creek Pond (CT 1024)	6/4/1982	Inflow Flood - Hydrologic Event	Masonry
Shady Brook Pond (CT 846)	6/4/1982	Inflow Flood - Hydrologic Event	Earth
UPPER MILLPOND	6/4/1982	Inflow Flood - Hydrologic Event	Earth; Stone
Mile Creek Pond (CT 1191)	6/4/1982	Inflow Flood - Hydrologic Event	Earth; Gravity
Hunts Brook Dam	6/4/1982	Inflow Flood - Hydrologic Event	Earth

Dam Name	Incident Date	Incident Type	Dam Type
Dolan Pond (CT 883)	6/4/1982	Inflow Flood - Hydrologic Event	Masonry
Dennison Road Pond (CT 1504)	6/4/1982	Inflow Flood - Hydrologic Event	Earth; Gravity
Abbott Pond (CT 774)	6/4/1982	Inflow Flood - Hydrologic Event	Masonry
Crystal Lake	6/4/1982	Inflow Flood - Hydrologic Event	Earth
Mill Pond	6/4/1982	Inflow Flood - Hydrologic Event	Masonry
Bushy Hill Pond	6/1/1982	Inflow Flood - Hydrologic Event	Earth
Deer Lake	6/1/1982	Inflow Flood - Hydrologic Event	Masonry
Holbrook Pond	6/1/1982	Inflow Flood - Hydrologic Event	Concrete
Mohegan Park	3/6/1963	Piping	
Crystal Lake	4/27/1961	Piping	Earth
Echo Lake	1/1/1958	Piping	Earth; Stone
Millard Pond	1/1/1955	Inflow Flood - Hydrologic Event	Masonry
Bolton Lake	6/8/1941	Faulty Construction	Earth
Bolton Lake	9/1/1938	Inflow Flood - Upstream Dam Failure	Earth
Upper Bolton Lake	9/1/1938	Inflow Flood - Hydrologic Event	Earth
Ansonia Brass and Copper Company Dam	5/28/1912	Undermining	
Bridgeport (Hydraulic Company)	1/1/1905	Inflow Flood - Hydrologic Event	Earth
Lake Housatonic	1/1/1902	Animal Attack	Concrete; Masonry; Gravity
Dyer	1/1/1901	Not Known	Timber Crib
Beaver Brook	11/3/1894	Piping	Rockfill; Masonry

Dam Name	Incident Date	Incident Type	Dam Type
Lake Housatonic	1/1/1891	Not Known	Concrete; Masonry; Gravity
Broad Brook Reservoir	9/18/1890	Not Known	Concrete
Bibbins Pond	3/26/1884	Not Known	Earth; Stone
Beaver Brook	3/26/1884	Not Known	Rockfill; Masonry
Staffordville Reservoir	3/27/1877	Seepage	Stone

Source: National Performance of Dams Program Dam Incident Database.
http://npdp.stanford.edu/dam_incidents

3.5.2 Drought

Table 8 shows Connecticut drought declarations from the last ten years, a brief description of the drought, and the counties affected.

Table 8. Connecticut drought-related USDA Declarations (2012 - 2022)

Year	Approval Date	Designation Number	Description of Disaster	Counties Affected
2012	10/24/2012	S3427	Drought, Excessive Heat	Fairfield, Litchfield
2014	12/10/2014	S3775	Drought	Hartford, Litchfield, Middlesex, New Haven, New London, Tolland, Windham
2015	11/4/2015	S3928	Drought	Fairfield, Hartford, Litchfield, Middlesex, New Haven, New London, Tolland, Windham
2016	9/7/2016	S4032	Drought – Fast Track	Windham
2016	9/21/2016	S4045	Drought – Fast Track	New London
2016	9/21/2016	S4047	Drought – Fast Track	Hartford, Litchfield, Tolland, Windham
2016	9/21/2016	S4050	Drought	Litchfield
2016	9/28/2016	S4055	Drought – Fast Track	Fairfield, Hartford, Litchfield, Middlesex, New

Year	Approval Date	Designation Number	Description of Disaster	Counties Affected
				Haven, New London, Tolland, Windham
2016	10/19/2016	S4076	Drought	New London, Windham
2017	3/3/2017	S4160	Drought – Fast Track	Hartford, Litchfield, Tolland
2020	10/14/2020	S4803	Drought – Fast Track	Hartford, Middlesex, New London, Tolland, Windham
2020	10/14/2020	S4808	Drought – Fast Track	New London, Windham
2020	10/14/2020	S4814	Drought – Fast Track	Hartford, Litchfield, Middlesex, New Haven, New London, Tolland, Windham
2020	10/14/2020	S4815	Drought – Fast Track	Hartford, Litchfield, Tolland
2020	10/15/2020	S4825	Drought – Fast Track	Fairfield, Hartford, Litchfield, New Haven
2020	10/15/2020	S4827	Drought – Fast Track	Tolland, Windham
2020	10/15/2020	S4832	Drought – Fast Track	New London
2020	10/16/2020	S4836	Drought – Fast Track	Litchfield
2022	8/15/2022	S5255	Drought – Fast Track	Tolland, Windham
2022	8/15/2022	S5257	Drought – Fast Track	New London, Windham
2022	8/22/2022	S5267	Drought – Fast Track	New London, Windham, Hartford, Middlesex, Tolland
2022	8/22/2022	S5271	Drought – Fast Track	New London, Windham
2022	9/7/2022	S5280	Drought – Fast Track	New London
2022	9/21/2022	S5287	Drought – Fast Track	Hartford, Middlesex, New Haven, New London, Tolland
2022	9/26/2022	S5292	Drought – Fast Track	Hartford, Litchfield, Middlesex, New Haven, New London, Tolland

Year	Approval Date	Designation Number	Description of Disaster	Counties Affected
2022	9/29/2022	S5290	Drought – Fast Track	Hartford, Litchfield, Tolland
2022	10/3/2022	S5300	Drought – Fast Track	Fairfield, Litchfield, Hartford, New Haven
2022	10/3/2022	S5306	Drought – Fast Track	Fairfield, Litchfield
2022	10/11/2022	S5308	Drought – Fast Track	New Haven, Fairfield, Hartford, Litchfield, Middlesex

Note: Fast track designations for severe droughts provide a nearly automatic designation when, during the growing season, any portion of the county meets the severe drought intensity value for eight consecutive weeks or a higher drought intensity value for any length of time as reported by the U.S. Drought Monitor.

3.5.3 Earthquake

Earthquakes occurring in Connecticut, or that were felt in Connecticut within the past 50 years is shown in Table 9.

Table 9. USGS earthquake events in Connecticut (1975 - 2022)

Earthquake Time of Occurrence	Magnitude	Place
2022-10-15T05:23:27.882Z	1.2	1 km SW of Stamford, Connecticut
2022-01-27T17:38:24.233Z	1.4	New York
2021-03-05T06:14:13.552Z	1.9	3 km SW of West Hartford, Connecticut
2020-10-22T16:23:54.878Z	2.2	9 km SE of Merritt Park, New York
2020-07-21T16:10:00.217Z	1.6	3 km NE of Newington, Connecticut
2019-10-29T00:09:18.480Z	1.27	1 km W of Mamaroneck, New York
2019-07-27T11:50:12.303Z	1.9	3 km ENE of Durham, Connecticut
2018-07-29T19:51:18.210Z	1.4	3 km N of Cos Cob, Connecticut
2018-07-14T06:53:22.740Z	1.1	2 km ESE of Durham, Connecticut
2018-07-11T03:32:13.500Z	1.3	0 km WNW of Greene, Rhode Island
2018-05-31T10:42:49.620Z	0.82	2 km WNW of Mamaroneck, New York
2018-02-27T11:06:22.770Z	1.5	2 km S of Woodbridge, Connecticut
2017-12-17T06:37:32.630Z	2	4 km E of Kensington, Connecticut
2017-07-05T08:27:56.630Z	0.9	New York

Earthquake Time of Occurrence	Magnitude	Place
2017-04-10T22:35:43.660Z	1.31	4 km WSW of Pawling, New York
2017-02-02T06:31:32.450Z	1.6	1 km NNW of Hebron, Connecticut
2016-06-13T14:12:11.910Z	1.4	4 km WNW of North Stamford, Connecticut
2016-01-12T04:59:07.310Z	0.81	0 km S of Byram, Connecticut
2015-05-17T02:06:48.120Z	1.4	6 km N of Bristol, Connecticut
2015-02-24T14:18:26.790Z	1.8	0 km ENE of Wauregan, Connecticut
2015-02-24T14:13:45.920Z	1.4	1 km ENE of Wauregan, Connecticut
2015-01-15T22:50:52.990Z	1	1 km E of Wauregan, Connecticut
2015-01-15T09:39:37.410Z	2	1 km NE of Wauregan, Connecticut
2015-01-14T13:10:21.760Z	1.5	0 km E of Wauregan, Connecticut
2015-01-14T11:33:44.090Z	1.8	0 km ENE of Wauregan, Connecticut
2015-01-13T12:27:06.490Z	2.6	2 km E of Wauregan, Connecticut
2015-01-12T18:04:14.270Z	1.6	1 km ENE of Wauregan, Connecticut
2015-01-12T17:03:16.820Z	1.7	2 km E of Wauregan, Connecticut
2015-01-12T16:49:21.720Z	1.03	1 km ESE of Wauregan, Connecticut
2015-01-12T11:50:06.020Z	2.1	2 km E of Wauregan, Connecticut
2015-01-12T11:43:01.000Z	0.75	1 km ESE of Wauregan, Connecticut
2015-01-12T11:36:38.890Z	3.3	0 km NE of Wauregan, Connecticut
2015-01-12T11:34:27.800Z	1.5	1 km ENE of Wauregan, Connecticut
2015-01-12T11:33:14.950Z	1.6	1 km E of Wauregan, Connecticut
2015-01-12T04:31:57.270Z	0.64	1 km ESE of Wauregan, Connecticut
2015-01-12T02:58:25.180Z	0.72	1 km ESE of Wauregan, Connecticut
2015-01-08T14:27:59.560Z	2.3	0 km WNW of Wauregan, Connecticut
2014-11-20T07:18:32.490Z	1.52	0 km SE of Byram, Connecticut
2014-11-09T10:43:39.800Z	0.76	1 km ENE of Wauregan, Connecticut
2014-11-09T10:42:24.280Z	1.5	0 km NE of Wauregan, Connecticut
2014-10-14T13:12:04.760Z	1.54	1 km ENE of Wauregan, Connecticut
2014-10-13T09:16:50.820Z	1.29	4 km E of Moosup, Connecticut
2014-08-18T11:08:23.240Z	1.57	1 km WSW of East Haddam, Connecticut
2014-08-14T07:34:29.130Z	1.66	5 km SW of Deep River Center, Connecticut

Earthquake Time of Occurrence	Magnitude	Place
2014-08-14T07:09:16.100Z	2.66	6 km SW of Deep River Center, Connecticut
2014-05-12T03:44:35.810Z	1.48	2 km ESE of Lincolndale, New York
2014-02-01T12:32:59.480Z	1.38	1 km SW of Rye Brook, New York
2013-11-29T14:42:13.230Z	1.99	1 km ENE of Old Mystic, Connecticut
2013-11-29T14:05:01.560Z	1.97	1 km SE of Stonington, Connecticut
2013-04-04T16:31:00.710Z	1.8	2 km W of Hope Valley, Rhode Island
2012-11-04T07:38:34.390Z	1.44	6 km E of Cannondale, Connecticut
2012-09-08T00:58:27.170Z	1.54	2 km S of Stamford, Connecticut
2011-06-03T00:46:50.000Z	1.7	3 km SE of East Hartford, Connecticut
2008-03-11T03:10:30.880Z	2.42	4 km WSW of Chester Center, Connecticut
2002-08-22T18:58:38.220Z	2.25	4 km E of Montville Center, Connecticut
2002-03-05T01:33:52.210Z	1.23	3 km SE of North Castle, New York
2001-08-15T14:44:35.430Z	1.9	8 km SE of Stafford Springs, Connecticut
2001-02-03T17:50:43.000Z	1.8	8 km S of Durham, Connecticut
2000-08-22T05:45:14.000Z	2.6	2 km WSW of Brewster Hill, New York
2000-06-16T04:02:53.000Z	3.3	5 km NE of Granville, Massachusetts
1992-03-10T23:50:46.900Z	2.8	2 km SW of Napeague, New York
1991-10-28T20:58:26.100Z	3	3 km WNW of Stamford, Connecticut
1991-04-12T11:12:11.620Z	2.7	2 km ENE of North Castle, New York
1987-09-11T14:46:33.300Z	2.4	3 km WNW of East Haddam, Connecticut
1983-02-26T19:59:35.450Z	3	4 km W of Pawling, New York
1982-06-17T15:29:24.400Z	2.4	1 km ENE of Moodus, Connecticut
1982-06-17T14:14:35.960Z	3	6 km E of Moodus, Connecticut
1982-06-17T14:14:20.530Z	2.2	1 km NNE of Moodus, Connecticut
1982-06-17T08:02:38.660Z	2.2	2 km NNE of Moodus, Connecticut
1981-10-21T16:49:06.700Z	3.8	14 km S of Madison Center, Connecticut
1980-10-25T00:41:28.300Z	3	4 km ENE of New Haven, Connecticut
1980-10-24T17:27:38.100Z	3.1	3 km N of East Haven, Connecticut
1979-12-30T14:15:11.600Z	2.5	0 km W of North Castle, New York
1976-04-24T10:22:22.100Z	2.2	2 km WNW of East Haddam, Connecticut

Earthquake Time of Occurrence	Magnitude	Place
1975-07-19T20:59:32.200Z	2.3	7 km NW of Mahopac, New York

Source: USGS

3.5.4 Extreme Cold

Table 10 shows all NCEI storm events database reported extreme cold events that have occurred in Connecticut between 2000 and 2022, including the affected area and an event description.

Table 10. Historical extreme cold events

Date	Affected Area	Event Description
1/17/2000	Southern Fairfield (Zone); Northern Fairfield (Zone); Southern New Haven (Zone); Northern New Haven (Zone); Northern Middlesex (Zone); Southern Middlesex (Zone); Northern New London (Zone); Southern New London (Zone)	An arctic cold front swept across the region during Sunday afternoon, January 16th. Strong and gusty northwest winds combined with well below normal temperatures and produced extremely low wind chill values mainly from 2 am to 10 am on January 17th and from 1 am to 1 pm on January 18th. On January 17th, wind speeds from 15 to 20 mph combined with temperatures from 5 to 10 degrees above 0, produced wind chill values from 15 to around 20 degrees below 0 in urban areas along the coast such as Bridgeport and from 20 to 30 degrees below 0 across suburban and rural areas. On January 18th, wind speeds averaging 15 mph combined with temperatures from 0 to 5 above zero, produced wind chill values from 20 to 30 degrees below 0 along the coast and from 30 to 35 degrees below 0 in rural areas.
1/21/2000	Southern Fairfield (Zone); Southern New Haven (Zone); Northern Middlesex (Zone); Northern New London (Zone); Southern Middlesex (Zone); Southern New London (Zone);	The combination of a quickly intensifying low pressure system off the New England Coast and a strong high-pressure system west of the Great Lakes caused strong and gusty northwest winds. Northwest winds averaged 25 to 35 mph with gusts from 40 mph at Danbury to 46 mph at Meriden from around 2 pm to 8 pm. As temperatures fell to around 10 degrees, wind chill values plummeted from 20 to 30 degrees below zero along the coast and to 25 to 35 degrees below zero inland.

Date	Affected Area	Event Description
	Northern New Haven (Zone); Northern Fairfield (Zone);	
1/23/2011	Northern Litchfield (Zone)	Bitterly cold air settled into the region as Canadian high pressure built in Sunday night January 23rd, into early Monday morning on January 24th. Temperatures plummeted to 5 to 15 degrees below zero across Litchfield County. Brisk westerly winds diminished during the evening, becoming light and variable to calm after midnight. The winds resulted in wind chill readings of 15 to 25 degrees below zero.
2/15/2015	Northern Litchfield (Zone); Southern Litchfield (Zone)	Behind a rapidly developing coastal storm, an extremely frigid Arctic air mass pour into the region from the north, beginning during the late morning hours on Sunday, February 15th. With the developing storm just east of the region, a strong pressure gradient allowed for very strong winds. Northwest winds frequently gusted over 30 MPH, with some gusts as high as 47 MPH through the evening hours. ||Temperatures fell quickly through the day and dropped below zero for Sunday night into the morning of Monday, February 16th. Some temperatures were as cold as 18 degrees below zero. With winds continuing to be gusty during the overnight and morning hours, wind chill values dropped as low as 15 to 30 degrees below zero. ||With much of the month experiencing cold temperatures, many towns and cities continued to keep warming shelters open. There were many reports of bursts water mains and pipes due to the frigid temperatures penetrating deep into the ground. This was especially true in areas where the infrastructure was older. ||By the afternoon hours on Monday, February 16th, wind chill values finally rose above dangerous levels, although it remained rather cold through the remainder of the day.
2/13/2016	Northern Litchfield (Zone); Southern Litchfield (Zone)	Behind an Arctic cold front, very cold temperatures poured into the region upon brisk northwesterly winds. Temperatures dropped through the day on Saturday, February 13th, reaching lows of 5 to 20 degrees below zero across northwestern Connecticut on Saturday Night. Along with winds gusting 20 to 35 MPH, wind chill values reached 15 to 40 degrees below zero Saturday Night into Sunday morning.||With temperatures warming up

Date	Affected Area	Event Description
		and winds diminishing, the threat for dangerously cold temperatures and low wind chills ended on the afternoon hours of Sunday, February 14th.
2/14/2016	Hartford (Zone)	Arctic high pressure brought strong northwest winds and extremely cold wind chills to southern New England. Many locations reported wind chills between 25 and 35 degrees below zero.
12/27/2017	Northern Litchfield (Zone)	A frigid Arctic air mass poured into the region Wednesday, December 27th along with gusty northwesterly winds. Despite gusty winds, low temperatures fell to as zero degrees to 8 degrees below zero across Litchfield county, Connecticut on Wednesday night. This resulted in wind chill values as low as 27 degrees below zero late Wednesday night into early Thursday morning. Bitterly cold wind chills continued through Thursday and into Friday morning.
1/1/2018	Northern Litchfield (Zone)	A frigid airmass combined with northwesterly winds up to 15 miles per hour resulted in dangerously cold wind chills on the first and second days of 2018. Wind chills fell as low as 15 to 25 below zero in many locations across the region on New Year's morning.
1/5/2018	Northern Litchfield (Zone); Southern Litchfield (Zone)	A deep upper level trough swept across the southern US and turned northeastward offshore of the east coast from the morning of January 3 through the morning of January 4, 2018. The interaction between the cold upper trough and the relatively warmer Atlantic waters resulted in tremendous intensification of a surface low pressure system that tracked from around Miami, FL to just offshore of Cape Cod on January 3 and 4. A good deal of moisture wrapped into this system and was lifted across much of the East Coast, resulting in a broad area of moderate to heavy snowfall. A heavy band of snow impacted northwest Connecticut from the late morning through the afternoon hours of January 4, resulting in snowfall rates up to 3 per hour and total snowfall amounts mainly in the 7 to 15 inch range. Gusty northerly winds occurred with this system as well, with gusts of 30-45 mph recorded. The winds and falling snow contributed to reduced visibility and blowing and drifting of snow. The snowfall tapered off in the evening of January 4. ||As the system pulled away, brutally cold Arctic air rushed southward into Connecticut, resulting in an extended

Date	Affected Area	Event Description
		period of extremely cold conditions from January 5 through January 7. The coldest wind chills occurred during the mornings of January 6 and 7, when frigid air combined with westerly winds gusting to 30-40 mph resulted in widespread wind chills as low as 15 to 30 degrees below zero. High temperatures on January 6 were mainly in the single digits and lower teens. Many warming shelters were opened across the state as a result of the cold weather.
1/20/2019	Northern Litchfield (Zone); Southern Litchfield (Zone)	A winter storm impacted northwestern Connecticut on January 19th and 20th. Low pressure formed over the lower Mississippi Valley and lifted northeast across the Tennessee Valley during the night of the 19th before moving along the Mason-Dixon line on the 20th. Strong rising motion occurred as southerly winds aloft transported moist air northward, which was lifted over the cold airmass in place over northwestern Connecticut. Snowfall broke out during the afternoon of the 19th, continuing heavy at times into the evening hours. The strong southerly flow brought above-freezing air aloft into the region, causing the snow to turn to sleet and freezing rain overnight into the early morning of the 20th before turning back to snow. Snow and sleet totals ranged from three to six inches with ice accretion of one to three tenths of an inch due to freezing rain. The freezing rain resulted in a handful of power outages over far southern parts of the county.||Frigid temperatures followed the snow for Monday and Tuesday, January 21st-22nd, with wind chills falling to -15 to -30F. The cold weather prompted the closing of schools and the opening of warming shelters across the region.
1/21/2019	Hartford (Zone)	Strong west to northwest winds trailing the January 20th storm drew cold air across Southern New England early on January 21st and caused wind chill values of 25 below zero or colder in Northern Connecticut through midday. The wind diminished during the afternoon and evening of of January 21st allowing wind chill values to become less extreme, in the teens below zero.
1/30/2019	Northern Litchfield (Zone)	An arctic cold front tracked through northwestern Connecticut during the afternoon of the 30th, accompanied by a heavy snow squall. Frigid air poured in behind this front along with strong westerly winds. Wind chills the morning of the 31st

Date	Affected Area	Event Description
		fell to 15 to 30 degrees below zero. The wind chills prompted many schools to close or delay opening.

Source: NCEI Storm Events Database

3.5.5 Extreme Heat

Table 11 shows all NCEI storm events database reported extreme heat events that have occurred in Connecticut between 2000 and 2022, including the affected area and an event description.

Table 11. Historical extreme heat events

Date	Affected Area	Description
3/8/2000	Litchfield (Zone)	n/a
5/7/2000	Hartford (Zone)	The high temperature at Bradley International Airport in Windsor Locks reached 93 degrees, which tied the record high for the date set in 1930.
5/8/2000	Hartford (Zone)	The high temperature at Bradley International Airport in Windsor Locks reached 92 degrees at 247 pm EDT, which broke the previous record high for the date of 90 degrees set in 1936.
10/14/2000	Hartford (Zone)	The high temperature of 81 degrees at Bradley International Airport in Windsor Locks tied the record high for the date which was set in 1954.
5/4/2001	Hartford (Zone)	The high temperature reached 91 degrees at Bradley International Airport in Windsor Locks, which broke the previous record high of 85 degrees set in 1965.
5/12/2001	Hartford (Zone)	The high temperature of 89 degrees at Bradley International Airport in Windsor Locks broke the record high for the date, which was 88 degrees set in 1991.
7/6/2010	Hartford (Zone); Windham (Zone)	A strong ridge built into Southern New England resulting in temperatures nearing 100 with high humidity. Heat index values ranged from 100 to 106 for most of Southern New England on the 6th and again on the 7th in a more limited area, generally the Connecticut River Valley.
7/21/2011	Hartford (Zone)	A strong upper level ridge brought very hot temperatures to Southern New England. A moist southwest low level flow increased humidity levels such that heat index values rose above 105 degrees for a period of a few hours.

Date	Affected Area	Description
7/22/2011	Southern Fairfield (Zone); Northern New London (Zone); Northern Middlesex (Zone); Northern New Haven (Zone); Southern New London (Zone); Southern Middlesex (Zone); Southern New Haven (Zone); Northern Fairfield (Zone); Hartford (Zone); Windham (Zone); Southern Litchfield (Zone); Northern Litchfield (Zone)	An oppressive hot and humid air mass produced excessive heat that resulted in day time temperatures 95 to 105 degrees with night time lows in the 70s and 80s.
7/18/2012	Northern New Haven (Zone)	High pressure remained over the western Atlantic as a cold front approached from the west.
7/19/2013	Southern Litchfield (Zone)	A large ridge of high pressure was situated along the eastern seaboard for the week of July 15th through July 19th. The flow around this high pressure ridge brought a very warm and humid air mass into Connecticut for much of the week, along with plenty of sunshine.||The result was high temperatures each day exceeding 90 degrees. When combined with the humidity, heat index values exceeded 100 degrees at times during the afternoon and evening hours. The hottest days were July 18th-19th, when high temperatures reached the mid to upper 90s in many locations. On the 19th, heat index values were between 105 and 110 degrees across southern portions of Litchfield County, with heat index values of 100 to 105 degrees across northern parts of Litchfield County. ||By the weekend, an approaching cold front brought somewhat cooler and less humid air into the region, which allowed heat index values to be lower.
7/19/2013	Northern New Haven (Zone); Southern Fairfield (Zone)	A large area of high pressure remained nearly stationary to the south resulting in excessive heat across the area.

Date	Affected Area	Description
8/12/2016	Northern New Haven (Zone)	High pressure over the western Atlantic Ocean ushered in hot and humid air northward across the area.
8/13/2016	Southern Litchfield (Zone)	On the morning of Saturday, August 13th, a warm front lifted northward across the region. This allowed a very warm and excessively humid air mass to be in place over the area. As temperatures rose through the 80s and into the 90s, dewpoints were unusually high in the mid to upper 70s. By the afternoon hours, this produced heat index values over 100 degrees in many valley areas, with some spots in southern Litchfield County seeing heat index values over 105 degrees.||Ahead of an advancing cold front, an organized line of thunderstorms moved from west to east across all of eastern Upstate New York late in the day. This line of thunderstorms crossed northwestern Connecticut during the late evening hours, producing damaging winds. In addition to the gusty winds, the thunderstorms also produced a significant amount of cloud-to-ground lightning. Numerous power outages were reported throughout the region. ||Thunderstorms ended with the passage of the cold front during the overnight hours.
8/13/2016	Northern New Haven (Zone); Southern Fairfield (Zone)	High pressure over the western Atlantic Ocean ushered in hot and humid air northward across the area.
7/1/2018	Northern Litchfield (Zone); Southern Litchfield (Zone); Southern Middlesex (Zone); Northern Middlesex (Zone); Hartford (Zone); Windham (Zone)	A hot and humid airmass brought excessively high heat indices to northwestern Connecticut from the beginning of July through the Independence Day holiday. Temperatures soared as high as 99 degrees on July 1st, the hottest day of the stretch. Combined with dewpoints in the mid-70s, heat indices reached near 110 degrees in the warmest areas. In addition to the hot daytime temperatures, overnight low temperatures only falling into the 70s was common, which exacerbated heat-related problems. The extensive heat prompted the opening of many cooling centers across the region.
7/20/2019	Southern Litchfield (Zone); Northern Middlesex (Zone);	A heat wave gripped northwestern Connecticut from July 19th through the 21st. Temperatures soared to the mid-90s with dewpoints in the low to mid-70s. This resulted in heat index values in the 100 to 110 range in the warmest areas. Saturday, July 20th was

Date	Affected Area	Description
	Northern Litchfield (Zone); Northern New Haven (Zone); Northern New Haven (Zone); Southern New Haven (Zone); Northern Fairfield (Zone); Southern Fairfield (Zone)	the hottest day for most areas. Due to the excessive heat, cooling centers were opened and pool hours were extended.
7/21/2019	Northern Middlesex (Zone); Northern New Haven (Zone); Southern New Haven (Zone); Southern Fairfield (Zone)	A Bermuda High pumped in a hot and humid and humid air mass northward into the area.

3.5.6 Flood-Related Hazards

Notable flood events between 2000 and 2022 are shown in Table 12.

Table 12. Notable flood events in Connecticut

Date	Affected Area	Description
3/22/2001	Fairfield Co.; Northern New London (Zone); Southern New London (Zone)	A strong and slow-moving coastal storm produced widespread heavy rain and strong gusty winds throughout much of southern Connecticut from Wednesday March 21st through Thursday March 22nd. Heavy rain, combined with rapid snowmelt from a deep pre-existing snowpack, produced significant rises on many small rivers and streams across southern Connecticut. This triggered some flooding of areas adjacent to these rivers and streams. The Yantic River rose above its' flood stage of 9.0 feet at Norwich and crested at 10 feet from 10 am to 11 am EST. The river was above flood stage from 6 am until 7:30 pm EST during March 22nd. Urban flooding also occurred with this storm. On average, between two and three inches of rain occurred with this storm.

Date	Affected Area	Description
		In addition to the heavy rain, strong gusty winds buffeted much of southern Connecticut during this storm. Wind gusts up to 40 mph, combined with nearly saturated ground conditions, led to fallen trees and power lines, with subsequent power outages scattered throughout southern Connecticut. These strong winds also created localized coastal flooding and beach erosion across coastal sections of Connecticut.
6/17/2001	New Haven Co.; Middlesex Co.; Southern New London (Zone);	On Sunday, June 17th, abundant moisture from the remnants of tropical storm Allison, combined with a cold front approaching from the west, produced extremely heavy rainfall across much of southern Connecticut during the early morning hours. Rainfall rates of up to 2 inches per hour produced widespread street and highway flooding, in addition to some flash flooding of small streams. Some rivers approached or even slightly exceeded flood stage during this heavy rain event. Heavy rainfall first affected portions of Fairfield County during the early morning hours, between 5 AM and 10 AM EDT. The area of heavy rain then slowly shifted east, across New Haven and Middlesex Counties from late morning during the early afternoon, and finally across New London County during the mid to late afternoon hours. In Fairfield County, heavy rainfall produced flooding of roadways and highways, and led to some scattered road closures. In New London County, spotters indicated areas of small stream and small creek flooding, in addition to road flooding. The Yantic River at Yantic reached its' flood stage of 9.0 feet at 3:07 PM EDT, crested at 11.1 feet at 7 PM EDT, and then dropped below flood stage at 2:40 AM EDT on June 18th.
10/8/2005	Northern Fairfield (Zone); Northern New London (Zone); Southern Middlesex (Zone); Northern Middlesex (Zone);	As a cold front moved slowly east, a wave of low pressure developed along the Southeast U.S. Coast and moved slowly north as a large area of high pressure off the New England Coast remained nearly stationary. Abundant moisture from the remnants of tropical system

Date	Affected Area	Description
	Southern New Haven (Zone); Northern New Haven (Zone); Southern Fairfield (Zone)	Tammy over the Southeast also interacted with and converged north along this front. Rain moved north and developed across the region during late Friday afternoon, October 7th. As the wave of low pressure moved north along the front, periods of heavy rain spread north across the region Friday night through Saturday, October 8th. Rain ended from west to east during Sunday, October 9th as the low moved northeast of the region. The heaviest rain fell across interior sections of Southwest Connecticut, mainly across the higher terrain of Northern Fairfield and Northern New Haven Counties. Because of dry antecedent conditions, most of the rainfall was absorbed, although run off did increase as the event continued. Rainfall amounts ranged from 1.60 inches at Groton Airport in Southeast CT to 7.15 inches at New Fairfied in Northern Fairfield County. Here are selected rainfall amounts in hundredths of an inch for: Fairfield County - from 2.78 inches at Sikorsky Airport in Bridgeport to 7.15 inches at New Fairfield. New Haven County - from 3.41 inches at Tweed Airport in New Haven to 5.07 inches in Meriden. New London County - from 1.61 inches at Groton Airport to 3.13 inches at Norwich. Maximum hourly rainfall rates ranged from 0.57 at Danbury Airport to 0.95 at Meriden. Urban flooding of low lying and poor drainage areas occurred throughout the region. The Quinnipiac River at Wallingford was above its' flood stage of 8.0 feet from 2 am EDT through 7:45 pm EDT on October 9th. The river crested at 9.03 feet at 4:45 am EDT on October 9th. Other small rivers and streams, such as the Naugatuck River at Beacon Falls and Waterbury, experienced significant within bank rises.
4/23/2006	Fairfield Co.; New Haven Co.	As a low pressure system over the Great Lakes moved slowly east during Saturday, April 22nd, another low developed over Southeast Virginia and

Date	Affected Area	Description
		moved slowly north toward the region on Sunday. Synoptic scale ascent over a cool moist layer of air caused by high pressure northeast of New England, caused heavy rain, which resulted in flooding of urban areas, rivers, small streams, and creeks. Amateur radio operators reported several streets closed, homes flooded, along with some evacuations in Norwalk at 3 pm EDT. They also reported road closures and homes flooded through Trumbull at 5:55 pm EDT. Trained spotters reported the Still River flooding over its' banks in Brookfield at 6 pm EDT. They also reported small creeks flooded in Southbury at 7 pm EDT. A 71-year-old woman died around 7 pm EDT in Fairfield when she stepped off her backyard retaining wall into the river. She was swept into the river by a fast moving current.
2/13/2008	Hartford Co.; Tolland Co.; Fairfield Co.; New London Co.; New Haven Co.; New Haven Co.; Windham Co.; Litchfield Co.; New London Co.	A low pressure system developed off the Mid-Atlantic coast and moved up the east coast southeast of Nantucket producing snow, rain, and ice across Southern New England. Widespread two to four inch rainfall amounts resulted in small stream and poor drainage flooding as well as some minor river flooding. In addition, there was some minor wind damage from strong northeast winds, especially along the coast.
12/12/2008	New Haven Co.; Middlesex Co.; Fairfield Co.; Middlesex Co.; New London Co.;	Low pressure tracked northeast from the Gulf of Mexico and over the local area along a stationary boundary from December 11th through December 12th. A prolonged period of rain, which was heavy at times, caused widespread flooding across Connecticut with total rainfall amounts ranging from 2.75 inches to 4.50 inches. The Yantic River at Yantic rose to a stage of 11.82 feet, which corresponds to major flood stage.
3/14/2010	New London Co.;	A Nor'easter developed off the Delmarva peninsula which produced an extended period of heavy rainfall across the area as it tracked very slowly to the northeast. This caused widespread flooding across portions of New London County.
3/30/2010	New London Co.; Fairfield Co.	A Nor'easter centered off the Delmarva coast produced an extended period of heavy rainfall across the area as it tracked very slowly to the

Date	Affected Area	Description
		northeast. This caused widespread flooding across portions of Southern Connecticut. Major flooding occurred in New London County.
3/7/2011	Hartford Co.; Hartford Co.; Litchfield Co.; Tolland Co.; New Haven Co.; Fairfield Co.	An area of low pressure lifting through the eastern Mid-Atlantic and deepening through southeast New England into the Gulf of Maine resulted in an area of heavy rains with amounts ranging 2 to 5 inches across coastal and interior New England on top of melting snows. This large amount of water into various basins resulted in flooding of tributaries and major rivers, inundating local neighborhoods and roadways.
8/28/2011	Litchfield Co.; Hartford Co.; Fairfield Co.; New Haven Co.	Tropical Storm Irene tracked north northeast across eastern New York and western New England during Sunday, August 28th, producing widespread flooding, and damaging winds across the region. ||Irene tracked from a position over New York City around 8 AM EST Sunday, to approximately 10 miles west of Danbury, CT at 10 AM EST, to approximately 15 miles south of Pittsfield, MA at 1 PM EST Sunday, to approximately 65 miles south of Rutland, VT at 4 PM EST. ||The greatest impact from Irene across Litchfield County was due to heavy to extreme rainfall, which resulted in widespread flash flooding. Rainfall amounts generally averaged 5 to 10 inches. Much of the rain which fell occurred within a 12 hour period, beginning early Sunday morning, and ending Sunday evening. ||This heavy to extreme rainfall resulted in widespread flash flooding and river flooding across Litchfield County. Numerous road closures were reported due to flooding and downed trees and power lines, along with some evacuations. In addition, moderate flooding was reported on the Housatonic River at Falls Village and at Gaylordsville. The Gaylordsville gage was damaged by flood waters. Strong winds also occurred across Litchfield County, with frequent wind gusts of 35 to 55 mph, along with locally stronger wind gusts exceeding 60 mph. The strongest winds occurred from the north to northeast during the morning hours, then from the west to northwest during Sunday evening. The combination of strong winds, and extremely saturated soil led to numerous downed trees and power lines across the region. This also resulted in widespread long duration power outages. ||In particular, the approximate number of

Date	Affected Area	Description
		customers affected by power outages included: Litchfield County, 25000. On September 2nd, 2011 a Major Disaster Declaration was declared, FEMA-4023-DR. This declaration made Individual Assistance and Public Assistance available to all 8 counties in the state of Connecticut. In addition, the declaration made Hazard Mitigation Grant Program assistance available. ||Individual Assistance: assistance to individuals and households. Public Assistance: assistance to state and local governments and certain private nonprofit organizations for emergency work and repair or replacement if disaster-damaged facilities.
8/5/2012	Hartford Co.	A cold front approaching from the west provided enough lift for showers and thunderstorms. As this front was approaching the atmosphere was sufficiently unstable across western Massachusetts, southwestern New Hampshire and western Connecticut for storms to become severe. Most damage was the result of strong to damaging winds.
3/30/2014	New London Co.	A wave of low pressure tracked northeast along a stationary frontal boundary from the Tennessee River Valley to the Mid-Atlantic Coast and into the Atlantic Ocean. Several inches of rain fell across Southern Connecticut resulting in flooding on the Yantic River in New London County.
8/25/2015	Hartford Co.	Cyclonic flow associated with an upper level low in the Great Lakes combined with an approaching cold front to produce showers and thunderstorms across much of western Massachusetts and northern Connecticut. A few of these storms produced damaging winds.
1/13/2018	Litchfield Co.	After a frigid end of December and beginning of January, an unseasonably warm airmass was pumped into western New England on January 12th on southerly winds. The temperatures reached the 50s and 60s during the day. Showers also developed in the warm airmass ahead of a cold front and were heavy at times, with some locations receiving one to three inches of rainfall. The combination of warm temperatures and heavy rainfall caused river ice to dislodge and resulted in ice jams in spots. Flooding occurred due to a combination of ice jam movement and heavy rainfall. Several roads were closed or damaged and a few residences had to be evacuated.

Date	Affected Area	Description
		After the strong cold front passed, many ice jams and their associated flooding froze back in place, resulting in road closures continuing for several days in some areas.
9/25/2018	Windham Co.; Tolland Co.; New London Co.	Rain developed across the area ahead of an approaching warm front, consolidating into a slow-moving band of heavy rain west of New York City that advanced eastward across southern Connecticut during the afternoon and evening. Precipitable water values increased from 1.84 on the morning sounding from Upton, NY to 2.13 by evening. Both of these values are above the 90th percentile based on a sounding climatology, with the 2.13 precipitable water value on the evening of the 25th a record for the date. Widespread rainfall amounts of 4 inches or more were reported across southern Connecticut with flash flooding resulting in numerous water rescues. A trained spotter in Trubmull received 7.32 inches of rain during the event, while a HAM radio operator in Lebanon received 6.79 inches. Automated stations near Durham and Hamden reported 7.24 and 8.59 inches of rain, respectively.
10/2/2018	Hartford Co.	Cool northeast flow was in place across the region but a warm front attempted to move north through Connecticut just as a mid-level short wave trough was approaching. Low pressure from the Midwest moved along the boundary, crossing New England at night. Instability and unseasonably high moisture generated damaging thunderstorms and downpours. A brief tornado also touched down in Mansfield, CT during the early evening.
1/24/2019	New London Co.	Widespread moderate to locally heavy rain associated with an area of low pressure resulted in rainfall amounts of 1-3 inches across much of southern Connecticut. Runoff from this rainfall later resulted in minor flooding on the Yantic River.
8/7/2019	Hartford Co.	A warm front moving across southern New England triggered strong to severe thunderstorms in western portions of southern New England from the mid afternoon hours through the evening. Another band of thunderstorms moved in from the southwest overnight, progressing to the coast before daybreak. Flash flooding occurred in Hartford County during the evening. Wind damage and localized flooding

Date	Affected Area	Description
		occurred in Massachusetts and northern Rhode Island.
7/3/2020	Hartford Co.	A robust backdoor cold front for early July standards in southern New England provided the forcing for some strong thunderstorms in northern Connecticut and western Massachusetts in the afternoon. With high humidity and precipitable water values (near two inches), flash flooding occurred when two inches of rain fell in less than an hour in the Hartford metropolitan area.
12/25/2020	New London Co.	A strong area of low pressure impacted the region Christmas Eve into Christmas Day. Moderate to heavy rain developed out ahead of the approaching cold front in an anomalously moist environment, leading to river flooding along the Yantic River. Precipitable water values on the 12Z 12/25 sounding from Upton, NY were around 1.5 inches, a record for the date based on the Storm Prediction Center's sounding climatology. This resulted in widespread rainfall totals of 1.5-2 inches across southeastern Connecticut.
7/9/2021	Hartford Co.; Tolland Co.	Tropical Storm Elsa made landfall in Rhode Island on Friday morning before moving into the Gulf of Maine. It interacted with a stalled frontal boundary and brought widespread heavy rainfall of 2 to 3.5 inches and gusty winds along the south coast, which caused scattered tree damage.
7/17/2021	Tolland Co.; Windham Co.	A relatively stationary front meandered across southern New England on the 17th and 18th while low pressure slowly moved along the front. At upper levels, an upper low was moving slowly eastward from the Great Lakes. With very moisture-laden air in place across the region, the result was heavy rain and flash flooding. In addition, there were rounds of severe thunderstorms and even a weak tornado in northern Connecticut. Rainfall totals ranged from 3.0 to 5.6 inches in northern Connecticut and western and central Massachusetts. Mainly 1.0 to 2.0 inches fell in Rhode Island and eastern Massachusetts.
8/19/2021	Hartford Co.	The remnants of Tropical Storm Fred moved across Southern New England producing heavy rain, gusty winds, and two tornadoes - one that moved from northeast Connecticut into Worcester County and another in central Worcester County.

Date	Affected Area	Description
8/22/2021	Hartford Co.	Tropical Storm Henri made landfall in southwest Rhode Island around noon on August 22nd, then moved slowly northwestward and westward across northern Connecticut and weakened. Henri brought strong wind gusts and flash flooding. The strongest gusts -- to 70 mph -- occurred along the Rhode Island coast. The worst flash flooding occurred in northeast Connecticut.||As the remnants of Henri moved eastward across southern New England on August 23rd, it spawned three tornadoes and a waterspout in MA and also it caused some renewed flooding.||The highest rainfall totals over the two-day period ranged from 5 to 6 inches in Hartford and Tolland Counties in northern Connecticut and in Franklin, Hampshire, and Hampden Counties in western Massachusetts.
9/2/2021	New Haven Co.; Litchfield Co.; New London Co.	Extremely heavy rainfall associated with the remnants of Hurricane Ida overspread southern Connecticut during the evening of September 1 and continued through the early morning hours of September 2. Rainfall totals ranged from 5-8+ inches across much of the region, with much of that rain falling in just a few hours. This resulted in not only widespread flash flooding but also extensive river flooding. The ASOS at Bridgeport Airport recorded 5.59 inches of rain. A CoCoRaHS observer near Stamford recorded 8.10 inches of rain, while another in Uncasville reported 8.58 inches. Broadcast media reported 8.37 and 8.90 inches in Clinton and near Madison, respectively.

Source: NCEI Storm Events Database

3.5.7 Thunderstorm

Notable thunderstorm events in Connecticut between 2000 and 2022 are shown in Table 13.

Table 13. Notable thunderstorm events in Connecticut

Date	Affected Area	Description
5/18/2000	Litchfield Co.; Fairfield Co.; New Haven Co.; Hartford Co.	A strong cold front crossed northwestern Connecticut late on May 18. At the same time, very strong winds aloft moved over the area. The combination of the instability and lift ahead of the front spawned a line of thunderstorms. A couple of

Date	Affected Area	Description
		the thunderstorm cells tapped into the strong wind aloft to produce locally severe weather in Litchfield county. Wind gusts from separate thunderstorms downed trees in New Milford during the late afternoon, and early evening. A wind gust was clocked at 59 mph in Washington. Large trees and power lines were brought down in Litchfield.
5/24/2000	Hartford Co.	Severe thunderstorms moved through northern Connecticut ahead of a cold front. The first round of thunderstorms occurred in the afternoon, and produced large hail in Hartford, Tolland, and Windham Counties. Golf ball size hail was reported in Enfield, and hail the size of quarters fell in Stafford Springs. Dime size hail was reported in Eastford and Ashford. The second round of thunderstorms moved through during the early evening. In Hartford County, dime size hail fell in Simsbury, and thunderstorm winds downed trees in Granby and Simsbury. Farther east, dime size hail was reported in Columbia and Willimantic, before the storms entered Rhode Island.
6/2/2000	Windham Co.; Hartford Co.; Tolland Co.; Litchfield Co.	Severe thunderstorms moved across northern Connecticut in advance of a strong cold front. The storms moved through late in the afternoon and early evening. In Hartford County, a spotter in Granby reported nickel to quarter size hail, and observed a funnel cloud near State Route 20. The hail accumulated two inches deep. In Ellington, in Tolland County, thunderstorm winds downed two large trees, and torrential rainfall caused flash flooding of a small stream in the vicinity of Pinney Road. The northeast corner of Windham County, including Woodstock and Thompson, saw substantial wind damage from the storms. In addition to numerous tree limbs and wires down, one large pine tree fell on a car, while a portion of another tree fell onto a house.
6/11/2000	Middlesex Co.; Litchfield Co.; Fairfield Co.; New Haven Co.; New London Co.	As a cold front swept south toward the area, lines of severe thunderstorms developed. Severe thunderstorms produced high winds that downed trees and power lines in Cromwell, Danbury, Cheshire, and Norwich. A spotter at Ledyard Center observed hail about the size of a nickel (0.88 inches). A peak wind gust of 52 knots or 60 mph was measured at Bridgeport Sikorsky Airport. A spotter

Date	Affected Area	Description
		from Guilford also reported numerous trees and power lines downed. These thunderstorms also produced torrential rain across Central New Haven County, Southern Middlesex, and Central and Southern New London Counties. Some flooding of low-lying and poor drainage areas occurred. State police stated that a man was struck and injured by lightning in Bethany on Amity Road around 4 pm.
8/10/2001	Tolland Co.; Windham Co.	Severe thunderstorms brought damaging winds to parts of northeast Connecticut. In Tolland County, trees and wires were downed in Coventry and Andover. In Windham County, the storms downed trees and wires in Thompson and Plainfield.
5/31/2002	Hartford Co.; Litchfield Co.; Tolland Co.; Windham Co.	The season's first widespread severe weather event downed trees and wires throughout Hartford, Tolland, and Windham Counties. A spotter in Stafford Springs measured a wind gust to 61 mph as the storms moved through. Golf ball sized hail was reported in Burlington, and quarter sized hail fell in West Hartford. Dime sized hail fell in South Windsor, Vernon, Tolland, and Willimantic.
6/16/2002	New Haven Co.	As a severe thunderstorm moved east across extreme Northern Fairfield, Northern New Haven and Northern Middlesex Counties, it produced large hail and damaging wind gusts. Spotters in Sherman and Waterbury reported 3/4-inch diameter hail. High winds downed trees in Naugatuck and trees and wires in East Hampton. An isolated severe thunderstorm, embedded within a band of heavy showers and thunderstorms, produced high winds that downed trees in Wallingford.
8/2/2002	Hartford Co.; Tolland Co.; Windham Co.	Severe thunderstorms moved through much of northern Connecticut during the afternoon and evening. There were many reports of downed trees, large branches, and power lines, especially in Hartford County. Thunderstorm winds blew out windows from a building in West Suffield, according to amateur radio operators.
9/23/2003	Litchfield Co.	A strong cold front produced a line of showers and thunderstorms across northwestern Connecticut during the morning of September 23. One of the

Date	Affected Area	Description
		storms became severe as it moved across Litchfield County. Thunderstorm winds brought down numerous trees and power lines on Whitehollow Road in the town of Salisbury. About twenty minutes later, more powerlines were knocked down on Baldwin Hill Road in the town of Washington.
5/23/2004	Hartford Co.	Severe thunderstorms moved across north central Connecticut during the afternoon and evening. There were numerous reports of penny to nickel sized hail in Hartford and Tolland Counties, but hail as large as ping pong balls was observed in Farmington and Plainville. No damage was reported as a result of the large hail.
7/17/2004	Hartford Co.	Severe thunderstorms downed large trees in Marlborough and Glastonbury. Nickel sized hail was also reported in Glastonbury.
8/21/2004	Hartford Co.; Fairfield Co.; Windham Co.; New Haven Co.	Severe thunderstorms downed large branches in Southington and Ashford and produced nickel sized hail in Ellington. Two men were struck by lightning while attending a Civil War reenactment in Woodstock.
5/27/2005	Fairfield Co.; Hartford Co.	As a severe thunderstorm moved east at around 30 mph, it produced high winds that downed trees about 8 miles south of Sherman.
7/19/2005	Middlesex Co.; Windham Co.; New London Co.	Severe thunderstorms developed over Central and Eastern Connecticut in the late afternoon and early evening hours of the 19th. These thunderstorms knocked down several trees which resulted in scattered power outages.
7/18/2006	New Haven Co.; Tolland Co.; Windham Co.; New London Co.; Hartford Co.	Severe thunderstorms produced damaging winds, hail, lightning, and heavy rain as they moved across the region. High winds downed many whole trees, large tree branches, and power lines. In Fairfield County, several trained spotters observed hail up to 1 inch in diameter in Darien and in Norwalk. A trained spotter's wind system measured a wind gust to 60 mph, 4 miles west of Stamford at 11:05 pm EDT. In New Haven County, wind damage occurred to trees and power lines in West Haven and Milford. Downed trees were blocking roads on Ocean and Annwan Avenues in West Haven. Torrential rain

Date	Affected Area	Description
		caused flash flooding along Merlin Avenue in Milford, where water rose over car hoods. In New London County, law enforcement reported trees and wires down in Voluntown.
12/1/2006	Litchfield Co.; Hartford Co.	A low-pressure system developed along the trailing end of a cold front over the lower Mississippi Valley on Thursday, November 30th, before moving northeast and intensifying rapidly. The low reached the eastern Great Lakes by Friday morning, and then moved across northern New York State by Friday evening. |A strong cold front trailing from this low swept across northwest Connecticut early Friday evening, preceded and accompanied by several lines of severe thunderstorms.
5/16/2007	Fairfield Co.; Litchfield Co.; New Haven Co.	Thunderstorms developed ahead of a cold front the afternoon of the 16th...with 1 particularly potent bow echo that moved across northern Fairfield, New Haven, and Middlesex Counties. This bow echo produced a microburst and an EF1 tornado in Fairfield County, and another microburst in Middlesex County.
6/5/2007	Fairfield Co.; New Haven Co.; Hartford Co.	Severe thunderstorms produced large hail (up to 1.75 inches in diameter and accumulating up to 1 inch in depth) and damaging winds in parts of Northern New Haven and Northern Fairfield Counties. Isolated flash flooding also occurred due to heavy rainfall with radar storm total estimates of 2 to 3 inches.
6/8/2008	Fairfield Co.; Hartford Co.; New Haven Co.	Numerous severe thunderstorms developed as a weak upper level trough interacted with a hot and humid airmass across the region. Strong downburst winds were characteristic of many of the storms.
5/24/2009	New Haven Co.; Tolland Co.; Hartford Co.	A cold front triggered scattered afternoon and early evening severe thunderstorms across southern Connecticut. In addition to the afternoon storms, three people were struck by lightning while camping in early morning convection.
6/26/2009	Hartford Co.; New Haven Co.; Tolland Co.	A cold front moved across Southern New England providing lift for showers and thunderstorms to develop across the area. Strong instability across the state of Connecticut as well as deep layer shear resulted in many of these storms to become severe. One of these storms produced a weak tornado (EF1) that moved across the community of Wethersfield.

Date	Affected Area	Description
		Numerous trees were downed, including one that split a house in half when it fell.
6/5/2010	Hartford Co.; Tolland Co.	A wave of low pressure moving along a stationary front in place across Southern New England produced showers and thunderstorms across much of the region.
6/23/2011	Fairfield Co.	A passing upper level disturbance interacted with a nearby stationary front to produce an isolated strong thunderstorm, whose strong winds and heavy rainfall combined to bring a tree down on a car in Fairfield County, killing the occupant.
7/18/2012	Hartford Co.; Litchfield Co.	A cold front moved across southern New England into a warm moist airmass with plenty of instability. This resulted in severe thunderstorms and in some cases training of storms that resulted in flash flooding across some of the more urban areas. A microburst occurred in Arlington, knocking down numerous trees and damaging a roof.
7/20/2013	Middlesex Co.	A coastal trough served as the trigger for scattered thunderstorms and embedded severe thunderstorms with increasing moisture and instability ahead of an approaching cold front.
8/28/2013	Fairfield Co.; Middlesex Co.; New Haven Co.	A combination of passing upper level energy and a nearby stationary front yielded severe thunderstorms across Fairfield, New Haven, and Middlesex Counties.
7/3/2014	Windham Co.	An approaching cold front, combined with tropical moisture in advance of Hurricane Arthur, produced two rounds of showers and thunderstorms during the afternoon and evening. The storms in the evening produced wind damage across parts of northern Connecticut.
6/23/2015	Litchfield Co.; New London Co.; Hartford Co.	A warm front moved northward across northwestern Connecticut during the morning hours on Tuesday, June 23rd. Behind this front, a warm and humid air mass moved into the region. As clouds gave way to partial sunshine, the atmosphere became unstable for the afternoon hours. As an advancing cold front moved towards the region from upstate New York, some scattered thunderstorms developed between the late afternoon and early evening hours. A few of these thunderstorms became severe, producing wind damage to trees. In addition, one of the

Date	Affected Area	Description
		thunderstorms produced a funnel cloud in Litchfield. ||As the cold front moved across the region, the threat for thunderstorms ended later in the evening, as a cooler and less humid air mass moved into the area.
2/25/2016	Tolland Co.; Hartford Co.	Low pressure tracked north through New York bringing a warm front through southern New England. Unseasonably deep moisture accompanied this front. This was a very complicated weather situation as a strong low level inversion was in place over the area with a very strong low level jet just above the inversion. As showers and thunderstorms developed, the storms and heavy rain allowed the stronger winds to mix down to the surface. In other areas, temperatures warmed enough at the surface to break the inversion and allow the stronger winds to mix down. This resulted in a complicated combination of severe thunderstorm winds and high winds. To add to the historical nature of this event, it occurred in February all during the overnight hours.
8/2/2017	Litchfield Co.	Scattered strong to severe thunderstorms developed over northwestern Connecticut during the afternoon hours on Wednesday, August 2, 2017. This was due to an upper level disturbance passing through the area. The severe weather knocked down numerous trees and power lines, produced large hail as well as isolated flash flooding in Litchfield county. Flash flooding occurred in the towns of Kent and Cornwall Center, with a report of a road being partially washed out. There was a maximum rainfall report of 3.03 inches in Kent from the storms.
5/15/2018	Fairfield Co.; New Haven Co.; Middlesex Co.	An approaching cold front triggered numerous severe thunderstorms over southern Connecticut. These storms produced 2 tornadoes in the Lower Hudson Valley, as well as microbursts and macroburts.
8/17/2018	Litchfield Co.	A series of disturbances ahead of a cold frontal boundary brought rounds of heavy rainfall and strong to severe thunderstorms to the region during the afternoon and evening hours of Friday, August 17th. As a result of these disturbances, numerous trees and wires were downed across the region. Rainfall from the event ranged from 1 to 3 inches.
7/6/2019	Litchfield Co.	A broken line of strong to severe thunderstorms moved into northwestern Connecticut during the

Date	Affected Area	Description
		afternoon of July 6th ahead of a cold front and prefrontal trough. The storms resulted in isolated reports of wind damage.
8/3/2019	Litchfield Co.; Fairfield Co.; New Haven Co.	An upper level trough moved through the region ahead of a cold front. This upper level energy sparked strong to severe thunderstorms across western Connecticut during the early afternoon hours of Saturday, August 3rd, 2019. As a result of these storms, multiple trees and wires were downed.
9/4/2019	Tolland Co.	A cold front pushed through southern New England in the evening. It was preceded by a strong upper level short wave, which tapped very unstable air to produce severe thunderstorms in CT and MA. An EF-1 tornado occurred in Tolland County in the late afternoon.
7/13/2020	Windham Co.	A slow moving cold front triggered scattered severe thunderstorms, localized flooding, and even a few funnel clouds across portions of southern New England during the afternoon and evening hours.
8/27/2020	Litchfield Co.	A pair of supercell thunderstorms tracked through Litchfield County along a warm front during the afternoon of the 27th. These storms resulted in numerous damage reports, especially in the area from Kent to Woodbury. Eighty percent of the town of Roxbury was without power as a result of the storms. In addition, two brief EF0 tornadoes occurred in Kent and Woodbury.
8/27/2020	New Haven Co.	An upper level disturbance in close proximity to a departing warm front triggered numerous severe thunderstorms across Northern New Jersey. A tornado touched down in Bethany to North Haven in New Haven County. Also, multiple microbursts affected parts of New Haven County which included, East Haven, North Haven, the Branfords, and Guilford.
11/15/2020	Windham Co.	A warm front moved through southern New England in the evening, followed by strong to damaging wind gusts. A cold front then moved through late in the evening, accompanied by a fine line of thunderstorms, which also produced some damaging winds.
4/21/2021	Litchfield Co.	A dynamic storm system brought severe thunderstorms and a tornado to northwest

Date	Affected Area	Description
		Connecticut on Wednesday, April 21st, 2021. An EF-0 tornado briefly touched down just north of Bulls Bridge, CT and moved east northeast into South Kent (Litchfield county), causing mainly tree damage. There were additional reports of downed trees and power lines across Litchfield county. As a result of the severe weather, about 5,000 people lost power.
7/7/2021	Tolland Co.; Hartford Co.; Windham Co.	A hot, humid air mass was in place across southern New England, with high downdraft CAPE when a cold front pushed into southern New England in the late afternoon and evening hours. Scattered severe thunderstorms were the result across portions of Massachusetts and northern Connecticut.
4/14/2022	Litchfield Co.	Showers and thunderstorms developed ahead of a strong cold front across northwestern Connecticut on April 14, 2022. A few storms became severe during the afternoon hours with downed trees and wires reported.
7/2/2022	Windham Co.	A shortwave trough moving eastward from the eastern Great Lakes, triggered strong thunderstorms in New York state, which moved into southern New England overnight. The atmosphere was very unstable and surface dewpoints were near 70 degrees. The result was strong to locally severe thunderstorms before daybreak.
8/23/2022	New Haven Co.	A front remained nearly stationary over the area. A wave of low pressure developed along the front and dragged a cold front through southeastern CT. Severe thunderstorms developed and produced damaging wind gusts.

Source: NCEI Storm Events Database

3.5.8 Tornado

Table 14 shows historical tornado events in Connecticut.

Table 14. Connecticut tornado events

Fujita Scale	Date	County Affected	Deaths	Injuries	Property Damage (2022 $)
F2	7/12/1950	Middlesex Co.	0	0	30358.4
F2	7/14/1950	Fairfield Co.	0	3	3035840.25

Fujita Scale	Date	County Affected	Deaths	Injuries	Property Damage (2022 $)
F2	8/20/1951	Tolland Co.	0	0	281399.04
F2	8/21/1951	Litchfield Co., Middlesex Co.	0	17	2813990.38
F3	5/10/1954	Tolland Co., Hartford Co.	0	2	271984.2
F2	10/24/1955	New Haven Co., Hartford Co.	0	0	27299.91
F0	8/8/1956	Tolland Co.	0	0	2689.84
F1	6/19/1957	Hartford Co.	0	0	2603692.17
F1	8/15/1958	Fairfield Co.	0	0	25316.18
F1	8/21/1958	Litchfield Co.	0	0	303.79
F2	9/7/1958	Tolland Co.	0	2	2531617.65
F2	5/12/1959	Litchfield Co.	0	0	25142.18
F1	5/30/1959	Hartford Co.	0	0	25142.18
F1	4/26/1961	Tolland Co.	0	0	24469.48
F3	5/24/1962	New Haven Co., Hartford Co.	1	50	24226407.28
F2	6/18/1962	Litchfield Co.	0	0	242264.07
F1	7/19/1963	Middlesex Co.	0	0	23909.72
F2	8/19/1965	Tolland Co.	0	0	232265.87
F2	8/11/1966	Litchfield Co.	0	0	225814.04
F1	8/9/1968	Fairfield Co.	0	0	0
F1	8/17/1968	Tolland Co.	0	0	210240.66
F1	8/20/1968	Litchfield Co.	0	0	21024.07
F1	10/3/1970	Hartford Co.	0	1	188566.37
F2	7/19/1971	Fairfield Co.	0	0	180651.23
F3	7/29/1971	New Haven Co.	0	2	1806512.35
F1	7/21/1972	Middlesex Co.	0	0	17503.29
F1	8/7/1972	Litchfield Co.	0	0	1750328.95
F1	8/9/1972	Litchfield Co.	0	0	175032.89
F2	6/12/1973	Litchfield Co.	0	0	197.74

Fujita Scale	Date	County Affected	Deaths	Injuries	Property Damage (2022 $)
F1	6/28/1973	Hartford Co.	0	1	16478.32
F1	6/29/1973	Litchfield Co.	0	0	16478.32
F2	8/31/1973	Hartford Co.	0	0	164783.22
F2	9/6/1973	Hartford Co.	0	0	16478322.07
F2	9/18/1973	New Haven Co., Fairfield Co., Tolland Co.	0	0	0
F1	6/27/1974	Middlesex Co.	0	0	1484.05
F1	7/3/1974	Litchfield Co.	0	0	14840.52
F1	6/19/1975	Litchfield Co.	0	0	0
F1	7/20/1975	Litchfield Co.	0	0	13599.21
F2	6/30/1976	Litchfield Co.	0	0	128583.04
F4	10/3/1979	Hartford Co.	3	500	1007765152
F1	7/28/1982	New Haven Co.	0	0	7581.74
F0	8/1/1983	Middlesex Co.	0	0	88.15
F2	7/5/1984	Hartford Co.	0	0	0
F1	6/24/1985	Windham Co.	0	0	6799605.02
F1	8/26/1985	Windham Co.	0	0	679.96
F2	7/10/1989	Litchfield Co., New Haven Co.	0	114	59003024.19
F0	6/29/1990	Fairfield Co.	0	7	5597.84
F0	7/5/1992	Fairfield Co.	0	0	0
F1	7/14/1992	Windham Co.	0	0	0
F1	8/4/1992	Fairfield Co., Hartford Co.	0	0	521.48
F0	6/29/1994	Hartford Co.	0	0	0
F1	5/29/1995	New Haven Co.	0	0	96015.42
F0	7/23/1995	New Haven Co.	0	0	0
F1	7/3/1996	New Haven Co.	0	0	3730465.26
F1	7/9/1996	Fairfield Co.	0	0	0
F1	5/31/1998	Litchfield Co.	0	0	7181.72

Fujita Scale	Date	County Affected	Deaths	Injuries	Property Damage (2022 $)
F1	6/30/1998	Middlesex Co., New London Co.	0	0	0
F0	6/30/1998	Middlesex Co.	0	0	0
F1	8/16/2000	Tolland Co.	0	0	8497.53
F1	6/23/2001	Litchfield Co.	0	1	247872.67
F2	6/23/2001	Litchfield Co.	0	0	413121.12
F0	6/23/2001	Hartford Co.	0	0	33049.69
F0	7/1/2001	Litchfield Co.	0	0	123936.34
F1	5/31/2002	Fairfield Co.	0	0	0
F0	5/31/2002	New Haven Co.	0	0	0
F1	6/5/2002	Litchfield Co.	0	0	65070.59
F0	6/16/2002	Litchfield Co.	0	0	16267.65
F1	6/16/2002	New London Co.	0	0	0
F1	7/12/2006	Fairfield Co.	0	0	2903323.41
EF1	5/16/2007	Fairfield Co.	0	0	0
EF0	5/28/2007	Tolland Co.	0	0	0
EF1	6/26/2009	Hartford Co.	0	0	1023092.75
EF1	7/31/2009	Fairfield Co., New Haven Co.	0	0	13641.24
EF1	6/24/2010	Fairfield Co.	0	3	4294749.97
EF1	7/21/2010	Litchfield Co., Hartford Co.	0	0	783791.87
EF1	6/9/2011	Litchfield Co.	0	0	0
EF0	7/1/2013	Fairfield Co., Hartford Co.	0	0	31406.55
EF1	7/1/2013	Hartford Co.	0	0	6281309.43
EF1	7/10/2013	Tolland Co.	0	0	62813.09
EF0	7/27/2014	New Haven Co.	0	0	30905.21
EF0	8/10/2016	New Haven Co.	0	0	18290.4
EF1	5/15/2018	Litchfield Co.	0	0	0
EFU	5/15/2018	Litchfield Co.	0	0	0

Fujita Scale	Date	County Affected	Deaths	Injuries	Property Damage (2022 $)
EF1	5/15/2018	New Haven Co.	0	0	116545.93
EF0	7/17/2018	Windham Co.	0	0	34963.78
EF0	8/4/2018	Windham Co.	0	0	0
EF1	10/2/2018	Fairfield Co.	0	0	58272.97
EF0	10/2/2018	Tolland Co.	0	0	3496.38
EF0	10/29/2018	New London Co.	0	0	58272.97
EF1	9/4/2019	Tolland Co.	0	0	28617.93
EF0	8/2/2020	Litchfield Co.	0	0	0
EF1	8/2/2020	Litchfield Co.	0	0	0
EF0	8/4/2020	Fairfield Co.	0	0	16961.51
EF0	8/27/2020	Litchfield Co.	0	0	0
EF1	8/27/2020	New Haven Co.	0	0	565383.62
EF0	4/21/2021	Litchfield Co.	0	0	2160.05
EF0	7/18/2021	Tolland Co.	0	0	48601.23
EF0	8/19/2021	Windham Co.	0	0	16200.41
EF0	9/9/2021	Tolland Co.	0	0	43201.09
EF0	11/13/2021	New Haven Co.	0	0	162004.1
EF0	11/13/2021	New Haven Co.	0	0	108002.73
EF0	11/13/2021	Windham Co.	0	0	27000.68
EF1	11/13/2021	New London Co.	0	0	14580.37
EF0	7/28/2022	Litchfield Co.	0	0	0

Source: NCEI Storm Events Database

3.5.9 Tropical Cyclone

Table 15 lists tropical cyclone events in Connecticut, as reported by the NCEI Storm Events Database.

Table 15. Tropical cyclone events in Connecticut

Date	Affected Area	Description
9/6/2008	Northern New Haven (Zone);	Tropical Storm Hanna impacted Southern Connecticut, making landfall near the

Date	Affected Area	Description
	Southern Fairfield (Zone)	Nassau/Suffolk County border around 10:35 pm on the 6th. Storm total rainfall ranged from 2.76 inches at Groton Airport to 6.45 inches at New Canaan. The highest sustained wind of 25 knots (29 mph) was reported in Bridgeport with the highest peak gust of 34 knots (39 mph) measured at Groton Airport. The lowest sea-level pressure was 996 mb. at Groton Airport. Coastal storm tides of 2 feet or less above astronomical tide levels were common. Near the coast, as well as inland, only scattered trees were reported down due to the wind, causing minor damage. No fatalities or injuries were attributed to the winds. All of the associated effects of Hanna resulted in an estimated $32,000 in property damage, and a minimal amount of crop damage. One person was killed due to flash flooding.
8/28/2011	Northern Litchfield (Zone); Hartford (Zone); Southern Fairfield (Zone)	Tropical Storm Irene tracked north northeast across eastern New York and western New England during Sunday, August 28th, producing widespread flooding, and damaging winds across the region. ||Irene tracked from a position over New York City around 8 AM EST Sunday, to approximately 10 miles west of Danbury, CT at 10 AM EST, to approximately 15 miles south of Pittsfield, MA at 1 PM EST Sunday, to approximately 65 miles south of Rutland, VT at 4 PM EST. The greatest impact from Irene across Litchfield County was due to heavy to extreme rainfall, which resulted in widespread flash flooding. Rainfall amounts generally averaged 5 to 10 inches. Much of the rain which fell occurred within a 12-hour period, beginning early Sunday morning, and ending Sunday evening. ||This heavy to extreme rainfall resulted in widespread flash flooding and river flooding across Litchfield County. Numerous road closures were reported due to flooding and downed trees and power lines, along with some evacuations. In addition, moderate flooding was reported on the Housatonic River at Falls Village and at Gaylordsville. The Gaylordsville gage was damaged by flood waters. Strong winds also occurred across Litchfield County, with frequent wind gusts of 35 to 55 mph, along with locally stronger wind gusts exceeding 60 mph. The strongest winds occurred from the north to northeast during the morning hours, then from the west to northwest during Sunday evening. The combination of strong winds, and extremely saturated soil led to numerous downed trees and

Date	Affected Area	Description
		power lines across the region. This also resulted in widespread long duration power outages. ||In particular, the approximate number of customers affected by power outages included: Litchfield County, 25000. On September 2nd, 2011 a Major Disaster Declaration was declared, FEMA-4023-DR. This declaration made Individual Assistance and Public Assistance available to all 8 counties in the state of Connecticut. In addition, the declaration made Hazard Mitigation Grant Program assistance available. ||Individual Assistance: assistance to individuals and households. Public Assistance: assistance to state and local governments and certain private nonprofit organizations for emergency work and repair or replacement if disaster-damaged facilities.
8/4/2020	Hartford (Zone); Northern Fairfield (Zone); Southern Fairfield (Zone)	Tropical Storm Isaias moved from coastal Virginia eastern New York state, near the Connecticut/Massachusetts border on Tuesday, August 4. As the storm reached the New York City area, southerly winds were maximizing across southern New England, causing widespread wind damage.
7/9/2021	Hartford (Zone); Northern New London (Zone); Southern New London (Zone); Tolland (Zone)	Tropical Storm Elsa made landfall in Rhode Island on Friday morning before moving into the Gulf of Maine. It interacted with a stalled frontal boundary and brought widespread heavy rainfall of 2 to 3.5 inches and gusty winds along the south coast, which caused scattered tree damage.
8/22/2021	Hartford (Zone); Northern New London (Zone); Southern Middlesex (Zone); Southern New London (Zone); Tolland (Zone)	Tropical Storm Henri made landfall in southwest Rhode Island around noon on August 22nd, then moved slowly northwestward and westward across northern Connecticut and weakened. Henri brought strong wind gusts and flash flooding. The strongest gusts -- to 70 mph -- occurred along the Rhode Island coast. The worst flash flooding occurred in northeast Connecticut.||As the remnants of Henri moved eastward across southern New England on August 23rd, it spawned three tornadoes and a waterspout in MA and also it caused some renewed flooding.||The highest rainfall totals over the two-day period ranged from 5 to 6 inches in Hartford and Tolland Counties in northern Connecticut and in Franklin, Hampshire, and Hampden Counties in western Massachusetts.

3.5.10 Wildland Fire

Table 16 shows wildland fire events in Connecticut between 1992 and 2020 by county.

Table 16. Wildland Fire Events 1992 - 2020

County	Number of Events
Fairfield	513
Hartford	361
Litchfield	1,885
Middlesex	685
New Haven	1,330
New London	575
Tolland	641
Windham	728
Total	6,718

Source: USDA Fire Program Analysis 2022

3.5.11 Winter Weather

Notable winter weather events and event descriptions from the NCEI Storm Events Database are shown in Table 17.

Table 17. Connecticut winter weather events

Date	Affected Area	Description
3/3/1996	Hartford (Zone); Tolland (Zone); Windham (Zone)	Two cold fronts swept across the state from west to east, bringing snow squalls accompanied by thunder between 5 and 6 AM. Visibility was reportedly reduced to zero with thunder and a heavy snow squall around 5:15 AM in the Hartford area. More snow squalls accompanied the passage of an arctic cold front during the afternoon. Snowfall totals generally were less than one inch.
1/24/1997	Tolland (Zone); Windham (Zone); Hartford (Zone)	Light freezing rain created very treacherous driving conditions and caused numerous skidding accidents, including many multiple-car accidents. State police at the Tolland barracks reported 60-80 accidents, mostly minor, late Friday night, January 24th. Several bridges had to be closed in the Hartford area when more than a dozen cars collided. Several other highways also were closed in northern Connecticut

Date	Affected Area	Description
		due to icing conditions. A spotter in Windsor reported 1/4 to 1/3" of ice on trees during the early morning hours on January 25th."
11/13/1997	Northern New Haven (Zone)	With a high pressure system extending from northwest of the Great Lakes east-southeast across Northern New England, a low pressure system developed off the Carolina Coast during Thursday evening on November 13th. It slowly intensified as it moved northeast, passing south of Long Island during Friday afternoon before moving offshore during Friday evening. A mixture of snow, sleet, and freezing rain created hazardous weather conditions across the area. Precipitation accumulated on roads, making both driving and walking hazardous. Several, mostly minor, traffic accidents occurred. Freezing rain also accumulated on trees, causing some tree limbs to fall on power lines that resulted in scattered power outages.
2/25/2001	Hartford (Zone); Windham (Zone); Tolland (Zone)	Snow changed to sleet and freezing rain, creating slippery travel at the end of the February school vacation week. There were many minor accidents throughout northern Connecticut, and there were several injuries indirectly attributed to the icy conditions.
3/8/2005	Northern Fairfield (Zone); Northern New Haven (Zone); Southern Fairfield (Zone)	A strong arctic cold front intensified as it swept southeast across the region. This caused rain to change to snow, temperatures to fall from the 40s into the 20s, and northwest winds that gusted between 40 and 55 mph. Near blizzard conditions occurred for a short time. Storm total snowfalls ranged from around 3 to 6 inches. Wet and mild antecedent conditions were followed by more than a 20 degree drop in temperature in 3 hours with strong gusty winds. This resulted in a flash"" freeze across roads that resulted in hundreds of vehicle accidents.
1/15/2006	Hartford (Zone)	An intensifying area of low pressure passing south of New England and into the Gulf of Maine produced a wintry mix of precipitation and gusty northeast winds across north central and Northeast Connecticut during the morning of 15 January 2006. Generally, between 2 and 3 inches of snow fell. This

Date	Affected Area	Description
		heavy, wet snow, combined with gusty northeast winds, brought down tree limbs and power lines across the region. No known injuries directly related from this winter storm.
2/13/2007	Northern Litchfield (Zone); Southern Litchfield (Zone)	A low pressure system developed over the lower Mississippi Valley on Tuesday February 13th, and then tracked northeast, reaching the mid Atlantic coast by Wednesday morning on February 14th, while intensifying. The storm continued to strengthen during the day on February 14th, before moving off the New England coast by Wednesday night. |This storm led to a wintry mix of snow, sleet and freezing rain across northwest Connecticut. Snow and sleet accumulations of 3 to 5 inches were reported, mainly across the higher elevations of northern Litchfield County. The precipitation began during the late evening hours of Tuesday, and ended Wednesday evening.
11/20/2007	Northern Litchfield (Zone); Southern Litchfield (Zone)	A low pressure system tracked from the Great Lakes into southeast Canada on Tuesday morning. A warm front associated with this low moved across eastern New York and western New England early Tuesday morning. With cold air initially in place, a mix of light snow, sleet and freezing rain developed before daybreak Tuesday, before changing to rain by midday Tuesday.
1/1/2008	Northern Litchfield (Zone); Southern Litchfield (Zone)	Low pressure located over the eastern Great Lakes on Tuesday morning, January 1st, tracked east across central New York Tuesday afternoon, and off the New England coast by Wednesday morning on January 2nd. ||As this low pressure tracked east, a swath of light to moderate snow fell across much of eastern New York and western New England. Snow began early Tuesday morning, and continued through Wednesday morning. ||This storm system produced 2 to 4 inches of snow accumulation across northwest Connecticut, with the greatest amounts across the higher elevations of northern Litchfield County. This snowfall led to hazardous travel conditions for both Tuesday morning, and for the Wednesday morning commute.
2/9/2008	Northern Litchfield (Zone)	A low pressure system tracked east across the Great Lakes on Saturday, February 9th, and then redeveloped along the New England coast by Sunday morning on February 10th. This storm system

Date	Affected Area	Description
		spread a swath of moderate snowfall across portions of east central New York and adjacent western New England from Saturday afternoon, into Sunday morning. ||Snowfall amounts generally ranged from 1 to 3 inches across northwest Connecticut, with the greatest amounts across the higher elevations of northern Litchfield county.||The snow tapered to scattered snow showers by late Sunday morning, before an arctic front swept across the region Sunday afternoon, accompanied by brief but locally intense snow squalls.
11/30/2008	Southern Litchfield (Zone); Northern Litchfield (Zone)	A developing low pressure system along the northern Gulf Coast on Saturday November 29th traveled north into the lower Ohio Valley by Sunday morning on November 30th, and then strengthened upon reaching the eastern Great Lakes by Monday morning on December 1st. A warm front associated with this system approached from the south during Sunday, producing a widespread light mixture of snow, sleet and freezing rain. The precipitation began during the morning hours across northwest Connecticut, and eventually changed to plain rain by Sunday evening. ||Snow and sleet amounts were light, generally an inch or less, along with ice accretion of less than one tenth of an inch. However, since this light wintry mix occurred on a busy travel day, the Sunday after Thanksgiving Day, the impact to travelers was high. Numerous minor accidents were reported, especially during the late morning through mid afternoon hours.
12/11/2008	Southern Litchfield (Zone)	A cold front moved across eastern New York and western New England on Wednesday, December 10th, ushering a cold airmass into the region. A low pressure system developed over the southeast states Wednesday and Wednesday night. This storm then headed northeast Thursday and Thursday night, December 11th, with precipitation spreading northward well in advance of the low. The low continued to track northeast, passing over the mid Atlantic region late Thursday night, and over the New York City Metropolitan area and southern New England Friday morning, December 12th. The low then moved to the Canadian Maritimes Friday night. ||As the storm approached, warmer air moved in aloft, and with a cold airmass remaining in place at the surface, this set the stage for a significant mixed

Date	Affected Area	Description
		precipitation event. The precipitation came down heavy at times, especially Thursday night. Hourly precipitation rates of one quarter to one third of an inch were reported for several hours in the form of freezing rain across much of the region. By the time the precipitation tapered off Friday morning, ice accretion from freezing rain ranged from one half to three quarters of an inch, with the greatest amounts occurring across higher elevations of northern Litchfield County.||The ice storm resulted in numerous downed trees and resultant power outages across northwest Connecticut, where an estimated 5,000 utility customers lost power. Many schools and businesses were closed Friday due to the loss of power.
12/17/2008	Northern Litchfield (Zone)	A low pressure system tracked northeast from the Tennessee Valley late Tuesday night December 16th, to Lake Ontario by Wednesday afternoon December 17th, while another low pressure system developed off the Delmarva Peninsula and tracked northeast, passing just east of Cape Cod late Wednesday. This combination of systems brought a swath of light snow, sleet and freezing rain across northwest Connecticut, beginning late Tuesday evening, and ending around midday Wednesday.||Total snow and sleet amounts ranged from 1 to 2 inches, with the greatest amounts across higher elevations. In addition, ice accretion of up to one tenth of an inch occurred across portions of Litchfield County.||This wintry mix led to treacherous travel conditions for the Wednesday morning commute.
1/10/2009	Northern Litchfield (Zone); Southern Litchfield (Zone)	A developing low pressure system tracked northeast from the lower Ohio Valley on Saturday January 10th, into central Pennsylvania Saturday night, and then east to a position off the New England coast by Sunday morning, January 11th.||This low pressure system spread moderate snowfall across much of northwest Connecticut, beginning late Saturday afternoon, and ending Sunday morning.||Snowfall amounts generally ranged from 3 to 6 inches.
1/28/2010	Southern Fairfield (Zone); Northern New Haven (Zone); Northern Fairfield (Zone)	A 3 to 5 hour period of moderate snowfall occurred over the region Thursday morning as an Alberta clipper system moved across the area. The timing and intensity of the event during the morning rush hour caused numerous traffic accidents.

Date	Affected Area	Description
1/18/2011	Northern Litchfield (Zone); Southern Litchfield (Zone)	Low pressure developed along mid Atlantic coast Tuesday, January 18th, and strengthened as it moved northeastward passing over Cape Cod Tuesday night around midnight. This storm brought a wintry mix of snow, sleet and freezing rain to the area. Snow and sleet accumulations across Litchfield County varied from 3 to 6 inches, with ice accumulations up to a quarter of an inch.
10/29/2011	Windham (Zone)	A rare and historic October Nor'easter brought very heavy snow to portions of southern New England on Saturday October 29. Low pressure tracked northeast from the North Carolina coast Saturday morning, rapidly strengthening as it passed well south of Nantucket Saturday evening. As the storm intensified, colder air from aloft was drawn into New England resulting in heavy snow in the interior. ||Snowfall accumulations of one to two feet were common in the Monadnocks, Berkshires, Connecticut Valley, and higher elevations in central Massachusetts. Up to 31 inches of snow was reported at Jaffrey, New Hampshire and Plainfield, Massachusetts. Minor accumulations were even reported down to the south coast as the rain changed to a period of snow late Saturday night before ending. The accumulation of the heavy wet snow on trees and power lines resulted in widespread tree damage and power outages across many communities in central and western Massachusetts, southern New Hampshire, and northeastern Connecticut. This resulted in school closures and numerous towns cancelled or rescheduled Halloween and trick-or-treating activities. At the peak, 830,000 customers in Connecticut were without power. Throughout Connecticut, 164 AT&T cell phone towers were damaged resulting in degraded cell phone service until towers could be repaired and power restored.||Air travel in and around the Hartford area was disrupted when numerous flights were diverted to Bradley International Airport from the New York City metro area and then power outages affected the airport. Several airplanes were not able to allow their passengers to disembark for seven hours or more. ||A motorist in Hebron died in a car accident believed to be the result of the weather conditions.||The precipitation started as mainly snow early Saturday afternoon across the interior of

Date	Affected Area	Description
		southern New England, although a brief period of rain at the onset was common across the lower elevations. Several hours of heavy snow occurred from mid afternoon through late evening on Saturday October 29. Snowfall rates reached 3 inches per hour for several hours in the Berkshires and Monadnocks as a nearly stationary band of heavy snow set up across this region. The snow tapered off just after midnight Saturday night in western New England with the last of the precipitation exiting eastern New England Sunday morning. This storm also brought damaging winds to Cape Cod and the islands with wind gusts up to 70 mph occurring early Sunday morning October 30 as well as minor to moderate coastal flooding to east coastal Massachusetts during the high tide early Sunday morning.
12/26/2012	Southern Litchfield (Zone); Northern Litchfield (Zone)	Low pressure organized on Christmas Day over the Deep South, producing widespread rain and severe weather across the Gulf Coast Region. As this storm lifted northward on Christmas Night, a secondary area of low pressure developed along the mid-Atlantic coastline. This secondary low become the dominant storm center and moved northeast towards Long Island. This storm then continued northeast across southeastern New England before lifting towards the Canadian Maritimes.||Although precipitation began as snow on the afternoon of December 26th, warmer air moving in aloft allowed for the precipitation to change over to sleet and freezing rain across Northwestern Connecticut. Some valley areas even changed over to just a plain rain. Snowfall amounts ranged from 4 to 6 inches across the area. This storm resulted in very slow travel during the holiday season, especially on the evening of the 26th and morning on the 27th.
3/18/2013	Southern Litchfield (Zone); Northern Litchfield (Zone); Hartford (Zone); Tolland (Zone); Windham (Zone)	During the afternoon of Monday, March 18th, an area of low pressure moved towards the eastern Ohio Valley. Precipitation well out ahead of the storm's warm front moved from southwest to northeast across the region. With enough cold air in place, the precipitation fell in the form of snow during the evening hours. By just after midnight on Tuesday, March 19th, the steady precipitation ended or changed to patchy areas of freezing drizzle or sleet.||At the same time, another storm system

Date	Affected Area	Description
		began to develop along the mid-Atlantic coast. This low pressure took a track just off the Northeast coast. The track of this storm allowed some additional moisture off the Atlantic Ocean to be drawn into the region. During the daylight hours on Tuesday, March 19th, an additional batch of steady snowfall developed across the entire region, as an upper level shortwave moved overhead. While some additional snow accumulated, the strength of the March sun helped limit the amount of the accumulations, especially on paved surfaces. Some additional snow showers and squalls lingered into the evening hours, before tapering off for Tuesday night.||At the end of the storm, snowfall amounts ranged from 4 to 6 inches across northwestern Connecticut.
1/18/2015	Southern Fairfield (Zone); Southern New Haven (Zone); Northern New Haven (Zone); Northern Fairfield (Zone); Northern Middlesex (Zone); Northern Litchfield (Zone); Southern Litchfield (Zone); Southern New London (Zone); Northern New London (Zone); Southern Middlesex (Zone); Hartford (Zone)	Warm air overriding a stationary front along the coast, while a shallow Arctic air mass remained entrenched over land, led to light freezing rain through the morning and into the afternoon. Freezing rain continued even as air temperatures warmed above freezing due to very cold ground temperatures.
2/21/2015	Southern Litchfield (Zone); Northern Litchfield (Zone); Northern Fairfield (Zone); Southern Fairfield (Zone); Northern New Haven (Zone);	During the afternoon on Saturday, February 21st, a storm system began to approach the region from the Ohio Valley. As a warm front stretched towards northwestern Connecticut, a band of steady snowfall developed and moved northward across the area. The snowfall fell locally moderate at times through the late afternoon and into the evening hours. ||As the storm lifted across the region, snowfall tapered off to snow showers and flurries during the overnight hours into the morning of Sunday, February 22nd. By

Date	Affected Area	Description
	Southern New Haven (Zone); Windham (Zone)	sunrise on Sunday morning, about 5 to 8 inches of snow fell across Litchfield County, with the highest amounts across the high terrain areas.
2/8/2016	Windham (Zone); Northern New London (Zone); Tolland (Zone); Southern New Haven (Zone); Hartford (Zone); Northern Fairfield (Zone); Southern Litchfield (Zone); Northern Litchfield (Zone)	A very powerful low pressure system tracked up the east coast, passing southeast of Southern New England. This storm brought heavy snow and gusty winds, resulting in blizzard conditions along the Massachusetts east coast.
12/17/2016	Northern New Haven (Zone); Northern New London (Zone); Southern Middlesex (Zone); Southern New London (Zone); Southern New Haven (Zone); Southern Fairfield (Zone); Northern Fairfield (Zone)	A warm front moving north along the Middle Atlantic coast initiated the development of a wave of low pressure south of Long Island on the morning of December 17. This system brought locally heavy snow and some ice to portions of Southern CT.
12/9/2017	Southern Litchfield (Zone); Northern Litchfield (Zone); Northern Fairfield (Zone); Southern Fairfield (Zone); Southern New Haven (Zone); Northern New Haven (Zone)	A low pressure area moved up the eastern seaboard on Saturday, December 9th. Although northwestern Connecticut was on the western edge of this storm system, steady snowfall moved into the area during the morning hours and continued through the remainder of the day. The snow briefly fell moderate in intensity at times, resulting in slow and difficult travel across the region. Snowfall tapered off just prior to midnight from west to east. By that point, most areas saw 3 to 6 inches of snowfall.
2/7/2018	Southern Litchfield (Zone);	A winter storm brought mixed wintry precipitation to western Connecticut. Precipitation began as snow during the morning hours but changed to a mix of

Date	Affected Area	Description
	Southern Fairfield (Zone); Northern Fairfield (Zone); Northern Litchfield (Zone); Hartford (Zone); Northern New Haven (Zone); Southern New Haven (Zone)	sleet, freezing rain and snow during the afternoon hours. Precipitation transitioned back to snow during the evening hours before exiting the region northwest to southeast. Snowfall and sleet totals ranged from 1 inch to 3 inches.
2/17/2018	Southern New Haven (Zone); Northern New London (Zone); Southern Middlesex (Zone); Northern Middlesex (Zone); Northern Litchfield (Zone)	A low pressure developed along a frontal boundary along the southeast coast on the evening of Saturday, February 17, 2018. This system brought heavy snow to southwest Connecticut and light to moderate snowfall across central and eastern Connecticut. Warmer temperatures across the southeastern portion of the state limited snowfall accumulation.
3/21/2018	Northern Fairfield (Zone); Southern Fairfield (Zone); Southern New Haven (Zone); Southern Middlesex (Zone); Northern Middlesex (Zone); Northern New London (Zone); Southern New London (Zone); Northern New London (Zone)	A large and slow-moving low pressure developed along the Middle Atlantic coast on Wednesday, March 21st and moved slowly north and east along the coast through Thursday, March 22nd. Locally heavy snow occurred across Southern Connecticut.
4/2/2018	Northern New Haven (Zone); Southern New Haven (Zone); Northern Middlesex (Zone); Southern Middlesex (Zone); Southern New London (Zone);	Waves of low pressure moved along a stalled frontal boundary across the Middle Atlantic. Moderate to heavy snow fell during the morning commute across southern Connecticut. Snowfall rates reached 1 inch per hour at times. A daily record snowfall for April 2nd of 6 inches was set at the Bridgeport Airport.

Date	Affected Area	Description
	Northern New London (Zone)	
1/30/2019	Southern Fairfield (Zone); Northern Fairfield (Zone); Southern New Haven (Zone); Northern New Haven (Zone); Southern Middlesex (Zone); Northern Middlesex (Zone)	A strong cold front initiated a broken line of snow squalls to the region. The snow squalls moved east across southern Connecticut during the evening commute. The snow squalls weakened as they moved into southeast Connecticut. While snowfall accumulations were generally under an inch, the squalls brought strong winds and whiteout conditions. Traffic was brought to a standstill during the squalls and created dangerous travel.
3/2/2019	Northern Fairfield (Zone)	A wave of low pressure brought light accumulating snow to southern Connecticut early on the morning of Saturday March 2, 2019. The low pressure quickly moved away from the coast after day break bringing an end to the accumulating snow.
12/1/2019	Southern Litchfield (Zone); Northern Fairfield (Zone); Northern New Haven (Zone); Northern Middlesex (Zone); Northern New London (Zone)	A major winter storm impacted eastern New York and western New England December 1-3, 2019. Snowfall began during the late morning and early afternoon of the 1st ahead of a weakening low pressure system approaching from the western Great Lakes. As the primary low pressure system weakened, it transferred its energy to a coastal low, which strengthened as it remained nearly stationary for much of the 2nd. This allowed snow to continue to accumulate throughout the day. As the low finally pulled away late on the 2nd into the early morning hours of the 3rd, one final heavy snow band crossed the area before the snow finally pulled out prior to daybreak on the 3rd. Amounts of 8-18 were common, except for southern portions of Litchfield County due to warmer temperatures and mixed precipitation.
3/23/2020	Northern Litchfield (Zone)	A late season snowfall impacted northwestern Connecticut on Monday, March 23rd, 2020. This was brought on by an anomalously cold air mass interacting with a coastal low pressure system. Snowfall totals ranged from two to six inches across Litchfield County.
2/18/2021	Southern Fairfield (Zone); Northern Fairfield (Zone);	A long duration wintry weather event occurred on Thursday, February 18, 2021 through Friday, February 19, 2021. A frontal wave of low pressure developed off the Middle Atlantic coast on February

Date	Affected Area	Description
	Southern New Haven (Zone); Southern Middlesex (Zone); Southern New London (Zone); Northern Middlesex (Zone); Northern New Haven (Zone); Northern New London (Zone)	18, 2021. The frontal wave combined with a strong upper level to produce a brief period of moderate to heavy snowfall during the morning and early afternoon on Thursday, February 18, 2021. The precipitation became light and changed to spotty freezing rain and freezing drizzle during the late afternoon through the overnight hours on February 18, 2021. The overall weather pattern did not change to much on Friday, February 19, 2021. Weak waves of low pressure continued to track along the frontal zone off the Middle Atlantic coast, combining with the lingering strong jet stream aloft to produce periods of mainly light snow. The light snow persisted into the evening hours before tapering off just before midnight on Friday, February 19, 2021.
1/5/2022	Northern Litchfield (Zone); Southern Litchfield (Zone); Northern Fairfield (Zone); Northern New Haven (Zone)	A frontal boundary off the East Coast resulted in a period of light freezing rain across portions of northwestern Connecticut during the morning hours on Wednesday, January 5. While amounts were only around a light glaze, icy conditions resulted in numerous vehicle accidents. Key Impacts: travel delays, vehicle accidents.
1/16/2022	Northern Litchfield (Zone); Southern Litchfield (Zone); Northern New Haven (Zone); Northern Fairfield (Zone)	A winter storm system brought anywhere from 4 to 7 inches to northwestern Connecticut. A car was reported stuck in the snow and rescued by a pickup truck near Norfolk.
2/13/2022	Southern Fairfield (Zone); Northern Fairfield (Zone); Southern New Haven (Zone); Northern New Haven (Zone); Northern New London (Zone); Southern Middlesex (Zone); Southern New London (Zone); Northern Middlesex (Zone)	Weak low pressure developed along a frontal wave along the southeast coastline and moved northeast offshore as 700 mb frontogenesis contributed to sub advisory and advisory level snowfall across portions of Southern Connecticut.

Date	Affected Area	Description
2/25/2022	Southern Fairfield (Zone); Southern Litchfield (Zone); Northern Litchfield (Zone); Northern Fairfield (Zone); Northern New Haven (Zone); Southern New Haven (Zone); Southern New London (Zone)	Low pressure moved northeast along the Tennessee Valley and the Lower Appalachains and redeveloped along the Mid Atlantic coast as it moved northeast. A brief mix of snow and sleet changed to freezing rain, and eventually plain rain before ending. Snow amounts were fairly negligible except in far northern areas where a couple of inches of snow and sleet fell before the change to freezing rain and even plain rain. No impact LSRs were issued / reported.
3/9/2022	Northern Litchfield (Zone); Southern Litchfield (Zone); Northern Fairfield (Zone)	An area of low pressure off the mid-Atlantic Coast brought a light to moderate snow to eastern New York on Wednesday March 9, 2022. Snow amounts ranged anywhere from 3-5 inches.
3/12/2022	Northern Litchfield (Zone); Southern Litchfield (Zone)	A winter storm system resulted in a total of 1-3 inches across northwestern Connecticut on March 12, 2022. This resulted in over 5500 reported power outages in the county of Litchfield. Key Impacts: Power Outages.
11/15/2022	Northern Litchfield (Zone); Southern Litchfield (Zone)	A winter weather system produced a combination of snow, sleet, and freezing rain across the area Tuesday evening November 15 into Wednesday November 16.

Source: NCEI Storm Events Database

3.7 Critical Facilities Hazard Analysis

This section contains detailed tables of critical facilities vulnerable to hazards with a mapped spatial extent. Each table includes the type of critical facility, as well as the community lifeline represented by each critical facility.

3.7.1 Dam Failure

Critical facilities and their corresponding community lifelines located in in dam inundation areas are shown in Table 18.

Table 18. Critical facilities in dam inundation areas

Facility Type by County	Community Lifeline	Critical Facilities In Inundation Area
Fairfield		
Veterans Medical Facilities	Health and Medical	1
State Healthcare Facilities	Health and Medical	0
Urgent Care Facilities	Health and Medical	1
Hospitals	Health and Medical	0
Public Health Department	Health and Medical	2
EMS Stations	Health and Medical	10
Fire Stations	Safety and Security	9
Local Law Enforcement	Safety and Security	3
Prisons	Safety and Security	0
State EOC	Safety and Security	0
Local EOC	Safety and Security	3
Major State Government Buildings	Safety and Security	0
Power Plants	Energy	3
Solid Waste Landfill Facilities	Hazardous Materials	1
EPA Wastewater Treatment Plants	Hazardous Materials	3
Gas Stations with Generators	Energy	1
Hartford		
Veterans Medical Facilities	Health and Medical	0
State Healthcare Facilities	Health and Medical	0
Urgent Care Facilities	Health and Medical	0

Facility Type by County	Community Lifeline	Critical Facilities In Inundation Area
Hospitals	Health and Medical	0
Public Health Department	Health and Medical	1
EMS Stations	Health and Medical	5
Fire Stations	Safety and Security	6
Local Law Enforcement	Safety and Security	4
Prisons	Safety and Security	0
State EOC	Safety and Security	0
Local EOC	Safety and Security	3
Major State Government Buildings	Safety and Security	0
Power Plants	Energy	2
Solid Waste Landfill Facilities	Hazardous Materials	6
EPA Wastewater Treatment Plants	Hazardous Materials	1
Gas Stations with Generators	Energy	0
Litchfield		
Veterans Medical Facilities	Health and Medical	0
State Healthcare Facilities	Health and Medical	0
Urgent Care Facilities	Health and Medical	0
Hospitals	Health and Medical	1
Public Health Department	Health and Medical	0
EMS Stations	Health and Medical	4
Fire Stations	Safety and Security	7
Local Law Enforcement	Safety and Security	4
Prisons	Safety and Security	0
State EOC	Safety and Security	0
Local EOC	Safety and Security	3
Major State Government Buildings	Safety and Security	0
Power Plants	Energy	3
Solid Waste Landfill Facilities	Hazardous Materials	3
EPA Wastewater Treatment Plants	Hazardous Materials	4
Gas Stations with Generators	Energy	2

Facility Type by County	Community Lifeline	Critical Facilities In Inundation Area
Middlesex		
Veterans Medical Facilities	Health and Medical	0
State Healthcare Facilities	Health and Medical	0
Urgent Care Facilities	Health and Medical	0
Hospitals	Health and Medical	0
Public Health Department	Health and Medical	0
EMS Stations	Health and Medical	1
Fire Stations	Safety and Security	1
Local Law Enforcement	Safety and Security	0
Prisons	Safety and Security	0
State EOC	Safety and Security	0
Local EOC	Safety and Security	0
Major State Government Buildings	Safety and Security	0
Power Plants	Energy	0
Solid Waste Landfill Facilities	Hazardous Materials	0
EPA Wastewater Treatment Plants	Hazardous Materials	0
Gas Stations with Generators	Energy	0
New Haven		
Veterans Medical Facilities	Health and Medical	0
State Healthcare Facilities	Health and Medical	0
Urgent Care Facilities	Health and Medical	3
Hospitals	Health and Medical	0
Public Health Department	Health and Medical	1
EMS Stations	Health and Medical	9
Fire Stations	Safety and Security	9
Local Law Enforcement	Safety and Security	6
Prisons	Safety and Security	0
State EOC	Safety and Security	0
Local EOC	Safety and Security	2
Major State Government Buildings	Safety and Security	1

Facility Type by County	Community Lifeline	Critical Facilities In Inundation Area
Power Plants	Energy	7
Solid Waste Landfill Facilities	Hazardous Materials	3
EPA Wastewater Treatment Plants	Hazardous Materials	7
Gas Stations with Generators	Energy	8
New London		
Veterans Medical Facilities	Health and Medical	0
State Healthcare Facilities	Health and Medical	0
Urgent Care Facilities	Health and Medical	0
Hospitals	Health and Medical	0
Public Health Department	Health and Medical	0
EMS Stations	Health and Medical	1
Fire Stations	Safety and Security	1
Local Law Enforcement	Safety and Security	1
Prisons	Safety and Security	0
State EOC	Safety and Security	0
Local EOC	Safety and Security	0
Major State Government Buildings	Safety and Security	0
Power Plants	Energy	1
Solid Waste Landfill Facilities	Hazardous Materials	0
EPA Wastewater Treatment Plants	Hazardous Materials	1
Gas Stations with Generators	Energy	0
Tolland		
Veterans Medical Facilities	Health and Medical	0
State Healthcare Facilities	Health and Medical	0
Urgent Care Facilities	Health and Medical	0
Hospitals	Health and Medical	0
Public Health Department	Health and Medical	0
EMS Stations	Health and Medical	0
Fire Stations	Safety and Security	0
Local Law Enforcement	Safety and Security	1

Facility Type by County	Community Lifeline	Critical Facilities In Inundation Area
Prisons	Safety and Security	0
State EOC	Safety and Security	0
Local EOC	Safety and Security	0
Major State Government Buildings	Safety and Security	0
Power Plants	Energy	0
Solid Waste Landfill Facilities	Hazardous Materials	1
EPA Wastewater Treatment Plants	Hazardous Materials	0
Gas Stations with Generators	Energy	0
Windham		
Veterans Medical Facilities	Health and Medical	0
State Healthcare Facilities	Health and Medical	0
Urgent Care Facilities	Health and Medical	0
Hospitals	Health and Medical	0
Public Health Department	Health and Medical	0
EMS Stations	Health and Medical	0
Fire Stations	Safety and Security	0
Local Law Enforcement	Safety and Security	1
Prisons	Safety and Security	0
State EOC	Safety and Security	0
Local EOC	Safety and Security	0
Major State Government Buildings	Safety and Security	0
Power Plants	Energy	0
Solid Waste Landfill Facilities	Hazardous Materials	0
EPA Wastewater Treatment Plants	Hazardous Materials	1
Gas Stations with Generators	Energy	0

3.7.2 Flood-Related Hazards

Critical facilities and their corresponding community lifelines located in in flood hazard areas are shown in Table 19.

Table 19. Critical facilities in flood hazard areas

Facility Type by County	Community Lifeline	Number of Critical Facilities in 100-year Floodplain	Number of Critical Facilities in 500-year Floodplain	Total Critical Facilities in Mapped Floodplain
Fairfield				
Veterans Medical Facilities	Health and Medical	0	0	0
State Healthcare Facilities	Health and Medical	1	0	1
Urgent Care Facilities	Health and Medical	1	0	1
Hospitals	Health and Medical	0	0	0
Public Health Department	Health and Medical	1	0	1
EMS Stations	Health and Medical	8	2	10
Fire Stations	Safety and Security	9	1	10
Local Law Enforcement	Safety and Security	3	0	3
Prisons	Safety and Security	1	0	1
State EOC	Safety and Security	0	0	0
Local EOC	Safety and Security	0	0	0
Major State Government Buildings	Safety and Security	0	0	0
Power Plants	Energy	6	0	6
Solid Waste Landfill Facilities	Hazardous Materials	0	0	0

Facility Type by County	Community Lifeline	Number of Critical Facilities in 100-year Floodplain	Number of Critical Facilities in 500-year Floodplain	Total Critical Facilities in Mapped Floodplain
EPA Wastewater Treatment Plants	Hazardous Materials	4	3	7
Gas Stations with Generators	Energy	2	1	3
Hartford				
Veterans Medical Facilities	Health and Medical	0	0	0
State Healthcare Facilities	Health and Medical	0	0	0
Urgent Care Facilities	Health and Medical	1	0	1
Hospitals	Health and Medical	0	0	0
Public Health Department	Health and Medical	0	0	0
EMS Stations	Health and Medical	0	2	2
Fire Stations	Safety and Security	2	4	6
Local Law Enforcement	Safety and Security	1	3	4
Prisons	Safety and Security	0	0	0
State EOC	Safety and Security	0	0	0
Local EOC	Safety and Security	1	3	4
Major State Government Buildings	Safety and Security	0	1	1

Facility Type by County	Community Lifeline	Number of Critical Facilities in 100-year Floodplain	Number of Critical Facilities in 500-year Floodplain	Total Critical Facilities in Mapped Floodplain
Power Plants	Energy	2	0	2
Solid Waste Landfill Facilities	Hazardous Materials	3	1	4
EPA Wastewater Treatment Plants	Hazardous Materials	4	0	4
Gas Stations with Generators	Energy	0	1	1
Litchfield				
Veterans Medical Facilities	Health and Medical	0	0	0
State Healthcare Facilities	Health and Medical	0	0	0
Urgent Care Facilities	Health and Medical	0	0	0
Hospitals	Health and Medical	0	0	0
Public Health Department	Health and Medical	0	0	0
EMS Stations	Health and Medical	4	0	4
Fire Stations	Safety and Security	7	0	7
Local Law Enforcement	Safety and Security	4	0	4
Prisons	Safety and Security	0	0	0
State EOC	Safety and Security	0	0	0

Facility Type by County	Community Lifeline	Number of Critical Facilities in 100-year Floodplain	Number of Critical Facilities in 500-year Floodplain	Total Critical Facilities in Mapped Floodplain
Local EOC	Safety and Security	3	0	3
Major State Government Buildings	Safety and Security	0	0	0
Power Plants	Energy	4	0	4
Solid Waste Landfill Facilities	Hazardous Materials	3	0	3
EPA Wastewater Treatment Plants	Hazardous Materials	5	0	5
Gas Stations with Generators	Energy	1	0	1
Middlesex				
Veterans Medical Facilities	Health and Medical	0	0	0
State Healthcare Facilities	Health and Medical	0	0	0
Urgent Care Facilities	Health and Medical	0	0	0
Hospitals	Health and Medical	0	0	0
Public Health Department	Health and Medical	0	2	2
EMS Stations	Health and Medical	3	1	4
Fire Stations	Safety and Security	2	4	6
Local Law Enforcement	Safety and Security	0	2	2

Facility Type by County	Community Lifeline	Number of Critical Facilities in 100-year Floodplain	Number of Critical Facilities in 500-year Floodplain	Total Critical Facilities in Mapped Floodplain
Prisons	Safety and Security	0	0	0
State EOC	Safety and Security	0	0	0
Local EOC	Safety and Security	0	1	1
Major State Government Buildings	Safety and Security	0	0	0
Power Plants	Energy	0	1	1
Solid Waste Landfill Facilities	Hazardous Materials	1	1	2
EPA Wastewater Treatment Plants	Hazardous Materials	2	1	3
Gas Stations with Generators	Energy	1	0	1
New Haven				
Veterans Medical Facilities	Health and Medical	1	0	1
State Healthcare Facilities	Health and Medical	0	0	0
Urgent Care Facilities	Health and Medical	0	0	0
Hospitals	Health and Medical	0	0	0
Public Health Department	Health and Medical	0	0	0
EMS Stations	Health and Medical	5	2	7

Facility Type by County	Community Lifeline	Number of Critical Facilities in 100-year Floodplain	Number of Critical Facilities in 500-year Floodplain	Total Critical Facilities in Mapped Floodplain
Fire Stations	Safety and Security	5	5	10
Local Law Enforcement	Safety and Security	2	2	4
Prisons	Safety and Security	0	0	0
State EOC	Safety and Security	0	0	0
Local EOC	Safety and Security	1	1	2
Major State Government Buildings	Safety and Security	0	0	0
Power Plants	Energy	7	2	9
Solid Waste Landfill Facilities	Hazardous Materials	0	0	0
EPA Wastewater Treatment Plants	Hazardous Materials	4	0	4
Gas Stations with Generators	Energy	2	4	6
New London				
Veterans Medical Facilities	Health and Medical	0	0	0
State Healthcare Facilities	Health and Medical	0	0	0
Urgent Care Facilities	Health and Medical	1	0	1
Hospitals	Health and Medical	0	0	0

Facility Type by County	Community Lifeline	Number of Critical Facilities in 100-year Floodplain	Number of Critical Facilities in 500-year Floodplain	Total Critical Facilities in Mapped Floodplain
Public Health Department	Health and Medical	0	1	1
EMS Stations	Health and Medical	6	5	11
Fire Stations	Safety and Security	6	2	8
Local Law Enforcement	Safety and Security	2	1	3
Prisons	Safety and Security	0	0	0
State EOC	Safety and Security	0	0	0
Local EOC	Safety and Security	0	1	1
Major State Government Buildings	Safety and Security	0	0	0
Power Plants	Energy	6	2	8
Solid Waste Landfill Facilities	Hazardous Materials	0	0	0
EPA Wastewater Treatment Plants	Hazardous Materials	7	1	8
Gas Stations with Generators	Energy	1	0	1
Tolland				
Veterans Medical Facilities	Health and Medical	0	0	0
State Healthcare Facilities	Health and Medical	0	0	0

Facility Type by County	Community Lifeline	Number of Critical Facilities in 100-year Floodplain	Number of Critical Facilities in 500-year Floodplain	Total Critical Facilities in Mapped Floodplain
Urgent Care Facilities	Health and Medical	0	0	0
Hospitals	Health and Medical	0	0	0
Public Health Department	Health and Medical	0	0	0
EMS Stations	Health and Medical	1	0	1
Fire Stations	Safety and Security	1	0	1
Local Law Enforcement	Safety and Security	1	0	1
Prisons	Safety and Security	0	0	0
State EOC	Safety and Security	0	0	0
Local EOC	Safety and Security	0	0	0
Major State Government Buildings	Safety and Security	0	0	0
Power Plants	Energy	0	0	0
Solid Waste Landfill Facilities	Hazardous Materials	0	0	0
EPA Wastewater Treatment Plants	Hazardous Materials	0	0	0
Gas Stations with Generators	Energy	0	0	0
Windham				

Facility Type by County	Community Lifeline	Number of Critical Facilities in 100-year Floodplain	Number of Critical Facilities in 500-year Floodplain	Total Critical Facilities in Mapped Floodplain
Veterans Medical Facilities	Health and Medical	0	0	0
State Healthcare Facilities	Health and Medical	0	0	0
Urgent Care Facilities	Health and Medical	0	0	0
Hospitals	Health and Medical	0	0	0
Public Health Department	Health and Medical	0	0	0
EMS Stations	Health and Medical	4	0	4
Fire Stations	Safety and Security	2	0	2
Local Law Enforcement	Safety and Security	2	0	2
Prisons	Safety and Security	0	0	0
State EOC	Safety and Security	0	0	0
Local EOC	Safety and Security	1	0	1
Major State Government Buildings	Safety and Security	0	0	0
Power Plants	Energy	3	0	3
Solid Waste Landfill Facilities	Hazardous Materials	0	0	0
EPA Wastewater Treatment Plants	Hazardous Materials	1	0	1

Facility Type by County	Community Lifeline	Number of Critical Facilities in 100-year Floodplain	Number of Critical Facilities in 500-year Floodplain	Total Critical Facilities in Mapped Floodplain
Gas Stations with Generators	Energy	1	0	1

3.7.3 Sea Level Rise

Critical facilities located within the counties affected by sea level rise are shown in Table 20.

Table 20. Critical facilities in sea level rise extents

Facility Type by County	Community Lifeline	1.8 ft SLR, MHHW	1.8 ft SLR, 100-yr storm	3 ft SLR, MHHW	6 ft SLR, MHHW
Fairfield					
Law Enforcement	Safety and Security	0	1	0	1
Fire Station	Safety and Security	0	4	0	3
EMS	Health and Medical	0	6	0	2
Urgent Care Facilities	Health and Medical	0	1	0	1
Gas Station with Generator	Energy	0	1	0	1
Power Plant	Energy	0	4	0	1
Municipal Solid Waste	Hazardous Materials	0	1	0	1
Wastewater Treatment Plant	Hazardous Materials	2	4	2	3
Middlesex					
EMS	Health and Medical	0	1	0	0
Wastewater Treatment Plant	Hazardous Materials	0	1	1	1

Facility Type by County	Community Lifeline	1.8 ft SLR, MHHW	1.8 ft SLR, 100-yr storm	3 ft SLR, MHHW	6 ft SLR, MHHW
New Haven					
Law Enforcement	Safety and Security	0	1	0	0
Fire Station	Safety and Security	0	3	1	2
EMS	Health and Medical	0	2	0	0
Power Plant	Energy	0	2	0	2
Wastewater Treatment Plant	Hazardous Materials	0	2	0	2
New London					
Law Enforcement	Safety and Security	0	1	0	1
Fire Station	Safety and Security	0	4	0	3
EMS	Health and Medical	0	4	0	3
Power Plant	Energy	0	1		1
Wastewater Treatment Plant	Hazardous Materials	1	3	2	3
Total		3	47	6	31

3.7.4 Tornado

Critical facilities and their corresponding community lifelines located in high tornado density areas are shown in Table 21.

Table 21. Critical facilities in high tornado density areas

Facility Type by County	Community Lifeline	Total Critical Facilities	Number of Critical Facilities in High Tornado Density Area	Percent of Critical Facilities in High Tornado Density Area
Fairfield				
Veterans Medical Facilities	Health and Medical	2	0	0%

Facility Type by County	Community Lifeline	Total Critical Facilities	Number of Critical Facilities in High Tornado Density Area	Percent of Critical Facilities in High Tornado Density Area
State Healthcare Facilities	Health and Medical	8	0	0%
Urgent Care Facilities	Health and Medical	8	0	0%
Hospitals	Health and Medical	8	0	0%
Public Health Department	Health and Medical	19	0	0%
EMS Stations	Health and Medical	111	0	0%
Fire Stations	Safety and Security	108	0	0%
Local Law Enforcement	Safety and Security	30	0	0%
Prisons	Safety and Security	5	0	0%
State EOC	Safety and Security	0	0	0%
Local EOC	Safety and Security	22	0	0%
Major State Government Buildings	Safety and Security	0	0	0%
Power Plants	Energy	18	0	0%
Solid Waste Landfill Facilities	Hazardous Materials	17	0	0%
EPA Wastewater Treatment Plants	Hazardous Materials	10	0	0%
Gas Stations with Generators	Energy	32	0	0%
Hartford				
Veterans Medical Facilities	Health and Medical	2	1	50%

Facility Type by County	Community Lifeline	Total Critical Facilities	Number of Critical Facilities in High Tornado Density Area	Percent of Critical Facilities in High Tornado Density Area
State Healthcare Facilities	Health and Medical	7	0	0%
Urgent Care Facilities	Health and Medical	15	1	7%
Hospitals	Health and Medical	12	4	33%
Public Health Department	Health and Medical	13	3	23%
EMS Stations	Health and Medical	54	5	9%
Fire Stations	Safety and Security	100	14	14%
Local Law Enforcement	Safety and Security	32	8	25%
Prisons	Safety and Security	6	0	0%
State EOC	Safety and Security	1	1	100%
Local EOC	Safety and Security	24	3	13%
Major State Government Buildings	Safety and Security	18	14	78%
Power Plants	Energy	22	9	41%
Solid Waste Landfill Facilities	Hazardous Materials	27	3	11%
EPA Wastewater Treatment Plants	Hazardous Materials	8	2	25%
Gas Stations with Generators	Energy	24	3	13%
Litchfield				
Veterans Medical Facilities	Health and Medical	1	0	0%

Facility Type by County	Community Lifeline	Total Critical Facilities	Number of Critical Facilities in High Tornado Density Area	Percent of Critical Facilities in High Tornado Density Area
State Healthcare Facilities	Health and Medical	1	0	0%
Urgent Care Facilities	Health and Medical	3	0	0%
Hospitals	Health and Medical	3	1	33%
Public Health Department	Health and Medical	2	1	50%
EMS Stations	Health and Medical	29	11	38%
Fire Stations	Safety and Security	42	14	33%
Local Law Enforcement	Safety and Security	22	8	36%
Prisons	Safety and Security	0	0	0%
State EOC	Safety and Security	0	0	0%
Local EOC	Safety and Security	22	8	36%
Major State Government Buildings	Safety and Security	0	0	0%
Power Plants	Energy	12	5	42%
Solid Waste Landfill Facilities	Hazardous Materials	22	11	50%
EPA Wastewater Treatment Plants	Hazardous Materials	10	3	30%
Gas Stations with Generators	Energy	11	5	45%
Middlesex				
Veterans Medical Facilities	Health and Medical	0	0	0%

Facility Type by County	Community Lifeline	Total Critical Facilities	Number of Critical Facilities in High Tornado Density Area	Percent of Critical Facilities in High Tornado Density Area
State Healthcare Facilities	Health and Medical	2	0	0%
Urgent Care Facilities	Health and Medical	0	0	0%
Hospitals	Health and Medical	2	0	0%
Public Health Department	Health and Medical	8	0	0%
EMS Stations	Health and Medical	31	0	0%
Fire Stations	Safety and Security	32	0	0%
Local Law Enforcement	Safety and Security	17	0	0%
Prisons	Safety and Security	1	0	0%
State EOC	Safety and Security	0	0	0%
Local EOC	Safety and Security	15	0	0%
Major State Government Buildings	Safety and Security	1	0	0%
Power Plants	Energy	9	0	0%
Solid Waste Landfill Facilities	Hazardous Materials	17	0	0%
EPA Wastewater Treatment Plants	Hazardous Materials	6	0	0%
Energy	9	0	0%	Energy
New Haven				
Veterans Medical Facilities	Health and Medical	3	1	33%
State Healthcare Facilities	Health and Medical	2	1	50%

Facility Type by County	Community Lifeline	Total Critical Facilities	Number of Critical Facilities in High Tornado Density Area	Percent of Critical Facilities in High Tornado Density Area
Urgent Care Facilities	Health and Medical	7	2	29%
Hospitals	Health and Medical	11	2	18%
Public Health Department	Health and Medical	15	2	13%
EMS Stations	Health and Medical	72	9	13%
Fire Stations	Safety and Security	109	22	20%
Local Law Enforcement	Safety and Security	37	10	27%
Prisons	Safety and Security	4	0	0%
State EOC	Safety and Security	0	0	0%
Local EOC	Safety and Security	29	9	31%
Major State Government Buildings	Safety and Security	1	1	100%
Power Plants	Energy	25	3	12%
Solid Waste Landfill Facilities	Hazardous Materials	27	8	30%
EPA Wastewater Treatment Plants	Hazardous Materials	13	4	31%
Gas Stations with Generators	Energy	40	9	23%
New London				
Veterans Medical Facilities	Health and Medical	2	0	0%
State Healthcare Facilities	Health and Medical	2	0	0%

Facility Type by County	Community Lifeline	Total Critical Facilities	Number of Critical Facilities in High Tornado Density Area	Percent of Critical Facilities in High Tornado Density Area
Urgent Care Facilities	Health and Medical	5	0	0%
Hospitals	Health and Medical	3	0	0%
Public Health Department	Health and Medical	10	0	0%
EMS Stations	Health and Medical	71	0	0%
Fire Stations	Safety and Security	60	0	0%
Local Law Enforcement	Safety and Security	24	0	0%
Prisons	Safety and Security	2	0	0%
State EOC	Safety and Security	0	0	0%
Local EOC	Safety and Security	21	0	0%
Major State Government Buildings	Safety and Security	0	0	0%
Power Plants	Energy	42	0	0%
Solid Waste Landfill Facilities	Hazardous Materials	23	0	0%
EPA Wastewater Treatment Plants	Hazardous Materials	11	0	0%
Gas Stations with Generators	Energy	9	0	0%
Tolland				
Veterans Medical Facilities	Health and Medical	0	0	0%
State Healthcare Facilities	Health and Medical	0	0	0%

Facility Type by County	Community Lifeline	Total Critical Facilities	Number of Critical Facilities in High Tornado Density Area	Percent of Critical Facilities in High Tornado Density Area
Urgent Care Facilities	Health and Medical	1	0	0%
Hospitals	Health and Medical	2	0	0%
Public Health Department	Health and Medical	2	1	50%
EMS Stations	Health and Medical	30	4	13%
Fire Stations	Safety and Security	30	3	10%
Local Law Enforcement	Safety and Security	10	2	20%
Prisons	Safety and Security	3	0	0%
State EOC	Safety and Security	0	0	0%
Local EOC	Safety and Security	12	2	17%
Major State Government Buildings	Safety and Security	0	0	0%
Power Plants	Energy	6	1	17%
Solid Waste Landfill Facilities	Hazardous Materials	13	2	15%
EPA Wastewater Treatment Plants	Hazardous Materials	1	1	100%
Gas Stations with Generators	Energy	6	0	0%
Windham				
Veterans Medical Facilities	Health and Medical	1	0	0%
State Healthcare Facilities	Health and Medical	0	0	0%

Facility Type by County	Community Lifeline	Total Critical Facilities	Number of Critical Facilities in High Tornado Density Area	Percent of Critical Facilities in High Tornado Density Area
Urgent Care Facilities	Health and Medical	1	0	0%
Hospitals	Health and Medical	2	0	0%
Public Health Department	Health and Medical	1	0	0%
EMS Stations	Health and Medical	34	0	0%
Fire Stations	Safety and Security	31	0	0%
Local Law Enforcement	Safety and Security	11	0	0%
Prisons	Safety and Security	2	0	0%
State EOC	Safety and Security	0	0	0%
Local EOC	Safety and Security	13	0	0%
Major State Government Buildings	Safety and Security	0	0	0%
Power Plants	Energy	14	0	0%
Solid Waste Landfill Facilities	Hazardous Materials	11	0	0%
EPA Wastewater Treatment Plants	Hazardous Materials	5	0	0%
Gas Stations with Generators	Energy	6	0	0%

3.7.5 Wildland Fire

Critical facilities and their corresponding community lifelines located in wildfire hazard areas (Wildland Urban Intermix and Wildland Urban Interface) are shown in Table 22.

Table 22. Critical facilities in wildland fire hazard areas

Facility Type by County	Community Lifeline	# within Intermix	# within Interface	Total Facilities At Risk
Fairfield				
Veterans Medical Facilities	Health and Medical	0	0	0
State Healthcare Facilities	Health and Medical	2	1	3
Urgent Care Facilities	Health and Medical	0	1	1
Hospitals	Health and Medical	1	0	1
Public Health Department	Health and Medical	4	4	8
EMS Stations	Health and Medical	24	28	52
Fire Stations	Safety and Security	20	24	44
Local Law Enforcement	Safety and Security	5	6	11
Prisons	Safety and Security	0	0	0
State EOC	Safety and Security	0	6	6
Local EOC	Safety and Security	4	0	4
Major State Government Buildings	Safety and Security	0	0	0
Power Plants	Energy	0	1	1
Solid Waste Landfill Facilities	Hazardous Materials	4	1	5
EPA Wastewater Treatment Plants	Hazardous Materials	0	2	2
Gas Stations with Generators	Energy	7	3	10
Hartford				

Facility Type by County	Community Lifeline	# within Intermix	# within Interface	Total Facilities At Risk
Veterans Medical Facilities	Health and Medical	0	0	0
State Healthcare Facilities	Health and Medical	1	0	1
Urgent Care Facilities	Health and Medical	0	2	2
Hospitals	Health and Medical	0	2	2
Public Health Department	Health and Medical	0	2	2
EMS Stations	Health and Medical	8	22	30
Fire Stations	Safety and Security	15	26	41
Local Law Enforcement	Safety and Security	4	8	12
Prisons	Safety and Security	0	0	0
State EOC	Safety and Security	0	0	0
Local EOC	Safety and Security	4	8	12
Major State Government Buildings	Safety and Security	0	0	0
Power Plants	Energy	3	2	5
Solid Waste Landfill Facilities	Hazardous Materials	6	3	9
EPA Wastewater Treatment Plants	Hazardous Materials	1	2	3
Gas Stations with Generators	Energy	4	5	11
Litchfield				
Veterans Medical Facilities	Health and Medical	1	0	1

Facility Type by County	Community Lifeline	# within Intermix	# within Interface	Total Facilities At Risk
State Healthcare Facilities	Health and Medical	1	0	1
Urgent Care Facilities	Health and Medical	1	1	2
Hospitals	Health and Medical	1	2	3
Public Health Department	Health and Medical	0	2	2
EMS Stations	Health and Medical	11	12	23
Fire Stations	Safety and Security	18	21	39
Local Law Enforcement	Safety and Security	9	10	19
Prisons	Safety and Security	0	0	0
State EOC	Safety and Security	0	0	0
Local EOC	Safety and Security	9	9	18
Major State Government Buildings	Safety and Security	0	0	0
Power Plants	Energy	1	6	7
Solid Waste Landfill Facilities	Hazardous Materials	16	2	18
EPA Wastewater Treatment Plants	Hazardous Materials	5	2	7
Gas Stations with Generators	Energy	5	6	11
Middlesex				
Veterans Medical Facilities	Health and Medical	0	0	0
State Healthcare Facilities	Health and Medical	1	0	1

Facility Type by County	Community Lifeline	# within Intermix	# within Interface	Total Facilities At Risk
Urgent Care Facilities	Health and Medical	0	0	0
Hospitals	Health and Medical	0	0	0
Public Health Department	Health and Medical	3	2	5
EMS Stations	Health and Medical	15	8	23
Fire Stations	Safety and Security	14	10	24
Local Law Enforcement	Safety and Security	3	8	11
Prisons	Safety and Security	0	0	0
State EOC	Safety and Security	0	0	0
Local EOC	Safety and Security	5	7	12
Major State Government Buildings	Safety and Security	0	0	0
Power Plants	Energy	0	2	2
Solid Waste Landfill Facilities	Hazardous Materials	13	1	14
EPA Wastewater Treatment Plants	Hazardous Materials	3	0	3
Gas Stations with Generators	Energy	3	3	6
New Haven				
Veterans Medical Facilities	Health and Medical	0	0	0
State Healthcare Facilities	Health and Medical	1	0	1
Urgent Care Facilities	Health and Medical	1	4	5

Facility Type by County	Community Lifeline	# within Intermix	# within Interface	Total Facilities At Risk
Hospitals	Health and Medical	0	2	2
Public Health Department	Health and Medical	3	3	6
EMS Stations	Health and Medical	14	19	33
Fire Stations	Safety and Security	18	37	55
Local Law Enforcement	Safety and Security	6	12	18
Prisons	Safety and Security	0	0	0
State EOC	Safety and Security	0	0	0
Local EOC	Safety and Security	6	10	16
Major State Government Buildings	Safety and Security	0	0	0
Power Plants	Energy	4	3	7
Solid Waste Landfill Facilities	Hazardous Materials	7	5	12
EPA Wastewater Treatment Plants	Hazardous Materials	1	2	3
Gas Stations with Generators	Energy	5	17	22
New London				
Veterans Medical Facilities	Health and Medical	0	2	2
State Healthcare Facilities	Health and Medical	1	1	2
Urgent Care Facilities	Health and Medical	2	2	4
Hospitals	Health and Medical	0	1	1

Facility Type by County	Community Lifeline	# within Intermix	# within Interface	Total Facilities At Risk
Public Health Department	Health and Medical	2	6	8
EMS Stations	Health and Medical	22	24	46
Fire Stations	Safety and Security	18	18	36
Local Law Enforcement	Safety and Security	9	6	15
Prisons	Safety and Security	0	0	0
State EOC	Safety and Security	0	0	0
Local EOC	Safety and Security	9	6	13
Major State Government Buildings	Safety and Security	0	0	0
Power Plants	Energy	16	8	24
Solid Waste Landfill Facilities	Hazardous Materials	20	1	21
EPA Wastewater Treatment Plants	Hazardous Materials	3	2	5
Gas Stations with Generators	Energy	5	2	7
Tolland				
Veterans Medical Facilities	Health and Medical	0	0	0
State Healthcare Facilities	Health and Medical	1	0	1
Urgent Care Facilities	Health and Medical	1	0	1
Hospitals	Health and Medical	1	1	2
Public Health Department	Health and Medical	1	1	2

Facility Type by County	Community Lifeline	# within Intermix	# within Interface	Total Facilities At Risk
EMS Stations	Health and Medical	20	8	28
Fire Stations	Safety and Security	21	7	28
Local Law Enforcement	Safety and Security	5	3	8
Prisons	Safety and Security	0	0	0
State EOC	Safety and Security	0	0	0
Local EOC	Safety and Security	8	4	12
Major State Government Buildings	Safety and Security	0	0	0
Power Plants	Energy	4	0	4
Solid Waste Landfill Facilities	Hazardous Materials	8	0	8
EPA Wastewater Treatment Plants	Hazardous Materials	0	0	0
Gas Stations with Generators	Energy	1	2	3
Windham				
Veterans Medical Facilities	Health and Medical	0	0	0
State Healthcare Facilities	Health and Medical	0	0	0
Urgent Care Facilities	Health and Medical	0	1	1
Hospitals	Health and Medical	0	2	2
Public Health Department	Health and Medical	0	1	1
EMS Stations	Health and Medical	24	10	34

Facility Type by County	Community Lifeline	# within Intermix	# within Interface	Total Facilities At Risk
Fire Stations	Safety and Security	23	8	31
Local Law Enforcement	Safety and Security	2	7	9
Prisons	Safety and Security	0	2	2
State EOC	Safety and Security	0	0	0
Local EOC	Safety and Security	7	5	12
Major State Government Buildings	Safety and Security	0	0	0
Power Plants	Energy	7	1	8
Solid Waste Landfill Facilities	Hazardous Materials	8	1	9
EPA Wastewater Treatment Plants	Hazardous Materials	2	2	4
Gas Stations with Generators	Energy	2	2	4

3.8 Connecticut Dams

High hazard dams in Connecticut are described in Table 23.

Table 23. Connecticut High Hazard Dams (National Inventory of Dams)

Dam Name	NID ID	Owner Names	Owner Types	Primary Purpose	County	City	Primary Dam Type	Dam Height (Ft)	Year Completed	Condition Assessment	Condition Assessment Date	EAP Prepared	EAP Last Revision Date
Peat Swamp Reservoir Dam	CT00088	SOUTH CENTRAL CT RWA	Public Utility	Water Supply	New Haven	ANSONIA	Concrete	41	1925	Poor	11/8/2019	Yes	5/31/2018
West Side Flood Control Dam #5	CT00484	CONNECTICUT DEEP	State	Flood Risk Reduction	Litchfield	SOUTH NORFOLK	Earth	20	1970	Satisfactory	9/7/2016	Yes	10/15/2012
Farm Brook Pond Site 2b	CT01547	CONNECTICUT DEEP	State	Fish and Wildlife Pond	New Haven	HAMDEN	Earth	28	1977	Satisfactory	4/24/2015	Yes	11/27/2015
Sucker Brook Flood Control Dam	CT00499	CONNECTICUT DEEP	State	Flood Risk Reduction	Litchfield	WINCHESTER		68	1970	Satisfactory		Yes	2/1/2017
Spectacle Swamp Flood Control Dam	CT00476	CONNECTICUT DEEP	State	Flood Risk Reduction	Fairfield	WILTON	Earth	21	1973	Satisfactory	4/15/2015	Yes	5/6/2016
Great Swamp Fc Aka Norwalk	CT05002	CONNECTICUT DEEP	State	Flood Risk Reduction	Fairfield	RIDGEFIELD	Earth	12	1979	Satisfactory	10/29/2018	Yes	5/6/2016

Dam Name	NID ID	Owner Names	Owner Types	Primary Purpose	County	City	Primary Dam Type	Dam Height (Ft)	Year Completed	Condition Assessment	Condition Assessment Date	EAP Prepared	EAP Last Revision Date
River #2 Dam													
Wood Creek Flood Control Dike Site #9	CT00486	CONNECTICUT DEEP	State		Litchfield	NORFOLK, CT	Earth	20	1971	Satisfactory	9/7/2016	Yes	10/15/2012
Union Pond Dam	CT00013	TOWN OF MANCHESTER	Local Government	Recreation	Hartford	MANCHESTER	Concrete	33	1901	Poor	8/19/2016	Yes	6/1/2017
Crystal Lake Dam	CT00138	CONNECTICUT DEEP	State	Recreation	Middlesex	MIDDLETOWN	Concrete	50	1850	Poor	10/18/2016	Yes	8/1/1983
North Pond Reservoir Dikes	CT00450	TORRINGTON WATER COMPANY	Public Utility	Water Supply	Litchfield			17		Satisfactory	6/19/2019	Yes	2/3/2017
Sterling Pond Dam	CT00610	TOWN OF STERLING	Local Government	Recreation	Windham	STERLING	Masonry	18.5	1870	Satisfactory	11/12/2020	Yes	12/28/2017
Wood Creek Flood Control Dam Site #9	CT00486	CONNECTICUT DEEP	State	Flood Risk Reduction	Litchfield	NORFOLK, CT	Earth	36	1971	Satisfactory		Yes	1/5/2005
Mackenzie Reservoir Dam	CT00037	TOWN OF WALLINGFORD	Local Government	Water Supply	New Haven	NORTH BRANFORD	Earth	29	1944	Fair	11/4/2020	Yes	2/1/2017
Hanover Reservoir Dam	CT00470	BARON;CHENEY; TOWN OF SPRAGUE	Local Government	Recreation	New London	SPRAGUE	Earth	26.5	1900	Poor		Yes	8/28/2017
Howard Reservoir Dam	CT00015	TOWN OF MANCHESTER	Local Government	Water Supply	Hartford	MANCHESTER	Masonry	44	1902	Satisfactory	7/30/2019	Yes	2/3/2017

Dam Name	NID ID	Owner Names	Owner Types	Primary Purpose	County	City	Primary Dam Type	Dam Height (Ft)	Year Completed	Condition Assessment	Condition Assessment Date	EAP Prepared	EAP Last Revision Date
Lake Phipps Dam #3	CT00109	LAKE PHIPPS SPECIAL TAXING DISTRICT	Local Government	Recreation	New Haven	WEST HAVEN	Earth	8	1920	Satisfactory	5/20/2020	Yes	12/1/2016
Echo Lake Dam	CT00124	TOWN OF WATERTOWN	Local Government	Recreation	Litchfield	WATERTOWN	Earth	24	1958	Satisfactory	12/17/2018	Yes	1/1/2017
American Can Company Dam	CT00047	C/O TOWER REALTY	Private	Recreation	Fairfield	RYE NY	Concrete	53	1970	Not Rated		Yes	8/30/2017
Farm Brook Flood Control Site #2a Dam	CT01546	CONNECTICUT DEEP	State	Flood Risk Reduction	New Haven	HAMDEN	Earth	29	1977	Satisfactory	4/24/2015	Yes	11/27/2015
Staffordville Reservoir Dam	CT00333	TOWN OF STAFFORD	Local Government	Recreation	Tolland	STAFFORDVILLE	Masonry	30	1850	Poor	11/30/2017	Yes	4/1/2018
Pachaug Pond Dam	CT00663	CONNECTICUT DEEP	State	Fish and Wildlife Pond	New London	JEWETT CITY	Earth	17	1888	Fair	5/26/2015	Yes	12/1/2017
Taftville Hydro Dam	CT00204	FIRSTLIGHT POWER RESOURCES	Public Utility	Hydroelectric	New London	NORWICH	Concrete	30	1867	Satisfactory	9/10/2020	Yes	1/1/2017
Dooley Pond Dam	CT00142	CONNECTICUT DEEP	State	Recreation	Middlesex	MIDDLETOWN	Earth	23.5	1870	Fair	9/29/2020	Yes	5/1/1983
Eagleville Dam	CT00161	CONNECTICUT DEEP	State	Recreation	Tolland	SOUTH COVENTRY STA	Earth	18	1860	Fair	10/6/2020	Yes	7/12/1985
Barber Pond Dam	CT00269	CONNECTICUT DEEP	State	Recreation	Hartford	BLOOMFIELD	Earth	11	1955	Poor	11/8/2018	Yes	1/5/2005

Dam Name	NID ID	Owner Names	Owner Types	Primary Purpose	County	City	Primary Dam Type	Dam Height (Ft)	Year Completed	Condition Assessment	Condition Assessment Date	EAP Prepared	EAP Last Revision Date
Silver Lake Dam	CT00254	CONNECTICUT DEEP	State	Recreation	Hartford	BERLIN	Earth	15	1920	Fair	10/2/2020	Yes	1/5/2005
Obed Heights Reservoir Dam	CT00414	DAVID MURRAY;FLORENCE BACON;GAIL MURRAY-FERRIS;PIONTKOWSKI REVOCABLE TRUST	Private	Recreation	Middlesex	OLD SAYBROOK	Earth	15	1880	Fair	11/25/2015	Yes	2/27/2018
Beaupres Pond Dam	CT00584	CARUSO E	Private	Recreation	Windham	POMFRET	Earth	12	1952	Satisfactory	4/8/2018	No	6/1/1988
Pattaconk Reservoir Dam	CT00398	CONNECTICUT DEEP	State	Recreation	Middlesex	CEDAR LAKE	Masonry	23	1932	Fair	10/2/2020	Yes	12/1/2017
Wrights Pond Dam	CT00393	CONNECTICUT DEEP	State	Recreation	Middlesex	IVORYTOWN	Masonry	10	1890	Fair	10/10/2018	Yes	12/1/2017
Long Hill Reservoir Dam	CT00307	CONNECTICUT WATER COMPANY	Public Utility	Water Supply	New Haven	WOODBRIDGE	Concrete	80	1914	Satisfactory	11/13/2020	Yes	6/21/2018
North Stamford Reservoir Dam	CT00048	AQUARION WATER COMPANY OF CONNECTICUT	Public Utility	Water Supply	Fairfield	RIDGEWAY	Concrete	40	1908	Satisfactory	6/11/2019	Yes	4/13/2017
Shenipsit Lake Dam	CT00209	CONNECTICUT WATER COMPANY	Public Utility	Water Supply	Tolland	ROCKVILLE	Masonry	27	1903	Satisfactory	11/13/2020	Yes	6/21/2018
Deep River Reservoir Dam	CT00346	CITY OF NORWICH	Local Government	Water Supply	New London	FITCHVILLE	Concrete	62	1926	Satisfactory	7/21/2017	Yes	3/1/2009
Morris Reservoir Dam	CT00473	CITY OF WATERBURY	Public Utility	Water Supply	Litchfield	WATERTOWN	Concrete	88		Satisfactory	10/23/2020	Yes	2/1/2017

Dam Name	NID ID	Owner Names	Owner Types	Primary Purpose	County	City	Primary Dam Type	Dam Height (Ft)	Year Completed	Condition Assessment	Condition Assessment Date	EAP Prepared	EAP Last Revision Date
East Mountain Reservoir Dam	CT00032	CITY OF WATERBURY	Local Government	Recreation	New Haven	WATERBURY	Concrete	35	1880	Satisfactory	11/5/2020	Yes	2/17/2017
Shepaug Reservoir Dam	CT00665	CITY OF WATERBURY	Local Government	Water Supply	Litchfield	WOODVILLE	Concrete	65	1933	Satisfactory	10/15/2020	Yes	2/1/2017
Nepaug East Dike	CT00370	METROPOLITAN DISTRICT COMMISSION	Public Utility	Water Supply	Hartford	COLLINSVILLE	Concrete	30	1916	Satisfactory	8/28/2019	Yes	7/1/2017
Ashland Pond Dam	CT00437	CONNECTICUT DEEP	State	Recreation	New London	JEWETT CITY	Earth	25	1800	Fair	10/30/2018	Yes	12/1/2017
Higganum Reservoir Dam	CT00430	CONNECTICUT DEEP	State	Recreation	Middlesex	HIGGANUM	Earth	48	1868	Fair	9/29/2020	Yes	8/1/1996
Leesville Dam	CT00662	CONNECTICUT DEEP	State	Recreation	Middlesex	EAST HADDAM	Earth	25	1900	Satisfactory	9/29/2020	No	1/5/2005
Bunnells Pond Dam	CT00076	CONNECTICUT DEEP	State	Recreation	Fairfield	BRIDGEPORT	Earth	32.6	1906	Fair	10/1/2020	Yes	12/18/2015
Woodridge Lake Dam	CT00452	WOODRIDGE LAKE PROPERTY OWNERS ASSOCIATION	Private	Recreation	Litchfield	MILTON	Earth	34	1970	Satisfactory	4/12/2019	Yes	7/25/2018
Quillinan Reservoir Dam	CT00024	CONNECTICUT DEEP	State	Recreation	New Haven	ANSONIA	Concrete	19	1880	Fair	10/1/2020	Yes	5/6/2016
Farm Brook Flood Control Site #1 Dam	CT00657	CONNECTICUT DEEP	State	Flood Risk Reduction	New Haven	HAMDEN	Earth	11	1974	Satisfactory	4/24/2015	Yes	11/27/2015

Dam Name	NID ID	Owner Names	Owner Types	Primary Purpose	County	City	Primary Dam Type	Dam Height (Ft)	Year Completed	Condition Assessment	Condition Assessment Date	EAP Prepared	EAP Last Revision Date
Messerschmidt Pond Dam	CT00392	CONNECTICUT DEEP	State	Recreation	Middlesex	WESTBROOK	Earth	23	1890	Fair	10/9/2018	Yes	12/1/2017
Cheshire Reservoir Dam	CT00303	SOUTH CENTRAL CT RWA	Public Utility	Water Supply	New Haven	MIXVILLE	Concrete	21	1908	Satisfactory	11/6/2019	Yes	5/31/2018
Park Pond Dam	CT00632	CONNECTICUT DEEP	State	Recreation	Litchfield	WINCHESTER	Masonry	20		Satisfactory	8/15/2018	Yes	12/4/2015
Black Rock Pond Dam	CT00633	CONNECTICUT DEEP	State	Recreation	Litchfield	THOMASTON	Earth	16	1945	Satisfactory	10/2/2020	Yes	12/11/2015
South Flood Control Dike	CT00487	CONNECTICUT DEEP	State	Flood Risk Reduction	Hartford		Earth	20		Satisfactory	5/1/2015	Yes	11/20/2015
Burr Pond Dam	CT00099	CONNECTICUT DEEP	State	Recreation	Litchfield	BURRVILLE	Masonry	17	1935	Satisfactory	8/15/2018	Yes	11/1/2016
Stillwater Pond Dam	CT00098	CONNECTICUT DEEP	State	Recreation	Litchfield	TORRINGTON	Earth	34		Satisfactory	10/5/2020	Yes	2/1/2017
Fitchville Pond Dam	CT00510	BOZRAH WATERWORKS, INC.	Public Utility	Recreation	New London	FITCHVILLE	Concrete	20	1871	Poor	9/12/2012	No	1/1/1983
Blue Hills Flood Control Site #2 Dike	CT50002	CONNECTICUT DEEP	State		Hartford		Earth	8		Satisfactory	4/22/2015	No	
North Pond Reservoir Dam	CT00450	TORRINGTON WATER COMPANY	Public Utility	Water Supply	Litchfield	DRAKEVILLE	Masonry	19.5	1840	Fair	6/19/2019	Yes	2/3/2017

Dam Name	NID ID	Owner Names	Owner Types	Primary Purpose	County	City	Primary Dam Type	Dam Height (Ft)	Year Completed	Condition Assessment	Condition Assessment Date	EAP Prepared	EAP Last Revision Date
Lake Gaillard East Dike	CT00387	SOUTH CENTRAL CT RWA	Public Utility	Water Supply	New Haven	NORTH BRANFORD	Earth	22	1929	Satisfactory	11/5/2019	Yes	5/21/2018
Lake Wintergreen Dam	CT00118	CONNECTICUT DEEP	State	Water Supply	New Haven	NEW HAVEN	Masonry	31	1863	Satisfactory	10/1/2020	Yes	6/3/2016
Glasgo Pond Dam	CT00084	CONNECTICUT DEEP	State	Recreation	New London	GRISWOLD	Masonry	26	1860	Satisfactory	3/22/2017	Yes	12/1/2017
Hall Meadow Brook Flood Control Dam	CT00497	CONNECTICUT DEEP	State	Flood Risk Reduction	Litchfield	TORRINGTON	Earth	75	1962	Satisfactory		Yes	2/1/2017
Beaver Dam Lake Dam	CT00083	BEAVER DAM ASSOCIATION OF STRATFORD;ONE WEST BANK;PAGANO;PAVIA	Private	Recreation	Fairfield	STRATFORD	Masonry	47	1901	Satisfactory	4/9/2019	Yes	7/1/2017
Quaddick Reservoir Dike	CT00184	CONNECTICUT DEEP	State	Recreation	Windham	PINEVILLE	Earth	18.5	1900	Fair	10/6/2020	Yes	1/5/2005
East Branch Flood Control Dam	CT00498	CONNECTICUT DEEP	State	Flood Risk Reduction	Litchfield	TORRRINGTON	Masonry	92		Satisfactory	9/13/2016	Yes	2/1/2017
Laurel Brook Reservoir Dam	CT00382	CITY OF MIDDLETOWN	Local Government	Water Supply	Middlesex	MIDDLETOWN	Earth	20	1866	Fair	10/8/2020	Yes	11/17/2020
Cold Spring	CT00495	CONNECTICUT DEEP	State	Flood Risk Reduction	Hartford	WEST HARTFORD	Earth	20	1968	Satisfactory	4/22/2015	Yes	11/27/2015

Dam Name	NID ID	Owner Names	Owner Types	Primary Purpose	County	City	Primary Dam Type	Dam Height (Ft)	Year Completed	Condition Assessment	Condition Assessment Date	EAP Prepared	EAP Last Revision Date
Flood Control Site #9 Dam													
Batterson Park Pond Dike	CT00262	CITY OF HARTFORD	Local Government	Recreation	Hartford		Earth	6		Satisfactory	6/23/2015	Yes	12/1/2020
Southington Reservoir #3 Dike	CT01638	TOWN OF SOUTHINGTON	Local Government		Hartford			6		Satisfactory	7/21/2020	Yes	2/28/2006
Plainville Reservoir Aka Crescent Lake Dam	CT00259	TOWN OF SOUTHINGTON	Local Government	Water Supply	Hartford	SOUTHINGTON	Masonry	17	1884	Fair	7/21/2020	Yes	2/28/2006
Deans Reservoir Dam	CT00614	AQUARION WATER COMPANY OF CONNECTICUT	Public Utility	Water Supply	New London		Masonry	15	1888	Fair	8/6/2020	Yes	4/13/2017
Great Pond Dam	CT50020	Town of Ridgefield	Local Government	Other	Fairfield		Earth	20		Fair	4/22/2020	Yes	1/3/2018
Silvia's Lower Pond Dam	CT01329	HEMINWAY, TRUSTEES;PATSIGA	Private	Fish and Wildlife Pond	New London		Masonry	14		Poor		No	
Talcott Flood Control Dam #2	CT00489	CONNECTICUT DEEP	State	Flood Risk Reduction	Hartford	WEST HARTFORD	Earth	18.5	1964	Satisfactory	10/24/2015	Yes	11/20/2015
Blue Hills Flood Control Site #2 Dam	CT00496	CONNECTICUT DEEP	State	Flood Risk Reduction	Hartford	BLOOMFIELD	Earth	24.5	1964	Satisfactory	4/22/2015	Yes	11/27/2015

Dam Name	NID ID	Owner Names	Owner Types	Primary Purpose	County	City	Primary Dam Type	Dam Height (Ft)	Year Completed	Condition Assessment	Condition Assessment Date	EAP Prepared	EAP Last Revision Date
Fairview Reservoir Dam and Dikes	CT00205	CITY OF NORWICH	Local Government	Water Supply	New London	NORWICHTOWN	Masonry	30	1868	Satisfactory	7/21/2017	Yes	3/1/2015
Burnt Hill Flood Control Dam	CT00488	CONNECTICUT DEEP	State	Flood Risk Reduction	Hartford	WEST HARTFORD	Earth	38.2	1966	Satisfactory	5/1/2015	Yes	11/20/2015
Upper Ansonia Reservoir East Dike	CT00029	CITY OF DERBY	Local Government		New Haven		Masonry	12		Fair	5/19/2017	No	6/30/1982
Margerie Lake Reservoir North Dike	CT00063	CITY OF DANBURY	Local Government	Water Supply	Fairfield		Earth	17.2		Satisfactory	10/22/2020	Yes	2/3/2017
Lower Ansonia Reservoir Dam	CT00027	CITY OF DERBY	Local Government	Water Supply	New Haven	EAST DERBY	Earth	17.8	1887	Fair	11/2/2015	Yes	11/27/2017
Lower Scovill Reservoir Dam	CT00293	TOWN OF WOLCOTT	Local Government	Recreation	New Haven	WATERBURY	Earth	15	1917	Fair	12/16/2019	Yes	8/7/2014
Upper Ansonia Reservoir Dam	CT00029	CITY OF DERBY	Local Government	Water Supply	New Haven	EAST DERBY	Masonry	20.8	1887	Fair	8/5/2015	Yes	11/27/2017
Highland Lake Dam	CT00106	JONES;TOWN OF WINCHESTER	Local Government	Recreation	Litchfield	WINCHESTER	Concrete	14	1860	Fair	4/5/2018	Yes	8/15/2018
Avery Flood Control	CT05001	CONNECTICUT DEEP	State	Flood Risk Reduction	Hartford	VERNON TOLLAND TPK	Earth	23	1993	Satisfactory	1/23/2015	Yes	12/1/2017

Dam Name	NID ID	Owner Names	Owner Types	Primary Purpose	County	City	Primary Dam Type	Dam Height (Ft)	Year Completed	Condition Assessment	Condition Assessment Date	EAP Prepared	EAP Last Revision Date
Site #2 Dam													
South Norwalk Reservoir Dike	CT00212	SOUTH NORWALK ELECTRIC AND WATER	Public Utility	Water Supply	Fairfield		Earth	20	1899	Satisfactory	7/24/2015	Yes	6/13/2019
South Norwalk Reservoir Dam	CT00212	SOUTH NORWALK ELECTRIC AND WATER	Public Utility	Water Supply	Fairfield	SILVERMINE	Earth	36	1899	Satisfactory	7/19/2017	Yes	6/13/2019
Meadow Ridge Detention Dam	CT01731	REDDING LIFE CARE LLC	Private	Flood Risk Reduction	Fairfield		Earth	11		Poor	7/2/2020	Yes	9/1/2017
Hartford Reservoir #5 Dam	CT00004	METROPOLITAN DISTRICT COMMISSION	Public Utility	Water Supply	Hartford	WEST HARTFORD	Earth	24	1884	Fair	7/19/2019	No	3/10/2016
Hartford Reservoir #5 Dike	CT00004	METROPOLITAN DISTRICT COMMISSION	Public Utility		Hartford			9		Fair	7/19/2019	No	
Hartford Reservoir #6 South Dam & Dike	CT00005	METROPOLITAN DISTRICT COMMISSION	Public Utility		Hartford			14	1895	Fair	7/16/2020	No	
Island Brook Lagoon Dam	CT00073	CHARCOAL POND ASSOCIATES	Private	Recreation	Fairfield		Masonry	19		Fair	3/1/2013	No	
Jennings Pond Dam	CT00396	TOWN OF CHESTER	Local Government	Recreation	Middlesex	CHESTER	Masonry	21.5	1870	Satisfactory	11/4/2020	Yes	7/29/2019
Rockwood Lake Dam	CT00046	AQUARION WATER	Public Utility	Water Supply	Fairfield	COS COB	Concrete	36	1893	Satisfactory	8/27/2020	Yes	2/20/2017

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		COMPANY OF CONNECTICUT											
Rockwood Lake North Street Dike	CT00046	AQUARION WATER COMPANY OF CONNECTICUT	Public Utility		Fairfield	GREENWICH	Concrete	12	1893	Satisfactory	8/27/2020	Yes	4/13/2017
Fountain Lake Dam	CT00025	CITY OF ANSONIA	Local Government	Recreation	New Haven	SEYMOUR	Concrete	15	1888	Fair	5/21/2018	Yes	12/2/2017
Mad River Flood Control Dam	CT00500	CONNECTICUT DEEP	State	Flood Risk Reduction	Litchfield	WINCHESTER	Masonry	178	1963	Satisfactory		Yes	2/1/2017
Bugbee Flood Control Dam	CT00491	CONNECTICUT DEEP	State	Flood Risk Reduction	Hartford	WEST HARTFORD	Earth	20	1969	Satisfactory	4/22/2015	Yes	11/20/2015
Farmington Reservoir Dam	CT00263	TOWN OF FARMINGTON	Local Government	Recreation	Hartford	FARMINGTON	Earth	8	1895	Satisfactory	5/24/2019	Yes	7/28/2017
Grupes Reservoir Dam	CT00057	CITY OF NORWALK	Local Government	Water Supply	Fairfield	PINE HILL	Concrete	24	1871	Poor	4/17/2019	Yes	2/1/2018
Bradley Hubbard Reservoir Dam	CT00132	CITY OF MERIDEN	Local Government	Recreation	New Haven	MERIDEN	Masonry	15	1891	Satisfactory	10/11/2017	Yes	2/3/2017
Poquonnock Reservoir Dam	CT00231	CITY OF GROTON	Local Government	Water Supply	New London	GROTON	Masonry	17.5	1901	Satisfactory	1/26/2018	Yes	7/1/2017

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Upper Hart Pond Dam	CT00248	CITY OF NEW BRITAIN	Local Government	Water Supply	Hartford	BERLIN	Earth	12.5	1920	Satisfactory	11/19/2020	Yes	11/6/2020
Lake Winnemaug Dam	CT00123	TOWN OF WATERTOWN	Local Government	Recreation	Litchfield	OAKVILLE	Earth	24	1920	Satisfactory	12/2/2020	Yes	1/1/2017
Lower Hart Ponds Dam	CT00247	CITY OF NEW BRITAIN	Local Government	Water Supply	Hartford	BERLIN	Earth	18	1920	Satisfactory	11/19/2020	Yes	11/6/2020
Freshwater Pond Dam	CT00279	TOWN OF ENFIELD	Local Government	Recreation	Hartford	ENFIELD	Masonry	20	1900	Poor	4/8/2020	Yes	4/4/2019
Scoville Reservoir Dam	CT00431	NASON GROUP, LLC	Private	Recreation	Middlesex	HIGGANUM	Masonry	21	1860	Satisfactory	10/9/2019	No	6/10/2008
Quaddick Reservoir Dam	CT00184	929 RIVERSIDE DRIVE LLC	Private	Recreation	Windham	NORTH GROSVENORDAL	Earth	22.5	1900	Satisfactory	10/6/2020	Yes	8/24/1994
Lake Konomoc Dike	CT00152	CITY OF NEW LONDON	Public Utility		New London	MONTVILLE	Earth	8		Fair	10/22/2019	Yes	1/1/2019
Lake Phipps Dam #2	CT00109	LAKE PHIPPS SPECIAL TAXING DISTRICT	Local Government	Recreation	New Haven	SEA BLUFF	Concrete	16	1880	Satisfactory	5/20/2020	Yes	12/1/2016
Scoville Reservoir Dike	CT00294	Town of Wolcott	Local Government	Recreation	New Haven	WOLCOTT	Earth	15		Satisfactory	12/16/2019	Yes	8/7/2014
Mixville Pond Dam	CT00302	TOWN OF CHESHIRE	Local Government	Recreation	New Haven	MIXVILLE	Earth	13	1870	Satisfactory	11/4/2019	Yes	8/1/2017

Dam Name	NID ID	Owner Names	Owner Types	Primary Purpose	County	City	Primary Dam Type	Dam Height (Ft)	Year Completed	Condition Assessment	Condition Assessment Date	EAP Prepared	EAP Last Revision Date
Pistapaug Reservoir Dam	CT00034	TOWN OF WALLINGFORD	Local Government	Water Supply	New Haven	NORTH BRANFORD	Earth	8.4	1941	Satisfactory	11/4/2020	Yes	2/1/2017
Canoe Brook Lake East Dike	CT00082	CANOE BROOK LAKE ASSOCIATION	Private	Recreation	Fairfield		Masonry	9		Satisfactory	5/21/2020	Yes	3/10/2016
Factory Pond Dam	CT00217	GEORGETOWN LAND DEVELOPMENT CO. LLC	Private	Recreation	Fairfield	GEORGETOWN	Earth	23.5	1874	Fair	12/31/2015	Yes	9/11/2017
Mill Pond Dam	CT00423	MAINSTREAM, INC.	Private	Recreation	Middlesex	CENTERBROOK	Masonry	18	1721	Fair	9/15/2020	Yes	1/1/2017
Williams Pond Dam	CT00900	THE SOAP FACTORY	Private	Recreation	Hartford	GLASTONBURY	Concrete	17	1900	Poor	10/2/2014	Yes	8/29/2019
Shelton Reservoir #2 Dam	CT00093	CITY OF SHELTON	Local Government	Recreation	Fairfield	SHELTON	Masonry	16.3	1900	Satisfactory	9/25/2019	Yes	6/30/2016
Ellithorpe Flood Control Site #5 Dam	CT00481	CONNECTICUT DEEP	State	Flood Risk Reduction	Tolland	STAFFORD	Earth	29	1968	Fair	4/29/2015	Yes	1/1/2000
Shenipsit Flood Control Site #6 Dam	CT00482	CONNECTICUT DEEP	State	Flood Risk Reduction	Tolland	STAFFORD SPRINGS	Earth	28.5	1961	Fair	4/29/2015	Yes	12/1/2017
Ellis Flood Control Site #2	CT00478	CONNECTICUT DEEP	State	Flood Risk Reduction	Tolland	WEST STAFFORD	Earth	38	1960	Fair	4/21/2015	Yes	12/1/2017
Whiting River	CT00483	CONNECTICUT DEEP	State	Flood Risk Reduction	Litchfield	NORTH CANAAN	Earth	80	1968	Not Rated		Yes	10/15/2012

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Flood Control Dam													
Merriman Pond Dam	CT00128	TOWN OF WATERTOWN	Local Government	Recreation	Litchfield	WATERTOWN	Earth	16	1900	Satisfactory	12/2/2020	Yes	1/1/2017
Lake Chamberlain Dam	CT00306	SOUTH CENTRAL CT RWA	Public Utility	Water Supply	New Haven	WOODBRIDGE	Masonry	88	1890	Satisfactory	11/6/2019	Yes	8/21/2018
Lake Whitney Dam	CT00119	SOUTH CENTRAL CT RWA	Public Utility	Water Supply	New Haven	NEW HAVEN	Masonry	37	1861	Poor	11/6/2019	Yes	5/31/2018
Popes Pond Dam	CT00214	SOUTH NORWALK ELECTRIC AND WATER	Public Utility	Water Supply	Fairfield	WILTON	Earth	24	1965	Satisfactory	5/29/2019	Yes	6/13/2019
Ulbrich Reservoir Dam	CT00038	TOWN OF WALLINGFORD	Local Government	Water Supply	New Haven	NORTHFORD	Concrete	17	1966	Satisfactory	11/4/2020	Yes	2/1/2017
Warren Pond Dam	CT00335	AMERICAN WOOLEN CO., INC.	Private	Recreation	Tolland	STAFFORD SPRINGS	Masonry	22	1852	Fair	8/11/2015	No	3/15/1983
Upper Guilford Lakes Dam	CT00412	GUILFORD LAKES IMPROVEMENT ASSOCIATION	Private	Recreation	New Haven	GUILFORD	Masonry	12	1929	Fair	1/2/2017	Yes	1/13/2020
Roman Pond Dam	CT00798	KENYON FALLS HOMEOWNERS ASSOCIATION INC.	Private	Other	Tolland		Earth	12		Fair	3/14/2016	Yes	5/4/2018
Norfolk Brook Flood Control Dam #6	CT00485	CONNECTICUT DEEP	State	Flood Risk Reduction	Litchfield	NORFOLK	Earth	43	1966	Satisfactory	6/23/2016	Yes	10/15/2012

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Lake Gaillard Dam	CT00387	SOUTH CENTRAL CT RWA	Public Utility	Water Supply	New Haven	NORTH BRANFORD	Concrete	100	1929	Satisfactory	11/5/2019	Yes	5/21/2018
Plymouth Reservoir Dam	CT00286	TOWN OF PLYMOUTH	Public Utility	Water Supply	Litchfield	THOMASTON	Masonry	20	1881	Satisfactory	8/23/2016	Yes	1/1/2017
South Pond Dam	CT00592	MOUNT RIGA, INC.	Private	Recreation	Litchfield	SALISBURY	Earth	21	1850	Satisfactory	12/18/2014	Yes	6/28/2018
Folly Brook Dike	CT01716	CITY OF HARTFORD	Local Government	Flood Risk Reduction	Hartford		Earth	10		Not Rated		Yes	
North Meadows Dike	CT01728	CITY OF HARTFORD	Local Government	Flood Risk Reduction	Hartford		Concrete	24		Fair		Yes	
Eureka Lake Dam	CT00077	TOWN OF BETHEL	Local Government	Water Supply	Fairfield	BETHEL	Concrete	9.5	1878	Satisfactory	8/25/2020	Yes	7/1/2017
Hammonasset Dam	CT00400	SOUTH CENTRAL CT RWA	Public Utility	Water Supply	New Haven	CLINTON	Concrete	62.5	1956	Satisfactory	11/5/2019	Yes	5/31/2018
Lake Glen Dam	CT00317	SOUTH CENTRAL CT RWA	Public Utility	Water Supply	New Haven	WOODBRIDGE	Concrete	62	1907	Satisfactory	11/6/2019	Yes	5/31/2018
Pomeroy Flood Control Site #3	CT00479	CONNECTICUT DEEP	State	Flood Risk Reduction	Tolland	WEST STAFFORD	Earth	36	1960	Fair	4/21/2015	Yes	1/1/2000
Waterbury Reservoir No. 2 Dam	CT00304	CITY OF WATERBURY WATER BUREAU	Local Government	Recreation	New Haven	EAST FARMS	Masonry	22	1880	Satisfactory	11/5/2020	Yes	2/17/2017
Skating Pond Dam & Dike	CT00203	CITY OF NORWICH	Local Government	Flood Risk Reduction	New London	NORWICH	Earth	16	1968	Satisfactory	8/20/2019	Yes	1/16/2018
Wintonbury Flood Control	CT00494	CONNECTICUT DEEP	State	Flood Risk Reduction	Hartford	BLOOMFIELD	Earth	23	1963	Satisfactory	4/22/2015	Yes	12/11/2016

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Site #1 Dam													
Canoe Brook Lake West Dike	CT00082	CANOE BROOK LAKE ASSOCIATION	Private	Recreation	Fairfield	TRUMBULL	Earth	16	1870	Satisfactory	5/21/2020	Yes	3/10/2017
Packers Pond Dam	CT00578	GLUCK;PROVIDENCE & WORCESTER RAILROAD COMPANY	Private	Recreation	Windham	PACKER	Masonry	20	1880	Satisfactory	12/22/2016	Yes	1/1/2017
Riverside Pond Dam	CT00336	TTM PRINTED CIRCUIT GROUP, INC.	Private	Water Supply	Tolland	STAFFORD	Masonry	21	1880	Poor	4/6/2020	Yes	3/1/2017
Pin Shop Pond Dam	CT00127	THE OLD PIN SHOP LLC	Private	Other	Litchfield	BUNKER HILL	Earth	23	1870	Fair	9/21/2017	Yes	11/1/2017
Mercers Pond Dam	CT00068	DEER HILL PARTNERS LLP	Private	Recreation	Fairfield	DANBURY	Earth	20	1870	Satisfactory	12/4/2017	Yes	4/3/2018
Menunkatuck Reservoir Dam	CT00408	SOUTH CENTRAL CT RWA	Public Utility	Water Supply	New Haven	NORTH GUILFORD	Concrete	46	1929	Satisfactory	11/5/2019	Yes	5/21/2018
Lake Watrous Dam	CT00318	SOUTH CENTRAL CT RWA	Public Utility	Water Supply	New Haven	WOODBRIDGE	Concrete	51	1915	Satisfactory	11/6/2019	Yes	5/31/2018
Lake Bethany Dam	CT00308	SOUTH CENTRAL CT RWA	Public Utility	Water Supply	New Haven	LAKE WATROUS	Concrete	61	1892	Satisfactory	11/6/2019	Yes	5/31/2018
Lake Dawson Dam	CT00319	SOUTH CENTRAL CT RWA	Public Utility	Water Supply	New Haven	WOODBRIDGE	Concrete	50	1890	Satisfactory	11/6/2019	Yes	5/31/2018

Dam Name	NID ID	Owner Names	Owner Types	Primary Purpose	County	City	Primary Dam Type	Dam Height (Ft)	Year Completed	Condition Assessment	Condition Assessment Date	EAP Prepared	EAP Last Revision Date
Lake Saltonstall Dam	CT00115	SOUTH CENTRAL CT RWA	Public Utility	Water Supply	New Haven	EAST HAVEN	Masonry	30	1882	Satisfactory	11/5/2019	Yes	5/21/2018
Hitchcock Lake Central Ave Dam	CT00297	TOWN OF WOLCOTT	Local Government		New Haven	WOLCOTT		8	1868	Satisfactory	12/16/2019	No	
Hitchcock Lake Dam	CT00297	WOLCOTT LAND CONSERVATION TRUST	Private	Recreation	New Haven	WATERBURY	Masonry	13	1868	Fair	12/16/2019	No	
Big Pond Dam	CT00194	BIG POND PRESERVATION ASSOCIATION	Private	Recreation	Windham	SOUTH WINDHAM	Concrete	20	1870	Satisfactory	6/26/2017	Yes	
Sawmill Pond Dam	CT00627	MCGUIRE	Private	Recreation	New London	VOLUNTOWN	Masonry	15	1870	Satisfactory	7/12/2016	No	3/21/2018
South Flood Control Dam	CT00487	CONNECTICUT DEEP	State	Flood Risk Reduction	Hartford	WEST HARTFORD	Earth	30.9	1964	Satisfactory	5/1/2015	Yes	12/11/2015
Avery Flood Control Site #1 Dam	CT05000	CONNECTICUT DEEP	State	Flood Risk Reduction	Hartford	VERNON TOLLAND TPK	Earth	20	1992	Satisfactory	1/23/2015	Yes	12/1/2017
Acme Pond Dam	CT00172	GP STRATEGIES CORP;WRIGHT INVESTORS SERVICES HOLDINGS, INC.	Private	Recreation	Windham	KILLINGLY	Earth	16	1846	Satisfactory	6/30/2020	Yes	7/3/2018
Nash Pond Dam	CT00060	BRAINERD NASH AGENTS	Private	Recreation	Fairfield	SAUGATUCK	Masonry	22	1879	Satisfactory	8/16/2019	Yes	7/28/2019
Thurston Pond Dam	CT00129	CHEMTURA CORPORATION	Private	Recreation	New Haven	NAUGATUCK	Earth	20	1890	Satisfactory	3/17/2020	Yes	8/2/2017

Dam Name	NID ID	Owner Names	Owner Types	Primary Purpose	County	City	Primary Dam Type	Dam Height (Ft)	Year Completed	Condition Assessment	Condition Assessment Date	EAP Prepared	EAP Last Revision Date
Conrad Pond Yale Golf Course Dam	CT01583	YALE UNIVERSITY	Private	Recreation	New Haven	WESTVILLE	Earth	22		Poor	3/5/2019	Yes	4/25/2019
Spring Lake Dam	CT00261	SPRING LAKE CONDOMINIUMS BUILDERS	Private	Recreation	Hartford	SOUTHINGTON	Concrete	13		Satisfactory	4/2/2019	Yes	6/1/2017
Adder Reservoir	CT00139	CITY OF MIDDLETOWN	Local Government	Water Supply	Middlesex	MIDDLETOWN	Earth	28	1934	Fair	10/8/2020	Yes	11/17/2020
Black Rock Dam	CT00508	USACE - New England District	Federal	Flood Risk Reduction	Litchfield	WATERBURY	Rockfill	130	1971	Not Available		Yes	9/4/2020
Hemlock Reservoir Dam	CT00018	AQUARION WATER COMPANY OF CONNECTICUT	Public Utility	Water Supply	Fairfield	FAIRFIELD	Masonry	75	1914	Fair	8/6/2020	Yes	4/13/2017
Spaulding Pond Dike	CT00202	CITY OF NORWICH	Local Government	Other	New London	NORWICH		16	1965	Satisfactory	8/20/2019	Yes	1/16/2018
Hitchcock Lake College Place Dike	CT00297	WOLCOTT LAND CONSERVATION TRUST	Private		New Haven	WATERBURY	Earth	4.5	1868	Satisfactory	12/16/2019	No	
Sylvia's Upper Pond Dam	CT00612	BRIARPATCH LLC;GUNTHER;POLLOCK	Private	Recreation	New London	STONINGTON	Masonry	12	1870	Fair	1/30/2017	No	
Great Hill Reservior Dam	CT00087	TOWN OF SEYMOUR	Local Government	Recreation	New Haven	SHELTON	Concrete	41	1909	Poor	8/15/2019	Yes	4/1/2017
Whitney Flood Control Site #1	CT00477	CONNECTICUT DEEP	State	Flood Risk Reduction	Tolland	WEST STAFFORD	Earth	52	1962	Satisfactory	4/21/2015	Yes	12/1/2017

Dam Name	NID ID	Owner Names	Owner Types	Primary Purpose	County	City	Primary Dam Type	Dam Height (Ft)	Year Completed	Condition Assessment	Condition Assessment Date	EAP Prepared	EAP Last Revision Date
Chestnut Hill Reservoir Dam	CT00298	TOWN OF WOLCOTT	Local Government	Recreation	New Haven	WOLCOTT	Earth	37	1919	Fair	12/16/2019	Yes	8/7/2014
Danbury Dike No. 2	CT00224	FirstLight Power Services LLC	Public Utility	Hydroelectric	Fairfield	New Milford	Earth	7	1989	Not Available		Yes	12/11/2014
North Lanesville Dike	CT00224	FirstLight Power Services LLC	Public Utility	Hydroelectric	Litchfield	New Milford	Concrete	7	1929	Not Available		Yes	12/11/2014
South Lanesville Dike	CT00224	FirstLight Power Services LLC	Public Utility	Hydroelectric	Litchfield	New Milford	Concrete	20	1929	Not Available		Yes	12/11/2014
Pemberwick Dam	CT00042	FAIRFIELD ASSOCIATES CONSERVATION; GREENWICH HILLS ASSOCIATION, INC.	Private	Recreation	Fairfield	PEMBERWICK	Concrete	44	1867	Fair		No	7/1/1981
Chestnut Ridge Dam	CT00075	TOWN OF BETHEL	Local Government	Water Supply	Fairfield	BETHEL	Earth	29	1910	Satisfactory	8/25/2020	Yes	7/1/2017
Merimere Reservoir Dike	CT00252	CITY OF MERIDEN	Local Government	Water Supply	New Haven		Earth	27		Satisfactory	10/11/2017	Yes	2/3/2017
Kensington Dam	CT00250	TOWN OF BERLIN	Local Government	Recreation	Hartford	KENSINGTON	Concrete	25	1901	Satisfactory	6/2/2020	Yes	1/1/2019
Kenmere Reservoir Dam	CT00251	CITY OF MERIDEN	Local Government	Water Supply	Hartford	KENSINGTON	Earth	38	1898	Satisfactory	10/11/2017	Yes	6/6/2017
Talcott Flood	CT00490	CONNECTICUT DEEP	State	Flood Risk Reduction	Hartford	WEST HARTFORD	Earth	30	1964	Satisfactory	5/1/2015	Yes	11/20/2015

Dam Name	NID ID	Owner Names	Owner Types	Primary Purpose	County	City	Primary Dam Type	Dam Height (Ft)	Year Completed	Condition Assessment	Condition Assessment Date	EAP Prepared	EAP Last Revision Date
Control Dam #1													
Richards Corner Compensating Dam	CT00371	METROPOLITAN DISTRICT COMMISSION	Public Utility	Water Supply	Litchfield	NEW HARTFORD	Earth	75	1920	Fair	9/9/2020	Yes	7/1/2017
Padanaram Reservoir Dam	CT00067	CITY OF DANBURY	Local Government	Water Supply	Fairfield	DANBURY	Concrete	29	1883	Satisfactory	10/22/2020	Yes	2/3/2017
Willimantic Reservoir Dam	CT00198	WILLIMANTIC WATER WORKS DEPT.	Local Government	Water Supply	Windham	WILLIMANTIC	Concrete	29	1885	Satisfactory	10/8/2019	Yes	12/1/2019
Scovill Reservoir Dam	CT00294	TOWN OF WOLCOTT	Local Government	Recreation	New Haven	WOLCOTT, WATERBURY	Masonry	32	1917	Satisfactory	12/16/2019	Yes	8/7/2014
Pitch Reservoir Dam	CT00474	CITY OF WATERBURY	Local Government	Water Supply	Litchfield	WATERTOWN	Masonry	94	1944	Satisfactory	10/23/2020	Yes	2/1/2017
Rainbow Reservoir Dam	CT00039	THE FARMINGTON RIVER POWER CO.	Public Utility	Hydroelectric	Hartford	WINDSOR	Earth	42.8	1925	Satisfactory	6/26/2019	Yes	8/1/2017
Putnam Reservoir Dam	CT00041	AQUARION WATER COMPANY OF CONNECTICUT	Public Utility	Water Supply	Fairfield	GREENWICH	Concrete	35	1910	Satisfactory	8/27/2020	Yes	4/13/2017
Laurel Reservoir Dam	CT00049	AQUARION WATER COMPANY OF CONNECTICUT	Public Utility	Water Supply	Fairfield	NORTH STAMFORD	Concrete	50	1923	Satisfactory	6/11/2019	Yes	4/13/2017

Dam Name	NID ID	Owner Names	Owner Types	Primary Purpose	County	City	Primary Dam Type	Dam Height (Ft)	Year Completed	Condition Assessment	Condition Assessment Date	EAP Prepared	EAP Last Revision Date
Wasel Reservoir Dike	CT00260	CITY OF NEW BRITAIN	Local Government	Water Supply	Hartford	SOUTHINGTON	Earth	50	1966	Satisfactory	11/19/2020	Yes	11/6/2020
West Lake Reservoir Dam	CT00070	CITY OF DANBURY	Local Government	Water Supply	Fairfield	DANBURY	Earth	42	1906	Satisfactory	10/22/2020	Yes	2/3/2017
Samuel Bargh Reservoir Dam	CT00050	AQUARION WATER COMPANY OF CONNECTICUT	Public Utility	Water Supply	Fairfield	RIVERBANK	Earth	75	1955	Satisfactory	7/27/2020	Yes	4/13/2017
New Britain Reservoir Dike	CT00661	CITY OF NEW BRITAIN	Local Government	Water Supply	Hartford	SOUTHINGTON	Concrete	29	1904	Satisfactory	11/23/2020	Yes	3/23/2018
Whigville Reservoir Dam	CT00379	CITY OF NEW BRITAIN	Local Government	Water Supply	Hartford	WHIGVILLE	Masonry	58	1909	Satisfactory	11/23/2020	Yes	7/31/2018
Killingworth Reservoir Dam	CT00401	CONNECTICUT WATER COMPANY	Public Utility	Water Supply	Middlesex	KELSEYTOWN	Earth	41	1895	Satisfactory	10/30/2020	Yes	6/21/2018
Mount Higby Reservoir Dam	CT00140	CITY OF MIDDLETOWN	Local Government	Water Supply	Middlesex	MIDDLETOWN	Masonry	30	1897	Satisfactory	10/8/2020	Yes	11/17/2020
Old Marsh Pond Dam	CT00285	CITY OF BRISTOL	Public Utility	Water Supply	Litchfield	EAST PLYMOUTH	Masonry	30	1913	Satisfactory	10/18/2019	Yes	8/1/2017
Hartford Reservoir #6 East Dam	CT00005	METROPOLITAN DISTRICT COMMISSION	Public Utility	Water Supply	Hartford	WEST HARTFORD	Earth	42	1895	Fair	7/16/2020	No	3/10/2016

Dam Name	NID ID	Owner Names	Owner Types	Primary Purpose	County	City	Primary Dam Type	Dam Height (Ft)	Year Completed	Condition Assessment	Condition Assessment Date	EAP Prepared	EAP Last Revision Date
Lower Kohanza Lake Dam	CT00064	CITY OF DANBURY	Local Government	Water Supply	Fairfield	DANBURY	Earth	25	1860	Satisfactory	10/22/2020	Yes	2/3/2017
Portland Reservoir Dam	CT00149	TOWN OF PORTLAND	Local Government	Water Supply	Middlesex	PORTLAND	Earth	28	1964	Satisfactory	12/2/2020	Yes	6/21/2017
Hallmere Reservoir Dam	CT00249	CITY OF MERIDEN	Local Government	Water Supply	Hartford	KENSINGTON	Earth	45	1897	Satisfactory	9/23/2015	Yes	6/7/2017
Mystic Reservoir Dam	CT00613	AQUARION WATER COMPANY OF CONNECTICUT	Public Utility	Water Supply	New London	STONINGTON	Concrete	34	1880	Satisfactory	8/6/2020	Yes	4/13/2017
Nepaug Phelps Dam	CT00370	METROPOLITAN DISTRICT COMMISSION	Public Utility	Water Supply	Hartford	UNIONVILLE	Masonry	67	1916	Fair	6/25/2020	Yes	4/1/2017
Bloomfield Flood Control Site #3 Dam	CT00492	CONNECTICUT DEEP	State	Flood Risk Reduction	Hartford	BLOOMFIELD	Earth	29	1962	Satisfactory	4/22/2015	Yes	12/4/2015
Broad Brook Reservoir Dam	CT00301	CITY OF MERIDEN	Local Government	Water Supply	New Haven	SOUTH MERIDEN	Concrete	40	1913	Satisfactory	10/11/2017	Yes	2/3/2017
Wasel Reservoir Dam	CT00260	CITY OF NEW BRITAIN	Local Government	Water Supply	Hartford	KENSINGTON	Earth	80	1966	Fair	11/19/2020	Yes	11/6/2020
Upper Shepaug Dam	CT00634	CITY OF WATERBURY	Local Government	Water Supply	Litchfield	WOODVILLE	Earth	87	1965	Satisfactory	10/15/2020	Yes	2/1/2017
New Britain	CT00661	CITY OF NEW BRITAIN	Local Government	Water Supply	New Haven	SOUTHINGTON	Concrete	42	1904	Satisfactory	11/23/2020	Yes	3/23/2018

Dam Name	NID ID	Owner Names	Owner Types	Primary Purpose	County	City	Primary Dam Type	Dam Height (Ft)	Year Completed	Condition Assessment	Condition Assessment Date	EAP Prepared	EAP Last Revision Date
Reservoir Dam													
Mianus Filter Plant Dam	CT00040	AQUARION WATER COMPANY OF CONNECTICUT	Public Utility	Water Supply	Fairfield	NORTH MIANUS	Masonry	31	1875	Fair	8/27/2020	Yes	4/12/2017
Batterson Park Pond Dam	CT00262	CITY OF HARTFORD	Local Government	Recreation	Hartford	NEW BRITIAN	Earth	25	1878	Satisfactory	4/3/2019	Yes	12/1/2020
Belleview Lake Dam	CT00642	CITY OF WATERBURY	Local Government	Recreation	New Haven	WATERBURY	Concrete	38	1899	Satisfactory	10/15/2019	Yes	3/19/2018
Bristol Reservoir #5 Dam	CT00366	CITY OF BRISTOL	Local Government	Water Supply	Litchfield	TERRYVILLE	Earth	60	1932	Satisfactory	10/18/2019	Yes	8/1/2017
Trap Falls Reservoir Dam	CT00091	AQUARION WATER COMPANY OF CONNECTICUT	Public Utility	Water Supply	Fairfield	STRATFORD	Concrete	48	1905	Satisfactory	8/6/2020	Yes	4/12/2017
Mulberry Reservoir Dam	CT00130	CONNECTICUT WATER COMPANY	Public Utility	Water Supply	New Haven	NAUGATUCK	Earth	66	1897	Satisfactory	11/13/2020	Yes	6/21/2018
Margerie Lake Reservoir South Dam	CT00063	CITY OF DANBURY	Local Government	Water Supply	Fairfield	HAYESTOWN	Earth	28.5	1933	Satisfactory	10/22/2020	Yes	2/3/2017
Maltby No. 1 Dam	CT00111	SOUTH CENTRAL CT RWA	Public Utility	Water Supply	New Haven	WEST HAVEN	Masonry	26	1862	Satisfactory	11/7/2019	Yes	5/21/2018
Bronson E. Lockwood Dam	CT00435	WATERTOWN FIRE DISTRICT	Public Utility	Water Supply	Litchfield	MINORTOWN	Masonry	34	1958	Satisfactory	9/1/2020	Yes	2/3/2017
New Canaan	CT00055	SOUTH NORWALK	Public Utility	Water Supply	Fairfield	NEW CANAAN	Concrete	44	1898	Satisfactory	7/19/2017	Yes	6/13/2019

Dam Name	NID ID	Owner Names	Owner Types	Primary Purpose	County	City	Primary Dam Type	Dam Height (Ft)	Year Completed	Condition Assessment	Condition Assessment Date	EAP Prepared	EAP Last Revision Date
Reservoir Dam		ELECTRIC AND WATER											
East Lake Reservoir Dam	CT00066	CITY OF DANBURY	Local Government	Water Supply	Fairfield	DANBURY	Earth	47	1855	Satisfactory	10/22/2020	Yes	2/3/2017
Hartford Reservoir #3 Dam	CT00002	METROPOLITAN DISTRICT COMMISSION	Public Utility	Water Supply	Hartford	WEST HARTFORD	Earth	41	1875	Fair	7/16/2020	Yes	3/10/2016
Shuttle Meadow Reservoir Dam	CT00162	CITY OF NEW BRITAIN	Local Government	Water Supply	Hartford	NEW BRITAIN	Concrete	35	1894	Satisfactory	11/19/2020	Yes	3/23/2018
Popps Mountain Dike	CT00108	AQUARION WATER COMPANY OF CONNECTICUT	Public Utility	Water Supply	Fairfield	WESTPORT	Concrete	36	1941	Satisfactory	10/31/2019	Yes	4/13/2017
John D. Milne Lake Dam	CT00058	CITY OF NORWALK	Local Government	Water Supply	Fairfield	PINE HILL	Concrete	70	1947	Fair	7/10/2020	Yes	6/20/2018
Mad River Dam Homestead Avenue Dam	CT00030	DEANGELIS	Private	Water Supply	New Haven	WATERBURY	Concrete	31	1900	Poor		No	1/5/2005
Hartford Reservoir #3 Dike	CT00002	METROPOLITAN DISTRICT COMMISSION	Public Utility		Hartford		Earth			Fair	11/4/2014	No	
Bushy Hill Pond Dam	CT00426	INCARNATION CENTER, INC.	Private	Water Supply	Middlesex	IVORYTON	Earth	33	1871	Satisfactory	11/30/2015	No	12/17/1981
Means Brook Reservoir Dam	CT00092	AQUARION WATER COMPANY OF CONNECTICUT	Public Utility	Water Supply	Fairfield	HUNTINGTON	Concrete	47	1917	Satisfactory	8/6/2020	Yes	4/13/2017

Dam Name	NID ID	Owner Names	Owner Types	Primary Purpose	County	City	Primary Dam Type	Dam Height (Ft)	Year Completed	Condition Assessment	Condition Assessment Date	EAP Prepared	EAP Last Revision Date
Hartford Reservoir #2 Dam	CT00003	METROPOLITAN DISTRICT COMMISSION	Public Utility	Water Supply	Hartford	WEST HARTFORD	Earth	32	1869	Satisfactory	7/19/2019	No	3/10/2016
Swan Lake Dam	CT00328	SWAN LAKE ESTATES	Private	Irrigation	New Haven	OXFORD	Masonry	28	1920	Fair	11/8/2019	Yes	1/20/2017
Saville Dam	CT00376	METROPOLITAN DISTRICT COMMISSION	Public Utility	Water Supply	Litchfield	NEW HARTFORD	Concrete	135	1940	Satisfactory	6/25/2020	Yes	4/1/2017
Easton Reservoir Dam	CT00020	AQUARION WATER COMPANY OF CONNECTICUT	Public Utility	Water Supply	Fairfield	PLATTSVILLE	Concrete	123	1926	Fair	8/27/2020	Yes	4/13/2017
Converse Lake Dam	CT00044	CONVERSE LAKE ASSOCIATION	Private	Recreation	Fairfield	RIVERSVILLE	Masonry	30	1900	Poor	6/5/2018	Yes	5/1/2015
Ruben Hart Reservoir Dam	CT00096	TORRINGTON WATER COMPANY	Public Utility	Irrigation	Litchfield	DRAKEVILLE	Concrete	50	1933	Satisfactory	6/19/2019	Yes	2/3/2017
Moody Reservoir Dam	CT00305	CONNECTICUT WATER COMPANY	Public Utility	Water Supply	New Haven	NAUGATUCK	Masonry	56	1900	Satisfactory	11/13/2020	Yes	6/21/2018
South Meadows Dike	CT01709	CITY OF HARTFORD	Local Government	Flood Risk Reduction	Hartford		Earth	43		Not Rated		Yes	
Nepaug Dam	CT00370	METROPOLITAN DISTRICT COMMISSION	Public Utility	Water Supply	Litchfield	COLLINSVILLE	Concrete	113	1918	Satisfactory	8/28/2019	Yes	7/1/2017
Black Pond Dam	CT00135	CITY OF MERIDEN	Local Government	Recreation	New Haven	MERIDEN	Earth	26	1880	Satisfactory	9/4/2020	Yes	6/6/2017
Risdon Pond Dam	CT00176	LIN	Private	Water Supply	New Haven	NAUGATUCK	Masonry	27	1890	Fair		Yes	

Dam Name	NID ID	Owner Names	Owner Types	Primary Purpose	County	City	Primary Dam Type	Dam Height (Ft)	Year Completed	Condition Assessment	Condition Assessment Date	EAP Prepared	EAP Last Revision Date
Canoe Brook Lake Dam	CT00082	CANOE BROOK LAKE ASSOCIATION	Private	Recreation	Fairfield	TRUMBULL	Earth	33	1870	Satisfactory	5/21/2020	Yes	3/10/2016
Lake Forest Dam	CT00078	LAKE FOREST ASSOCIATION;RACHEL SEDGEWICK	Private	Recreation	Fairfield	BRIDGEPORT	Earth	28	1899	Satisfactory	11/18/2016	Yes	9/1/2018
Lake Harwinton Dam	CT00367	HARWINTON LAKE ASSOCIATION	Private	Recreation	Litchfield	HARWINTON	Earth	30	1930	Satisfactory	7/24/2020	Yes	8/1/2020
Goss Brook Dam	CT00465	CONNECTICUT RIVERS COUNCIL, BSA	Private	Recreation	Windham	WARRENVILLE	Earth	38.5	1963	Satisfactory	11/3/2020	Yes	6/7/2017
Pinewood Lake Dam	CT00080	PINEWOOD LAKE ASSOCIATION	Private	Recreation	Fairfield	TRUMBULL	Masonry	28	1890	Satisfactory	10/23/2020	Yes	9/30/2017
Columbia Lake Dam	CT00520	TOWN OF COLUMBIA	Local Government	Recreation	Tolland	COLUMBIA	Earth	28	1865	Satisfactory		Yes	7/17/2018
Hartford Reservoir #1 Dam	CT00001	METROPOLITAN DISTRICT COMMISSION	Public Utility	Hydroelectric	Hartford	WEST HARTFORD	Earth	46	1868	Poor	7/19/2019	No	3/10/2016
Samuel P. Senior Dam	CT00108	AQUARION WATER COMPANY OF CONNECTICUT	Public Utility	Water Supply	Fairfield	WESTPORT	Concrete	130	1941	Satisfactory	6/12/2019	Yes	4/13/2017
Hockanum Reservoir Dam	CT00620	FROMSON	Private	Recreation	Tolland	ROCKVILLE	Masonry	37	1900	Fair	11/19/2019	Yes	7/1/2020
Oxoboxo Lake Dam	CT00238	WESTROCK	Private	Recreation	New London	OAKDALE	Masonry	26	1810	Poor	12/13/2018	Yes	2/1/2017
Spaulding Pond Dam	CT00202	CITY OF NORWICH	Local Government	Flood Risk Reduction	New London	NORWICH	Earth	28	1965	Satisfactory	8/20/2019	Yes	1/16/2018

Dam Name	NID ID	Owner Names	Owner Types	Primary Purpose	County	City	Primary Dam Type	Dam Height (Ft)	Year Completed	Condition Assessment	Condition Assessment Date	EAP Prepared	EAP Last Revision Date
American Felt Dam	CT00043	1881 LIMITED LIABILITY COMPANY	Private	Recreation	Fairfield	PEMBERWICK	Concrete	37	1867	Satisfactory	7/10/2019	Yes	2/3/2017
Lake Phipps Dam #1	CT00109	LAKE PHIPPS SPECIAL TAXING DISTRICT	Local Government	Recreation	New Haven	SEA BLUFF	Masonry	29	1880	Satisfactory	5/20/2020	Yes	12/1/2016
Samp Mortar Reservoir Dam	CT00017	LAKE HILLS ASSOCIATION, INC.	Private	Recreation	Fairfield	FAIRFIELD	Concrete	29	1901	Satisfactory	8/8/2016	Yes	3/13/2018
Stevenson	CT00023	FirstLight Power Services LLC	Public Utility	Hydroelectric	Fairfield	Oxford	Concrete	103	1919	Not Available		Yes	11/5/2018
Shepaug	CT00232	FirstLight Power Services LLC	Public Utility	Hydroelectric	New Haven	Berkshire Estates	Concrete	138	1955	Not Available		Yes	1/28/2021
Hanover Pond	CT00134		Not Listed		New Haven	Meriden, Wallingford		25	2006	Not Available		Yes	8/17/2018
Middle Lanesville Dike	CT00224	FirstLight Power Services LLC	Public Utility	Hydroelectric	Litchfield	New Milford	Earth	45	1929	Not Available		Yes	12/11/2014
Goodwin	CT00541	Metropolitan District of Hartford	Local Government	Hydroelectric	Hartford	Riverton	Earth	125	1960	Not Available		Yes	12/7/2015
Lake Housatonic	CT00026	McCallum Enterprises I, Limited Partnership	Private	Hydroelectric	New Haven	Shelton	Masonry	25.2	1870	Not Available		Yes	12/14/2020
Rocky River Canal Dike	CT00224	FirstLight Power Services LLC	Public Utility	Hydroelectric	Litchfield	New Milford	Other	72	1902	Not Available		Yes	12/11/2014

Dam Name	NID ID	Owner Names	Owner Types	Primary Purpose	County	City	Primary Dam Type	Dam Height (Ft)	Year Completed	Condition Assessment	Condition Assessment Date	EAP Prepared	EAP Last Revision Date
Rocky River Main Dam	CT00224	FirstLight Power Services LLC	Public Utility	Hydroelectric	Litchfield	New Milford	Other	107	1929	Not Available		Yes	12/14/2020
Danbury Dike No. 1	CT00224	FirstLight Power Services LLC	Public Utility	Hydroelectric	Fairfield	Danbury	Earth	47	1929	Not Available		Yes	12/11/2014
Bristol Reservoir #1 Dam	CT00008	CITY OF BRISTOL	Local Government	Water Supply	Hartford		Earth	25	1885	Satisfactory	10/21/2019	Yes	8/1/2017
Hancock Brook Dam - Railroad Dike	CT00507	USACE - New England District	Federal	Flood Risk Reduction	Litchfield	WATERBURY	Earth	51	1966	Not Available		Yes	7/1/2013
Hop Brook Dam - Saddle Dike	CT00504	USACE - New England District	Federal	Flood Risk Reduction	New Haven	NAUGATUCK	Earth	33	1968	Not Available		Yes	2/10/2023
West Thompson Dam	CT00502	USACE - New England District	Federal	Flood Risk Reduction	Windham	PUTNAM	Gravity	70	1965	Not Available		Yes	4/16/2020
West Thompson Dam - Reardon Road Dike	CT00502	USACE - New England District	Federal	Flood Risk Reduction	Windham	PUTNAM	Gravity	19	1965	Not Available		Yes	4/16/2020
Hancock Brook Dam	CT00507	USACE - New England District	Federal	Flood Risk Reduction	Litchfield	WATERBURY	Earth	35	1966	Not Available		Yes	7/1/2013
Northfield Brook Dam	CT00505	USACE - New England District	Federal	Flood Risk Reduction	Litchfield	THOMASTON	Gravity	111	1965	Not Available		Yes	7/1/2013
Hop Brook Dam	CT00504	USACE - New England District	Federal	Flood Risk Reduction	New Haven	NAUGATUCK	Rockfill	89	1968	Not Available		Yes	2/10/2023

Dam Name	NID ID	Owner Names	Owner Types	Primary Purpose	County	City	Primary Dam Type	Dam Height (Ft)	Year Completed	Condition Assessment	Condition Assessment Date	EAP Prepared	EAP Last Revision Date
Mansfield Hollow Dam	CT00503	USACE - New England District	Federal	Flood Risk Reduction	Windham	WILLIMANTIC	Gravity	78	1952	Not Available		Yes	8/29/2019
Thomaston Dam	CT00501	USACE - New England District	Federal	Flood Risk Reduction	Litchfield	THOMASTON	Rockfill	137	1960	Not Available		Yes	9/30/2019
Colebrook River Dam	CT00506	USACE - New England District	Federal	Flood Risk Reduction	Litchfield	COLEBROOK	Gravity	223	1969	Not Available		Yes	1/29/2021
Colebrook River Dam - Saddle Dike	CT00506	USACE - New England District	Federal	Flood Risk Reduction	Litchfield	COLEBROOK	Rockfill	54	1969	Not Available		Yes	1/29/2021
Mansfield Hollow Dam - Dike F	CT00503	USACE - New England District	Federal	Flood Risk Reduction	Tolland	WILLIMANTIC	Gravity	78	1952	Not Available		Yes	8/29/2019
Mansfield Hollow Dam - Dike C	CT00503	USACE - New England District	Federal	Flood Risk Reduction	Tolland	WILLIMANTIC	Gravity	78	1952	Not Available		Yes	8/29/2019
Mansfield Hollow Dam - Dike D and E	CT00503	USACE - New England District	Federal	Flood Risk Reduction	Tolland	WILLIMANTIC	Gravity	78	1952	Not Available		Yes	8/29/2019
Mansfield Hollow Dam - Dike A and B	CT00503	USACE - New England District	Federal	Flood Risk Reduction	Tolland	WILLIMANTIC	Gravity	78	1952	Not Available		Yes	8/29/2019

3.9 NFIP Policies in Force

Table 24 shows NFIP Policies in Force by community in Connecticut.

Table 24. NFIP Policies in Force in Connecticut by Municipality

State	County	Community Name (Number)	Policies In Force	Total Coverage ($)	Total Written Premium + FPF ($)
CONNECTICUT	FAIRFIELD COUNTY	BETHEL, TOWN OF (090001)	67	19377000	76063
CONNECTICUT	FAIRFIELD COUNTY	BRANFORD, TOWN OF (090073)	1	250000	1397
CONNECTICUT	FAIRFIELD COUNTY	BRIDGEPORT, CITY OF (090002)	1228	266823000	1054004
CONNECTICUT	FAIRFIELD COUNTY	BROOKFIELD, TOWN OF (090003)	39	14316000	46427
CONNECTICUT	FAIRFIELD COUNTY	CLINTON, TOWN OF (090061)	16	3058000	4557
CONNECTICUT	FAIRFIELD COUNTY	DANBURY, CITY OF (090004)	184	63524000	327633
CONNECTICUT	FAIRFIELD COUNTY	DARIEN, TOWN OF (090005)	498	156012000	707611
CONNECTICUT	FAIRFIELD COUNTY	EASTON, TOWN OF (090006)	26	7903000	19669
CONNECTICUT	FAIRFIELD COUNTY	FAIRFIELD, TOWN OF (090007)	1763	499405000	2120464
CONNECTICUT	FAIRFIELD COUNTY	GREENWICH, TOWN OF (090008)	1364	429306000	1985465
CONNECTICUT	FAIRFIELD COUNTY	MONROE, TOWN OF (090009)	25	8047000	19064
CONNECTICUT	FAIRFIELD COUNTY	NEW CANAAN, TOWN OF (090010)	124	40180000	121460
CONNECTICUT	FAIRFIELD COUNTY	NEW FAIRFIELD, TOWN OF (090188)	22	6309000	21175
CONNECTICUT	FAIRFIELD COUNTY	NEWTOWN, TOWN OF (090011)	53	15804000	67738
CONNECTICUT	FAIRFIELD COUNTY	NORWALK, CITY OF (090012)	1619	451347000	2161125
CONNECTICUT	FAIRFIELD COUNTY	REDDING, TOWN OF (090141)	28	7866000	18743
CONNECTICUT	FAIRFIELD COUNTY	RIDGEFIELD, TOWN OF (090013)	55	18677000	56166
CONNECTICUT	FAIRFIELD COUNTY	SHELTON, CITY OF (090014)	195	51362000	168431
CONNECTICUT	FAIRFIELD COUNTY	SHERMAN,TOWN OF (090166)	13	3922000	9281

State	County	Community Name (Number)	Policies In Force	Total Coverage ($)	Total Written Premium + FPF ($)
CONNECTICUT	FAIRFIELD COUNTY	STAFFORD, TOWN OF (090152)	1	76000	824
CONNECTICUT	FAIRFIELD COUNTY	STAMFORD, CITY OF (090015)	1953	500635000	1851294
CONNECTICUT	FAIRFIELD COUNTY	STRATFORD, TOWN OF (090016)	1291	330291000	1229154
CONNECTICUT	FAIRFIELD COUNTY	TRUMBULL, TOWN OF (090017)	116	32426000	104242
CONNECTICUT	FAIRFIELD COUNTY	Unknown (Unknown)	2170	615138000	3455473
CONNECTICUT	FAIRFIELD COUNTY	WESTBROOK,TOWN OF (090070)	1	335000	8171
CONNECTICUT	FAIRFIELD COUNTY	WESTON, TOWN OF (090018)	96	30212000	125666
CONNECTICUT	FAIRFIELD COUNTY	WESTPORT, TOWN OF (090019)	1010	326611000	1662384
CONNECTICUT	FAIRFIELD COUNTY	WILTON, TOWN OF (090020)	138	42062000	146263
CONNECTICUT	FAIRFIELD COUNTY	WOODSTOCK, TOWN OF (090120)	1	164000	1438
CONNECTICUT	HARTFORD COUNTY	AVON, TOWN OF (090021)	74	19125000	50070
CONNECTICUT	HARTFORD COUNTY	BERLIN, TOWN OF (090022)	67	21462000	76293
CONNECTICUT	HARTFORD COUNTY	BLOOMFIELD, TOWN OF (090122)	40	12656000	43769
CONNECTICUT	HARTFORD COUNTY	BRISTOL, CITY OF (090023)	97	21364000	147694
CONNECTICUT	HARTFORD COUNTY	BURLINGTON, TOWN OF (090145)	6	1785000	3778
CONNECTICUT	HARTFORD COUNTY	CANTON, TOWN OF (090135)	23	7520000	30292
CONNECTICUT	HARTFORD COUNTY	EAST GRANBY, TOWN OF (090025)	3	675000	1621
CONNECTICUT	HARTFORD COUNTY	EAST HARTFORD, TOWN OF (090026)	261	61233000	173317
CONNECTICUT	HARTFORD COUNTY	EAST WINDSOR, TOWN OF (090027)	33	8724000	47271
CONNECTICUT	HARTFORD COUNTY	ENFIELD, TOWN OF (090028)	86	24320000	106807
CONNECTICUT	HARTFORD COUNTY	FARMINGTON, TOWN OF (090029)	52	16448000	43478
CONNECTICUT	HARTFORD COUNTY	GLASTONBURY, TOWN OF (090124)	207	39737000	175208
CONNECTICUT	HARTFORD COUNTY	GRANBY, TOWN OF (090125)	14	3545000	14164

State	County	Community Name (Number)	Policies In Force	Total Coverage ($)	Total Written Premium + FPF ($)
CONNECTICUT	HARTFORD COUNTY	HARTFORD, CITY OF (095080)	49	21392000	111466
CONNECTICUT	HARTFORD COUNTY	MANCHESTER, TOWN OF (090031)	42	12078000	48678
CONNECTICUT	HARTFORD COUNTY	MARLBOROUGH, TOWN OF (090148)	14	3187000	13123
CONNECTICUT	HARTFORD COUNTY	NEW BRITAIN, CITY OF (090032)	125	24272000	198680
CONNECTICUT	HARTFORD COUNTY	NEW HARTFORD, TOWN OF (090048)	39	8537000	11278
CONNECTICUT	HARTFORD COUNTY	NEWINGTON, TOWN OF (090033)	56	12011000	45625
CONNECTICUT	HARTFORD COUNTY	PLAINVILLE, TOWN OF (090034)	43	15282000	45912
CONNECTICUT	HARTFORD COUNTY	ROCKY HILL, TOWN OF (090142)	22	11700000	76105
CONNECTICUT	HARTFORD COUNTY	SIMSBURY, TOWN OF (090035)	44	11070000	49551
CONNECTICUT	HARTFORD COUNTY	SOUTHINGTON, TOWN OF (090037)	62	17013000	71676
CONNECTICUT	HARTFORD COUNTY	SOUTH WINDSOR, TOWN OF (090036)	39	11658000	45628
CONNECTICUT	HARTFORD COUNTY	SUFFIELD, TOWN OF (090038)	19	5474000	18303
CONNECTICUT	HARTFORD COUNTY	Unknown (Unknown)	283	73586000	501979
CONNECTICUT	HARTFORD COUNTY	WEST HARTFORD,TOWN OF (095082)	189	53391000	147450
CONNECTICUT	HARTFORD COUNTY	WETHERSFIELD, TOWN OF (090040)	70	21089000	77863
CONNECTICUT	HARTFORD COUNTY	WINDSOR LOCKS, TOWN OF (090042)	9	3351000	15356
CONNECTICUT	HARTFORD COUNTY	WINDSOR, TOWN OF (090041)	103	27047000	56749
CONNECTICUT	LITCHFIELD COUNTY	BANTAM, BOROUGH OF (090043)	1	13000	76
CONNECTICUT	LITCHFIELD COUNTY	BARKHAMSTED, TOWN OF (090134)	6	1900000	4019
CONNECTICUT	LITCHFIELD COUNTY	BETHLEHEM, TOWN OF (090178)	7	1880000	13051
CONNECTICUT	LITCHFIELD COUNTY	BRIDGEWATER, TOWN OF (090184)	4	759000	3823
CONNECTICUT	LITCHFIELD COUNTY	CANAAN, TOWN OF (090044)	5	1729000	11948
CONNECTICUT	LITCHFIELD COUNTY	COLEBROOK, TOWN OF (090180)	7	1738000	4287

State	County	Community Name (Number)	Policies In Force	Total Coverage ($)	Total Written Premium + FPF ($)
CONNECTICUT	LITCHFIELD COUNTY	CORNWALL, TOWN OF (090045)	6	1825000	6228
CONNECTICUT	LITCHFIELD COUNTY	GOSHEN, TOWN OF (090177)	15	5344000	16362
CONNECTICUT	LITCHFIELD COUNTY	HARWINTON, TOWN OF (090147)	3	868000	4036
CONNECTICUT	LITCHFIELD COUNTY	KENT, TOWN OF (090186)	15	4695000	21339
CONNECTICUT	LITCHFIELD COUNTY	LITCHFIELD, TOWN OF (090047)	19	5164000	18583
CONNECTICUT	LITCHFIELD COUNTY	MORRIS, TOWN OF (090176)	14	3749000	13066
CONNECTICUT	LITCHFIELD COUNTY	NEW HARTFORD, TOWN OF (090048)	38	7602000	55964
CONNECTICUT	LITCHFIELD COUNTY	NEW MILFORD,TOWN OF (090049)	67	16713000	148886
CONNECTICUT	LITCHFIELD COUNTY	NORFOLK, TOWN OF (090181)	2	371000	1045
CONNECTICUT	LITCHFIELD COUNTY	NORTH CANAAN, TOWN OF (090149)	29	4632000	40305
CONNECTICUT	LITCHFIELD COUNTY	PLYMOUTH, TOWN OF (090138)	21	6081000	32281
CONNECTICUT	LITCHFIELD COUNTY	ROXBURY, TOWN OF (090051)	15	4554000	18441
CONNECTICUT	LITCHFIELD COUNTY	SALISBURY, TOWN OF (090052)	32	8802000	39610
CONNECTICUT	LITCHFIELD COUNTY	SHARON, TOWN OF (090053)	20	6892000	23592
CONNECTICUT	LITCHFIELD COUNTY	SOUTHBURY, TOWN OF (090089)	1	350000	628
CONNECTICUT	LITCHFIELD COUNTY	THOMASTON, TOWN OF (090055)	2	543000	1086
CONNECTICUT	LITCHFIELD COUNTY	TORRINGTON, CITY OF (095081)	160	24171000	77858
CONNECTICUT	LITCHFIELD COUNTY	Unknown (Unknown)	124	27508000	186666
CONNECTICUT	LITCHFIELD COUNTY	WARREN, TOWN OF (090175)	15	4043000	9350
CONNECTICUT	LITCHFIELD COUNTY	WASHINGTON, TOWN OF (090057)	31	10448000	76866
CONNECTICUT	LITCHFIELD COUNTY	WATERBURY, CITY OF (090091)	1	100000	330
CONNECTICUT	LITCHFIELD COUNTY	WATERTOWN, TOWN OF (090058)	42	10746000	48575
CONNECTICUT	LITCHFIELD COUNTY	WINCHESTER, TOWN OF (090132)	41	7835000	28842

State	County	Community Name (Number)	Policies In Force	Total Coverage ($)	Total Written Premium + FPF ($)
CONNECTICUT	LITCHFIELD COUNTY	WOODBURY, TOWN OF (090133)	27	6163000	31101
CONNECTICUT	MIDDLESEX COUNTY	BROOKFIELD, TOWN OF (090003)	1	250000	672
CONNECTICUT	MIDDLESEX COUNTY	CHESTER, TOWN OF (090060)	40	11740000	66647
CONNECTICUT	MIDDLESEX COUNTY	CLINTON, TOWN OF (090061)	417	109803000	478359
CONNECTICUT	MIDDLESEX COUNTY	CROMWELL, TOWN OF (090123)	57	16021000	78378
CONNECTICUT	MIDDLESEX COUNTY	DEEP RIVER, TOWN OF (090062)	19	5260000	18549
CONNECTICUT	MIDDLESEX COUNTY	DURHAM, TOWN OF (090185)	8	2034000	5310
CONNECTICUT	MIDDLESEX COUNTY	EAST HADDAM, TOWN OF (090063)	24	6807000	40270
CONNECTICUT	MIDDLESEX COUNTY	EAST HAMPTON, TOWN OF (090064)	10	3884000	9150
CONNECTICUT	MIDDLESEX COUNTY	ESSEX, TOWN OF (090065)	51	18227000	68083
CONNECTICUT	MIDDLESEX COUNTY	FENWICK, BOROUGH OF (090187)	15	5040000	20458
CONNECTICUT	MIDDLESEX COUNTY	HADDAM, TOWN OF (090066)	31	7872000	43142
CONNECTICUT	MIDDLESEX COUNTY	KILLINGWORTH, TOWN OF (090174)	16	4861000	13906
CONNECTICUT	MIDDLESEX COUNTY	MIDDLEFIELD, TOWN OF (090067)	4	824000	2015
CONNECTICUT	MIDDLESEX COUNTY	MIDDLETOWN, CITY OF (090068)	175	45397000	195488
CONNECTICUT	MIDDLESEX COUNTY	NEW HAVEN, CITY OF (090084)	1	350000	946
CONNECTICUT	MIDDLESEX COUNTY	OLD SAYBROOK, TOWN OF (090069)	986	276533000	1211788
CONNECTICUT	MIDDLESEX COUNTY	PORTLAND, TOWN OF (090130)	33	8205000	54558
CONNECTICUT	MIDDLESEX COUNTY	Unknown (Unknown)	423	104513000	703164
CONNECTICUT	MIDDLESEX COUNTY	WESTBROOK,TOWN OF (090070)	389	112921000	594722
CONNECTICUT	NEW HAVEN COUNTY	ANSONIA, CITY OF (090071)	14	4639000	16672
CONNECTICUT	NEW HAVEN COUNTY	BEACON FALLS, TOWN OF (090072)	11	4035000	10034
CONNECTICUT	NEW HAVEN COUNTY	BETHANY, TOWN OF (090144)	4	1400000	2353

State	County	Community Name (Number)	Policies In Force	Total Coverage ($)	Total Written Premium + FPF ($)
CONNECTICUT	NEW HAVEN COUNTY	BETHEL, TOWN OF (090001)	1	350000	917
CONNECTICUT	NEW HAVEN COUNTY	BRANFORD, TOWN OF (090073)	822	217347000	1098831
CONNECTICUT	NEW HAVEN COUNTY	CHESHIRE, TOWN OF (090074)	39	11674000	29037
CONNECTICUT	NEW HAVEN COUNTY	DERBY, CITY OF (090075)	15	4552000	15500
CONNECTICUT	NEW HAVEN COUNTY	EAST HAVEN, TOWN OF (090076)	686	166839000	760227
CONNECTICUT	NEW HAVEN COUNTY	GUILFORD, TOWN OF (090077)	488	139057000	515561
CONNECTICUT	NEW HAVEN COUNTY	HAMDEN, TOWN OF (090078)	162	50651000	288503
CONNECTICUT	NEW HAVEN COUNTY	MADISON, TOWN OF (090079)	412	131930000	637211
CONNECTICUT	NEW HAVEN COUNTY	MERIDEN, CITY OF (090081)	101	29322000	217212
CONNECTICUT	NEW HAVEN COUNTY	MIDDLEBURY, TOWN OF (090080)	23	5231000	30637
CONNECTICUT	NEW HAVEN COUNTY	MILFORD, CITY OF (090082)	2089	546386000	2166719
CONNECTICUT	NEW HAVEN COUNTY	NAUGATUCK, BOROUGH OF (090137)	78	15429000	73156
CONNECTICUT	NEW HAVEN COUNTY	NEW HAVEN, CITY OF (090084)	711	185484000	951166
CONNECTICUT	NEW HAVEN COUNTY	NORTH BRANFORD, TOWN OF (090085)	72	19969000	63240
CONNECTICUT	NEW HAVEN COUNTY	NORTH HAVEN, TOWN OF (090086)	105	36433000	125929
CONNECTICUT	NEW HAVEN COUNTY	ORANGE, TOWN OF (090087)	52	14074000	57218
CONNECTICUT	NEW HAVEN COUNTY	OXFORD, TOWN OF (090150)	27	6487000	58394
CONNECTICUT	NEW HAVEN COUNTY	PROSPECT, TOWN OF (090151)	5	1750000	2783
CONNECTICUT	NEW HAVEN COUNTY	SEYMOUR, TOWN OF (090088)	31	7413000	72160
CONNECTICUT	NEW HAVEN COUNTY	SOUTHBURY, TOWN OF (090089)	40	10477000	65327
CONNECTICUT	NEW HAVEN COUNTY	STRATFORD, TOWN OF (090016)	3	750000	10046
CONNECTICUT	NEW HAVEN COUNTY	TRUMBULL, TOWN OF (090017)	1	350000	631
CONNECTICUT	NEW HAVEN COUNTY	Unknown (Unknown)	919	230720000	1497722

State	County	Community Name (Number)	Policies In Force	Total Coverage ($)	Total Written Premium + FPF ($)
CONNECTICUT	NEW HAVEN COUNTY	WALLINGFORD, TOWN OF (090090)	97	27493000	105805
CONNECTICUT	NEW HAVEN COUNTY	WATERBURY, CITY OF (090091)	88	14351000	56094
CONNECTICUT	NEW HAVEN COUNTY	WEST HAVEN, CITY OF (090092)	877	172339000	583833
CONNECTICUT	NEW HAVEN COUNTY	WOLCOTT, TOWN OF (090093)	17	3463000	18894
CONNECTICUT	NEW HAVEN COUNTY	WOODBRIDGE, TOWN OF (090153)	38	10177000	24250
CONNECTICUT	NEW LONDON COUNTY	BOZRAH, TOWN OF (090094)	2	490000	2470
CONNECTICUT	NEW LONDON COUNTY	COLCHESTER, TOWN OF (090095)	13	4767000	9648
CONNECTICUT	NEW LONDON COUNTY	EAST LYME, TOWN OF (090096)	314	94217000	329825
CONNECTICUT	NEW LONDON COUNTY	GRISWOLD, TOWN OF (090173)	11	3009000	8177
CONNECTICUT	NEW LONDON COUNTY	GROTON, CITY OF (090126)	77	21878000	136852
CONNECTICUT	NEW LONDON COUNTY	GROTON LONG POINT ASSOCIATION (090167)	215	62830000	376250
CONNECTICUT	NEW LONDON COUNTY	GROTON, TOWN OF (090097)	269	81754000	329015
CONNECTICUT	NEW LONDON COUNTY	JEWETT CITY, BOROUGH OF (090098)	1	85000	502
CONNECTICUT	NEW LONDON COUNTY	LEBANON, TOWN OF (090155)	15	4002000	13788
CONNECTICUT	NEW LONDON COUNTY	LEDYARD, TOWN OF (090157)	24	5921000	21037
CONNECTICUT	NEW LONDON COUNTY	LISBON, TOWN OF (090172)	7	1016000	8829
CONNECTICUT	NEW LONDON COUNTY	LYME, TOWN OF (090127)	31	9057000	36279
CONNECTICUT	NEW LONDON COUNTY	MONTVILLE, TOWN OF (090099)	22	5763000	15355
CONNECTICUT	NEW LONDON COUNTY	NEW LONDON, CITY OF (090100)	225	54635000	216924
CONNECTICUT	NEW LONDON COUNTY	NOANK FIRE DISTRICT (090129)	69	20734000	98288
CONNECTICUT	NEW LONDON COUNTY	NORTH STONINGTON, TOWN OF (090101)	18	5119000	14965
CONNECTICUT	NEW LONDON COUNTY	NORWICH, CITY OF (090102)	225	37735000	175673
CONNECTICUT	NEW LONDON COUNTY	OLD LYME, TOWN OF (090103)	363	105949000	425346

State	County	Community Name (Number)	Policies In Force	Total Coverage ($)	Total Written Premium + FPF ($)
CONNECTICUT	NEW LONDON COUNTY	PRESTON, TOWN OF (090139)	13	3245000	15131
CONNECTICUT	NEW LONDON COUNTY	RIDGEFIELD, TOWN OF (090013)	2	605000	2148
CONNECTICUT	NEW LONDON COUNTY	SALEM, TOWN OF (090156)	1	191000	390
CONNECTICUT	NEW LONDON COUNTY	SPRAGUE, TOWN OF (090105)	18	2905000	34124
CONNECTICUT	NEW LONDON COUNTY	STONINGTON, BOROUGH OF (090193)	160	43249000	173277
CONNECTICUT	NEW LONDON COUNTY	STONINGTON, TOWN OF (090106)	601	159218000	759988
CONNECTICUT	NEW LONDON COUNTY	Unknown (Unknown)	490	136019000	812184
CONNECTICUT	NEW LONDON COUNTY	VOLUNTOWN, TOWN OF (090143)	2	455000	1060
CONNECTICUT	NEW LONDON COUNTY	WATERFORD, TOWN OF (090107)	206	60539000	262359
CONNECTICUT	TOLLAND COUNTY	ANDOVER, TOWN OF (090161)	6	1701000	4923
CONNECTICUT	TOLLAND COUNTY	BOLTON, TOWN OF (090109)	4	1101000	3505
CONNECTICUT	TOLLAND COUNTY	COLUMBIA, TOWN OF (090160)	7	2084000	16152
CONNECTICUT	TOLLAND COUNTY	COVENTRY, TOWN OF (090110)	9	1863000	6218
CONNECTICUT	TOLLAND COUNTY	ELLINGTON, TOWN OF (090158)	9	2130000	4460
CONNECTICUT	TOLLAND COUNTY	ENFIELD, TOWN OF (090028)	1	40000	108
CONNECTICUT	TOLLAND COUNTY	HEBRON, TOWN OF (090162)	7	2167000	5950
CONNECTICUT	TOLLAND COUNTY	MANSFIELD, TOWN OF (090128)	19	4661000	21988
CONNECTICUT	TOLLAND COUNTY	SOMERS, TOWN OF (090112)	21	5296000	22962
CONNECTICUT	TOLLAND COUNTY	STAFFORD, TOWN OF (090152)	15	4652000	38486
CONNECTICUT	TOLLAND COUNTY	TOLLAND, TOWN OF (090171)	8	2425000	5658
CONNECTICUT	TOLLAND COUNTY	UNION, TOWN OF (090190)	1	164000	1689
CONNECTICUT	TOLLAND COUNTY	Unknown (Unknown)	10	2027000	10620
CONNECTICUT	TOLLAND COUNTY	VERNON, TOWN OF (090131)	24	6711000	24213

State	County	Community Name (Number)	Policies In Force	Total Coverage ($)	Total Written Premium + FPF ($)
CONNECTICUT	TOLLAND COUNTY	WILLINGTON, TOWN OF (090159)	4	732000	4918
CONNECTICUT	WINDHAM COUNTY	ASHFORD, TOWN OF (090165)	2	630000	1015
CONNECTICUT	WINDHAM COUNTY	BROOKLYN, TOWN OF (090164)	6	1528000	7315
CONNECTICUT	WINDHAM COUNTY	CANTERBURY, TOWN OF (090183)	1	85000	1428
CONNECTICUT	WINDHAM COUNTY	CHAPLIN, TOWN OF (090179)	1	350000	631
CONNECTICUT	WINDHAM COUNTY	DANIELSON, BOROUGH OF (090169)	1	175000	490
CONNECTICUT	WINDHAM COUNTY	EASTFORD, TOWN OF (090115)	5	1444000	3214
CONNECTICUT	WINDHAM COUNTY	KILLINGLY, TOWN OF (090136)	15	3882000	22445
CONNECTICUT	WINDHAM COUNTY	PLAINFIELD, TOWN OF (090116)	22	7499000	29727
CONNECTICUT	WINDHAM COUNTY	POMFRET, TOWN OF (090163)	2	700000	1160
CONNECTICUT	WINDHAM COUNTY	PUTNAM, TOWN OF (090194)	10	3372000	24539
CONNECTICUT	WINDHAM COUNTY	STERLING, TOWN OF (090118)	2	402000	3993
CONNECTICUT	WINDHAM COUNTY	THOMPSON, TOWN OF (090117)	4	1092000	3384
CONNECTICUT	WINDHAM COUNTY	Unknown (Unknown)	22	5706000	35386
CONNECTICUT	WINDHAM COUNTY	WINDHAM, TOWN OF (090119)	17	4371000	26440
CONNECTICUT	WINDHAM COUNTY	WOODSTOCK, TOWN OF (090120)	8	1620000	5823

3.11 FEMA Repetitive Loss and Severe Repetitive Loss

Table 25 shows FEMA Repetitive Loss properties by community, and Table 26 shows FEMA Severe Repetitive Loss properties by community in Connecticut.

Table 25. FEMA Repetitive Loss properties

Community	Repetitive Loss Properties	Total Losses	Total Building Payments ($)	Total Contents Payments ($)
Avon, Town Of (090021)	3	7	42073.57	3479.24
Berlin, Town Of (090022)	6	20	186301.55	93732.30
Bethel, Town Of (090001)	6	21	408330.05	114465.73
Bloomfield, Town Of (090122)	5	13	90498.94	1506
Branford, Town Of (090073)	128	317	7632409.5	915068.29
Bridgeport, City Of (090002)	111	304	6081406.92	2230451.05
Bristol, City Of (090023)	32	100	1603362.74	136489.56
Brookfield, Town Of (090003)	3	6	51583.73	31984.91
Burlington, Town Of (090145)	1	2	15080.58	0
Canton, Town Of (090135)	7	18	74665.89	21436.90
Chaplin, Town Of (090179)	1	5	29597.75	9684.17
Cheshire, Town Of (090074)	5	12	94725.24	39367.69
Chester, Town Of (090060)	6	16	403023.46	43199.9
Clinton, Town Of (090061)	60	145	4334946.6	262065.81
Columbia, Town Of (090160)	1	2	2322.66	8425.54
Cromwell, Town Of (090123)	3	7	50671.9	6725.12
Danbury, City Of (090004)	30	95	3044897.8	774626.64
Darien, Town Of (090005)	72	211	9832816.22	1969986.10
Deep River, Town Of (090062)	1	5	85241.68	14649
Derby, City Of (090075)	3	12	24329.54	10801.99
Durham, Town Of (090185)	1	2	6826.54	0
East Haddam, Town Of (090063)	9	24	272149.43	154929.99
East Hampton, Town Of (090064)	1	7	64277.71	10043.46
East Hartford, Town Of (090026)	5	16	162278.26	24154.91
East Haven, Town Of (090076)	247	860	26240251.82	2468571.45
East Lyme, Town Of (090096)	23	68	1337645.27	175032.04
Easton, Town Of (090006)	2	4	17197.11	2563.32
Enfield, Town Of (090028)	6	15	138408.65	30731.06
Essex, Town Of (090065)	5	18	133058.62	35022.67

Community	Repetitive Loss Properties	Total Losses	Total Building Payments ($)	Total Contents Payments ($)
Fairfield, Town Of (090007)	207	659	16607523.41	2294611.15
Farmington, Town Of (090029)	6	20	732954.03	84458.20
Fenwick, Borough Of (090187)	2	5	169116.90	396.86
Franklin, Town Of (090154)	2	7	39887.49	7949.23
Granby, Town Of (090125)	1	4	14146.60	8898.02
Greenwich, Town Of (090008)	145	449	14299547.51	1948877.04
Groton Long Point Association (090167)	5	13	142164.23	735.76
Groton, City Of (090126)	4	11	115988.96	9792.14
Groton, Town Of (090097)	6	18	123791.46	28574.10
Guilford, Town Of (090077)	66	174	6129874.54	694931.19
Haddam, Town Of (090066)	6	15	187423.51	29560.91
Hamden, Town Of (090078)	51	164	1586653.51	734782.20
Hartford, City Of (095080)	3	11	71092.72	82102.08
Kent, Town Of (090186)	3	8	67553.04	20214.93
Killingworth, Town Of (090174)	1	2	3021.39	2570.93
Ledyard, Town Of (090157)	3	6	34886.66	340
Litchfield, Town Of (090047)	1	3	29054.64	2402.53
Lyme, Town Of (090127)	5	12	474199.72	170031.90
Madison, Town Of (090079)	90	240	7368046.92	466613.57
Manchester, Town Of (090031)	2	4	16543.90	26660.04
Mansfield, Town Of (090128)	4	31	444073.96	108433.62
Marlborough, Town Of (090148)	1	2	6386.46	14.20
Meriden, City Of (090081)	28	74	709581.98	488893.43
Middlebury, Town Of (090080)	2	4	31194.45	0
Middletown, City Of (090068)	4	25	948318.05	319460.26
Milford, City Of (090082)	553	1647	50014815.70	4929354.22
Monroe, Town Of (090009)	1	2	10514.07	6995.38
Montville, Town Of (090099)	2	5	41711.32	1067.66
Morris, Town Of (090176)	1	3	45033.33	5623.48
New Britain, City Of (090032)	15	40	305139.3	19710.55
New Canaan, Town Of (090010)	8	25	526647.57	54907.87
New Hartford, Town Of (090048)	4	11	185626.24	17264.05
New Haven, City Of (090084)	53	126	1651343.48	695511.47
New London, City Of (090100)	17	50	1187097.24	83364.17
New Milford,Town Of (090049)	16	50	1604823.29	686493.42
Newington, Town Of (090033)	5	18	135987.06	558512.02

Community	Repetitive Loss Properties	Total Losses	Total Building Payments ($)	Total Contents Payments ($)
Newtown, Town Of (090011)	3	8	51467.98	13578.3
North Branford, Town Of (090085)	10	25	256549.91	121372.81
North Haven, Town Of (090086)	23	76	1081938.57	356702.87
North Stonington, Town Of (090101)	2	4	21063.17	15628.82
Norwalk, City Of (090012)	262	776	20768158.81	2394774.89
Norwich, City Of (090102)	21	61	657340.10	910315.16
Old Lyme, Town Of (090103)	38	91	2413048.15	210286.12
Old Saybrook, Town Of (090069)	99	254	6847360.26	1123621.78
Orange, Town Of (090087)	18	77	764825.79	260179.45
Oxford, Town Of (090150)	15	68	635657.67	110804.77
Plainville, Town Of (090034)	6	21	190168.51	28111.82
Plymouth, Town Of (090138)	3	7	124290.6	14518.13
Pomfret, Town Of (090163)	2	4	127840.44	6277.09
Portland, Town Of (090130)	6	18	403826.73	477495.43
Putnam, Town Of (090194)	1	2	5508.75	0
Ridgefield, Town Of (090013)	6	14	55370.15	15419.99
Rocky Hill, Town Of (090142)	1	3	34106	10244.16
Seymour, Town Of (090088)	1	2	2467.35	500
Shelton, City Of (090014)	22	75	1109066.73	329452.72
Simsbury, Town Of (090035)	11	48	471270.07	63664.63
South Windsor, Town Of (090036)	2	8	53208.65	29046.5
Southbury, Town Of (090089)	21	70	1428333.05	165340.13
Southington, Town Of (090037)	10	32	240665.88	330333.63
Stafford, Town Of (090152)	1	2	29560.32	10068
Stamford, City Of (090015)	132	415	14773004.22	2258873.26
Stonington, Borough Of (090193)	2	5	116965.55	24432.74
Stonington, Town Of (090106)	18	46	927259.66	100191.65
Stratford, Town Of (090016)	77	254	5467968.28	1430179.88
Thomaston, Town Of (090055)	1	2	8655.58	0
Thompson, Town Of (090117)	1	3	168286.4	36200
Tolland, Town Of (090171)	1	2	6063.45	0
Torrington, City Of (095081)	3	7	120150.08	0
Trumbull, Town Of (090017)	28	77	443029.14	146843.68
Vernon, Town Of (090131)	4	14	108769.25	66468.34
Wallingford, Town Of (090090)	12	29	241555.61	288375.55
Warren, Town Of (090175)	2	4	19514.71	0

Community	Repetitive Loss Properties	Total Losses	Total Building Payments ($)	Total Contents Payments ($)
Washington, Town Of (090057)	2	4	139189.03	17099.84
Waterbury, City Of (090091)	5	11	99602.91	19642.79
Waterford, Town Of (090107)	10	24	220123.24	3435.85
Watertown, Town Of (090058)	4	13	328278.74	331330.35
West Hartford,Town Of (095082)	37	114	868731.86	206752.85
West Haven, City Of (090092)	66	175	3184624.48	271923.02
Westbrook,Town Of (090070)	79	177	4759333.03	466429.72
Weston, Town Of (090018)	16	38	541473.77	58514.22
Westport, Town Of (090019)	248	778	21425401.93	3285656.67
Wethersfield, Town Of (090040)	7	15	78719.89	7107.03
Wilton, Town Of (090020)	16	45	780237.81	133990.71
Windsor, Town Of (090041)	2	4	26579.85	5058.57
Windsor Locks, Town Of (090042)	1	2	11877.85	0
Wolcott, Town Of (090093)	3	8	82321.70	84402.90
Woodbridge, Town Of (090153)	8	30	156609.13	80993.60
Woodbury, Town Of (090133)	1	3	24163.33	0
Woodstock, Town Of (090120)	1	2	39534.14	0

Table 26. FEMA Severe Repetitive Loss properties

Community	Severe Repetitive Loss Properties	Total Losses	Total Building Payments ($)	Total Contents Payments ($)
Berlin, town of (090022)	1	8	80379.51	31288.16
Bethel, town of (090001)	2	10	283848.56	96192.71
Branford, town of (090073)	6	41	1081332.98	233952.28
Bridgeport, city of (090002)	10	59	1468607.34	1374313.23
Bristol, city of (090023)	7	38	761186.47	23955.13
Chester, town of (090060)	1	4	33590.98	5880.50
Clinton, town of (090061)	4	15	564415.82	44308.88
Danbury, city of (090004)	8	39	1824239.51	621255.96
Darien, town of (090005)	8	40	3008678.12	506874.41
Deep river, town of (090062)	1	5	85241.68	14649
East Haddam, town of (090063)	2	10	187340.24	150219.24
East Hampton, town of (090064)	1	7	64277.71	10043.46
East Hartford, town of (090026)	1	5	68408	21395.74
East haven, town of (090076)	54	371	13558049.85	1508166.8
East Lyme, town of (090096)	2	7	97929.85	34072.19

Community	Severe Repetitive Loss Properties	Total Losses	Total Building Payments ($)	Total Contents Payments ($)
Enfield, town of (090028)	1	5	51954.29	26744.34
Fairfield, town of (090007)	29	157	4395778.69	588474.33
Farmington, town of (090029)	1	9	658974.63	70796.71
Greenwich, town of (090008)	20	104	5377885.20	880788.40
Guilford, town of (090077)	6	39	2167438.49	294948.15
Hamden, town of (090078)	4	49	1057809.08	155502.02
Hartford, city of (095080)	1	7	0	80029.08
Madison, town of (090079)	5	24	1180536.90	174115.81
Mansfield, town of (090128)	2	24	407991.81	98228.90
Meriden, city of (090081)	3	9	112648.56	152026.66
Middletown, city of (090068)	1	15	806851.20	306779.84
Milford, city of (090082)	70	342	14598695.24	1826930.26
New Canaan, town of (090010)	1	7	95404.88	18225.45
New Hartford, town of (090048)	1	5	108655.38	17264.05
New haven, city of (090084)	3	13	134128.34	25685.61
New London, city of (090100)	2	13	100050.74	9240.11
New Milford, town of (090049)	2	12	1348236.23	344843.35
Newington, town of (090033)	1	5	47518.74	280798.37
North Branford, town of (090085)	2	4	109935.04	0
North haven, town of (090086)	6	35	533434.11	247954.53
Norwalk, city of (090012)	28	128	4524074.1	1088821.09
Norwich, city of (090102)	1	6	326843.75	340697.28
Old Lyme, town of (090103)	3	16	378544.42	74728.75
Old say brook, town of (090069)	10	44	2457938.19	872374.64
Orange, town of (090087)	8	48	523214.42	187449.30
Oxford, town of (090150)	4	31	302886.44	51174.57
Plainville, town of (090034)	2	10	111070.97	8688.80
Portland, town of (090130)	2	10	355354.24	451128.89
Shelton, city of (090014)	6	33	700668.81	194595.36
Simsbury, town of (090035)	1	10	206202.75	26759.21
South Windsor, town of (090036)	1	6	45785.12	29046.50
Southbury, town of (090089)	5	27	639862.59	91495.56
Southington, town of (090037)	1	5	17809.06	32242.24
Stamford, city of (090015)	21	104	5914505.65	1475143.95
Stonington, town of (090106)	1	4	103039.29	10280.28
Stratford, town of (090016)	9	66	1757096.21	1054741.31
Trumbull, town of (090017)	3	15	182176.01	47044.64

Community	Severe Repetitive Loss Properties	Total Losses	Total Building Payments ($)	Total Contents Payments ($)
Unknown (unknown)	2	15	118933.03	120492.15
Vernon, town of (090131)	1	5	15608.40	35684.19
Wallingford, town of (090090)	1	2	69176.14	32016.78
Watertown, town of (090058)	1	5	278695.62	324169.97
West Hartford, town of (095082)	3	14	282835.08	56419.75
West haven, city of (090092)	3	33	1275626.29	39506.29
Westbrook, town of (090070)	2	4	428899.24	75989.88
Westport, town of (090019)	33	177	4285664.7	721150.68
Wilton, town of (090020)	1	6	95985.80	50435.86
Woodbridge, town of (090153)	1	6	57733.17	29549.48
Woodstock, town of (090120)	1	2	39534.14	0

3.12 Hazus Reports

See separate document.

3.13 Transportation Infrastructure

Table 27: Infrastructure assets exposed to hazards.

Transportation Infrastructure	SFHA Flood Zone	Tornado	High/Moderate Thunderstorm	Wildland Fire	Dam Failure
Roads	83%	12%	68%	29%	6%
Highways	79%	21%	81%	85%	54%
Railroads	90%	15%	65%	26%	20%
Airports	78%	18%	56%	13%	3%

3.14 Most Vulnerable Assets

The risk assessment identified the most vulnerable state-owned and -operated assets, including the assets identified in Table 28.

Table 28. Most Vulnerable State Assets

Sector	Asset	Reason	Mitigation Strategy Link
Government Facilities	State Police Firearms Training Facility (Nod Road, Simsbury, CT 06070)	The State Police Firearms Training Facility on Nod Road is located within the floodway and has a history of flooding frequently. Police officers (state and local) are required to take a certain amount of firearms training every year, and this facility is one that is constantly used for this required training. When the location floods and then becomes unusable for a certain amount of time, this presents problems for public safety when officers do not have the required training.	• Action 21: State Agency Vulnerability Assessment Project Support • Action 37: Support mitigation projects across the state • Action 48: Resilient State Facilities Initiative • Action 49: Backup power for state-owned facilities and state-owned gas stations
Government Facilities	State of Connecticut Superior Court (70 Housatonic Ave, Bridgeport, CT 06604, United States	The State of Connecticut Superior Court location along Housatonic Avenue is located within the Special Flood Hazard Area and exposed to the projected 1% annual chance floodplain with 1.8ft of sea level rise.	• Action 14: Nature-based Adaptation Strategies (related to the Housatonic River, as there are also RL and SRL properties in this area) • Action 18: Resilient Bridgeport Project Support (regarding the nearby flood risk reduction project in the South End)

Sector	Asset	Reason	Mitigation Strategy Link
			• Action 20: DEEP Climate Resilience Fund Project Support (regarding the City of Bridgeport's comprehensive climate risk and vulnerability assessment and prioritized projects list) • Action 21: State Agency Vulnerability Assessment Project Support • Action 37: Support mitigation projects across the state • Action 48: Resilient State Facilities Initiative
Government Facilities	State Capital and Legislative Office Buildings and Armory (210 Capitol Avenue, Hartford, CT 06106)	These buildings are most critical to state operations during response and recovery from disasters. Hartford has a large state government workforce. A halt in operations can affect the local economy, the impacts of which can be exacerbated by factors contributing to high social sensitivity in Hartford. Hartford has also been identified as a community disadvantaged to climate change in the federal Climate and Economic Justice Screening Tool.	• Action 20: DEEP Climate Resilience Fund Project Support (regarding the City of Hartford's citywide flooding/climate resiliency assessment and prioritized projects list) • Action 21: State Agency Vulnerability Assessment Project Support • Action 37: Support mitigation projects across the state • Action 48: Resilient State Facilities Initiative

Sector	Asset	Reason	Mitigation Strategy Link
			• Action 49: Backup power for state-owned facilities and state-owned gas stations
Government Facilities	Connecticut DOT headquarters (2800 Berlin Turnpike, Newington, CT 06111)	These buildings are most critical to state operations during response and recovery from disasters.	• Action 21: State Agency Vulnerability Assessment Project Support • Action 37: Support mitigation projects across the state • Action 48: Resilient State Facilities Initiative • Action 49: Backup power for state-owned facilities and state-owned gas stations
Government Facilities	DESPP Headquarters (1111 Country Club Road, Middletown, CT 06457)	These buildings are most critical to state operations during response and recovery from disasters.	• Action 21: State Agency Vulnerability Assessment Project Support • Action 37: Support mitigation projects across the state • Action 48: Resilient State Facilities Initiative • Action 49: Backup power for state-owned facilities and state-owned gas stations
Government Facilities	CTDEEP Marine Headquarters (333 Ferry Road,	DEEP Marine Headquarters is located along Long Island Sound where some buildings are located in the Special Flood Hazard Area and exposed to the	• Action 21: State Agency Vulnerability Assessment Project Support

Sector	Asset	Reason	Mitigation Strategy Link
	Old Lyme, CT 06371)	projected 1% annual chance floodplain with 1.8ft of sea level rise.	• Action 37: Support mitigation projects across the state • Action 48: Resilient State Facilities Initiative • Action 49: Backup power for state-owned facilities and state-owned gas stations
Government Facilities	State Data Center (Groton, CT)	The State Data Center Tier II facility provides the storage of backup and primary data for the state's computer-based systems. It may be vulnerable to flooding based on its exposure (location-identifying specifics withheld). However, it is well mitigated from most natural hazards.	• Action 21: State Agency Vulnerability Assessment Project Support • Action 37: Support mitigation projects across the state • Action 48: Resilient State Facilities Initiative • Action 49: Backup power for state-owned facilities and state-owned gas stations
Healthcare and Public Health	Connecticut Valley Hospital (87 Holmes Dr, Middletown CT, 06457)	This state-owned facility provides treatment of persons with mental health needs and persons with justice system involvement. This facility is located in the high wildland fire risk area of the Wildland Urban Interface. It was identified in River COGs Hazard Mitigation Plan as a major employer.	• Action 21: State Agency Vulnerability Assessment Project Support • Action 37: Support mitigation projects across the state • Action 48: Resilient State Facilities Initiative

Sector	Asset	Reason	Mitigation Strategy Link
			• Action 75: Integrate public health into resilience planning and emergency response
Healthcare and Public Health	UConn Health (263 Farmington Ave, Farmington, CT 06030)	This state-owned facility provides a complete range of medical and dental services, including emergency care that is critical in responding to hazard events. Areas surrounding the hospital facility are in the Wildland Urban Interface, which could impact egress from the hospital during a wildland fire event that requires evacuation.	• Action 21: State Agency Vulnerability Assessment Project Support • Action 37: Support mitigation projects across the state • Action 48: Resilient State Facilities Initiative • Action 75: Integrate public health into resilience planning and emergency response
Transportation	State Route 7	Portions of Route 7 intersect the Special Flood Hazard Area and have experienced flooding impacts. Heavy rain associated with storms in July 2023 contributed to road closures along Route 7 in Cannan, Sharon, and New Milford. A notable cause is the Housatonic River overflowing its banks.	• Action 14: Nature-based Adaptation Strategies (related to the Housatonic River, as there are also RL and SRL properties in this area) • Action 21: State Agency Vulnerability Assessment Project Support • Action 28: Integrate mitigation across plans (regrading mitigation project integration into transportation planning)

Sector	Asset	Reason	Mitigation Strategy Link
			• Action 37: Support mitigation projects across the state • Action 47: Statewide Transportation Resilience Improvement Plan • Action 64: Support evacuation route planning conducted by local governments
Transportation	Interstate 95	Portions of Interstate 95 intersect the Special Flood Hazard Area. In July 2023, heavy rain associated with storms contributed to an Interstate 95 southbound road closure at Exit 16 in Norwalk. Flooding also occurs near the section of Interstate 95 in the Long Wharf area of New Haven.	• Action 11: New Haven Long Wharf Flood Resilience • Action 21: State Agency Vulnerability Assessment Project Support • Action 28: Integrate mitigation across plans (regrading mitigation project integration into transportation planning) • Action 37: Support mitigation projects across the state • Action 47: Statewide Transportation Resilience Improvement Plan • Action 64: Support evacuation route planning conducted by local governments

Sector	Asset	Reason	Mitigation Strategy Link
Transportation	Union Station, Metro-North Commuter Railroad (50 Union Ave #3, New Haven, CT 06519)	Union Station is the largest commuter rail station in Connecticut. It services commuters coming to and from New York City and is critical to economic stability. The station floods frequently. New Haven also has medium to high social sensitivity and has been identified as a community disadvantaged to climate change in the federal Climate and Economic Justice Screening Tool.	• Action 21: State Agency Vulnerability Assessment Project Support • Action 28: Integrate mitigation across plans (regrading mitigation project integration into transportation planning) • Action 37: Support mitigation projects across the state • Action 47: Statewide Transportation Resilience Improvement Plan • Action 64: Support evacuation route planning conducted by local governments
Transportation	Bradley Airport (Schoephoester Rd, Windsor Locks, CT 06096)	While this facility is operated by The Connecticut Airport Authority, it is considered a state asset, As the largest airport in New England, besides Boston Logan, this facility is critical to commerce.	• Action 20: DEEP Climate Resilience Fund Project Support (regarding the City of Hartford's citywide flooding/climate resiliency assessment and prioritized projects list) • Action 21: State Agency Vulnerability Assessment Project Support • Action 28: Integrate mitigation across plans (regrading mitigation project integration into transportation planning)

Sector	Asset	Reason	Mitigation Strategy Link
			• Action 37: Support mitigation projects across the state • Action 47: Statewide Transportation Resilience Improvement Plan
Energy	CAS Plant (490 Capitol Avenue, Hartford, CT 06106)	This facility provides heat and air conditioning to 15 state-owned central office buildings, including the Capitol. Hartford has a large state government workforce. A halt in operations can affect the local economy and improper heating and cooling of facilities can affect workplace safety, especially during periods of extreme heat and extreme cold.	• Action 3: Comprehensive Energy Strategy (CES) • Action 20: DEEP Climate Resilience Fund Project Support (regarding the City of Hartford's citywide flooding/climate resiliency assessment and prioritized projects list) • Action 21: State Agency Vulnerability Assessment Project Support • Action 37: Support mitigation projects across the state • Action 48: Resilient State Facilities Initiative • Action 49: Backup power for state-owned facilities and state-owned gas stations

4 | Local Plan Coordination Appendix

4.1 Local Plan Analysis

See separate document.

5 | Mitigation Strategy Appendix

5.1 Progress of Hazard Mitigation Activities from 2014–2019

Table 5-2 provides a summary of the progress and status of those hazard mitigation actions included in the previous (2019) plan. This includes actions which have been carried over for implementation in 2023-2028, as noted in the table with reference to the new (2023) action number. A list of other past activities pursued for natural hazard mitigation by the State and local communities can be found in Appendix 5-3.

Table 29. Previous Mitigation Action Status Details

Heading	Description
2019 Action #	Identifies the unique number of the Action from the 2019 plan.
Action Descriptions	Provides the narrative description of the 2019 action.
Lead Agency	Names the identified lead agency and if possible, lead department, with the primary responsibility for implementation of the 2019 action.
Current Status	Status is listed as one of the following: • Completed • Ongoing/Continuous Activity • Partially Completed/In Progress • Deferred • Deleted
Current Status Description	A narrative description of the implementation status in 2023.
2019 Priority Level	Identifies high, medium, or low priority assigned to the action.
Carry Over from 2019	Lists yes or no based on if the action is carried forward into this 2023 plan.
2023 Action #	For 2019 actions carried to this plan update, this lists the current action number. It is important to recognize that some actions carried forward may have slightly revised wording from the 2019 version. This is the number listed in Table 30.

It is important to note that some previous actions, while they may be continued, have been removed as an action from the Hazard Mitigation Strategy because they are more appropriately considered ongoing program activities. These actions are described as an ongoing/continuous activity under Current Status but are not identified as a mitigation action for carry over to the 2023 plan.

Table 30. Progress in Hazard Mitigation Activities, 2019–2023

2019 Action #	Action Description	Lead Agency	Current Status	Current Status Description	2019 Priority Level	Carry Over	2023 Action Number
1	Review model ordinances and samples of higher standards language that communities can adopt into existing floodplain ordinances and building codes.	DEEP - Land and Water Resources Division / DCS	Ongoing / Continuous Activity	This action is now considered a capability. DEEP routinely updates and shares the State's model floodplain management regulations for inland and coastal communities along with other samples of higher standards and other best practices.	High	No	N/A
2	Conduct technical transfer and training associated with current extreme rainfall data.	USDA / Natural Resources Conservation Service	Ongoing / Continuous Activity	This action is now considered a capability. As extreme rainfall data becomes available it will continue to be shared by DEEP, OPM, and other supporting agencies. Transfer and training will continue as better data becomes available/evolves.	Low	No	N/A
3	Conduct technical transfer and training associated with available LiDAR data.	USDA / Natural Resources Conservation Service	Ongoing / Continuous Activity	This action is now considered a capability. New LiDAR data is being prepared and transferred through OPM and other supporting agencies. Transfer and training will continue as better data becomes available/evolves.	Low	No	N/A
4	Encourage municipalities to adopt local water use restriction ordinances to ensure that proper water conservation measures are implemented during periods of severe to extreme drought and other water emergencies, in line with the Connecticut Drought Preparedness and Response Plan. Expand the local focus on drinking water vulnerability, with a particular emphasis on private wells.	DPH / Drinking Water Section	Deferred	This has been partially completed with respect to encouraging municipalities to do this. Efforts are now underway through the Water Planning Council to revisit the concept of the model water use restriction ordinances and evaluate the best approach to promote municipal interest in such ordinances. This action is on hold for now but will remain on the WPC's agenda, with the expectation that model ordinances will eventually be drafted to work for different	High	No	N/A

2019 Action #	Action Description	Lead Agency	Current Status	Current Status Description	2019 Priority Level	Carry Over	2023 Action Number
				situations of each town (e.g., large systems, private systems, well-water, etc.)			
5	Launch an outreach campaign to promote FEMA's Community Rating System (CRS) as a means for local communities to soften the likely increase in many flood insurance policy rates resulting from new reforms to the National Flood Insurance Program (NFIP) enacted by Federal Legislation.	DEEP - Land and Water Resources Division	Partially Completed / In Progress	Some COGs have received grants to assist their communities and there have been some training courses offered through DEEP and CAFM, and DEEP continues to promote CRS when performing CAVs and CACs.	High	Yes	12
6	Encourage local hazard mitigation plans to consider continuity of agricultural operations during and following hazard events.	DESPP / Emergency Management and Homeland Security	Partially Completed / In Progress	Through discussions facilitated by CIRCA and the HMP consultant, continuity of chicken and livestock operations was specifically added to the 2023 SCCOG HMCAP. While not completed formally as described action toward this activity is underway and it will be carried forward.	Low	Yes	99
7	Communicate the importance of natural hazard mitigation to agricultural producers through the Department of Agriculture's weekly newsletter. This would consist of articles with links to useful websites such as DEEP and "ReadyAg" (available from PSU website).	DAG / Bureau of Agricultural Development & Resource Preservation / COGs / Working Lands Alliance	Deferred	No action has been completed on this, however per Executive Order 21-3, DAG has been tasked to engage stakeholders on what is needed to ensure working lands and soils in Connecticut continue to be resilient to the impacts of climate change.	Low	Yes	100
8	Develop a body of customizable presentations, social media templates, Flood Insurance factsheets and short workshop educational materials that could be utilized on a scheduled basis. While these could be developed for multiple hazards, the emphasis of this activity is on flood mitigation and climate change adaptation.	Connecticut Association of Flood Managers DEEP - Land and Water Resources Division	Completed	DEEP has developed and held trainings and webinars including to the CT Association of Floodplain Managers (CAFM).	High	No	N/A

2019 Action #	Action Description	Lead Agency	Current Status	Current Status Description	2019 Priority Level	Carry Over	2023 Action Number
9	Investigate the possibility of holding the CFM exam and CFM courses on an annual basis for interested persons.	Connecticut Association of Flood Managers	Completed	CAFM offers courses and webinars for CFM credits. The exam situation has changed, and this action is no longer needed.	Low	No	N/A
10	Develop educational tools to inform decision makers on the value of acquiring, maintaining, and increasing climatological data collection, including hydrologic (e.g., stream gage) data, and the continuation of the Land and Water Resources Division (previously OLISP) sentinel monitoring program to help provide early warning of climate change impacts. Communicate with USGS to maintain monitoring systems. This activity is linked to Activity #28.	CHMC and Water Planning Council / CIRCA	Ongoing / Continuous Activity	This action is now considered a capability. It is an ongoing effort with USGS, CIRCA, and others that will continue with the development of more tools to inform decision makers in combination with similar efforts of many agencies.	Medium	No	N/A
11	Continue to mitigate and reduce the number of repetitive loss properties. As noted in this plan, CT will do the following: – Seek Federal funds to mitigate through elevation and acquisition, RL and SRL properties – Encourage sub applicants to prioritize RL and SRL properties – As grantee, give priority to RL and SRL properties – When BCAs of RL and SRL property applications are even, priority ranking will be given to RL and SRL properties – Identify outside funding for mitigating RL and SRL properties – Continue to advocate for NRCS and State Bond Funding for mitigating RL and SRL properties – Communicate acquisition process to municipalities – Assist municipalities with Benefit Cost Analysis for RL and SRL properties	DESPP / Emergency Management & Homeland Security	Ongoing / Continuous Activity	All bulleted items are advanced by DESPP each year. This action is now considered a capability.	High	No	N/A

2019 Action #	Action Description	Lead Agency	Current Status	Current Status Description	2019 Priority Level	Carry Over	2023 Action Number
12	Develop implementation strategy for Public Act 13-15, which requires consideration of the ways in which a water pollution control project mitigates the effects of sea level rise. The Act also requires that the list of priority water quality projects include the necessity and feasibility of implementing measures designed to mitigate the impact of a rise in sea level over the projected life span of such project.	DEEP Municipal Water Pollution Control Section	Deferred	No progress has been reported but the activity will be carried forward.	Medium	Yes	62
13	Develop project category priorities for hazard mitigation funding administered by the State regardless of funding source, and then design consistent evaluation criteria to be used during application reviews for various programs as required (i.e., HMGP Administrative Plan), recognizing there will be differences in program eligibility, etc.	DESPP / Emergency Management & Homeland Security / CT Interagency Hazard Mitigation Committee	Partially Completed / In Progress	DEMHS is documenting state mitigation priorities across all products to improve the method for evaluating projects.	High	Yes	32 & 36
14	Through communications with other state agencies and communities with FEMA-approved Natural Hazard Mitigation Plans, develop a list of potential mitigation projects that can be maintained and assessed for further development upon availability of funding sources. This will also help assist in future NHMP planning by identifying when areas and facilities of concern exist and developing metrics ahead of time.	DESPP / Emergency Management & Homeland Security	Deleted	This is a good idea for local jurisdictions and regions, but it is not DEMHS's responsibility to keep a list of projects to fund when grant funding becomes available.	High	No	N/A
15	Acquire and install emergency backup generators and/or renewables and alternate energy sources at state-	DAS / Division of Construction Services	Partially Completed / In Progress	DAS provides generator backup for all larger new construction capital projects. Currently assisting DPH on providing a federally	High	Yes	49

2019 Action #	Action Description	Lead Agency	Current Status	Current Status Description	2019 Priority Level	Carry Over	2023 Action Number
	owned critical facilities and gas stations.			funded generator in Rocky Hill at the Public Health Lab.			
16	Conduct phragmites control/invasive plant control (herbicide and mowing) on state-owned land tidal and freshwater marshes to reduce fuel load and wildfire risk in tidal areas for three year period to control this invasive species. Reduce phragmites by 50% in year one; 40% in year two; 10% in year three with 100% reduction after three years.	DEEP / Bureau of Natural Resources	Deferred	No reported progress since 2019 but the activity will be carried forward through updated/revised actions focused on invasive species assessment, management, and mitigation activities.	Low	Yes	54 & 61
17	Continue to direct communities to tools to support improved local vulnerability and risk assessments to support hazard mitigation planning and the development of fundable hazard mitigation projects including RL and SRL acquisitions. Build on successful delivery of online Adaptation Resource Toolkit (ART) and maintain related training workshops.	DESPP / Emergency Management & Homeland Security	Ongoing / Continuous Activity	This activity is advanced by DESPP each year in coordination with FEMA, DEEP, CIRCA, and other state partners. This action is now considered a capability.	Medium	No	N/A
18	Convene a forum of state agencies to coordinate and evaluate gaps in policies and in climatological data, to establish priorities, and to identify strategies to secure funding for necessary enhancements. This activity is linked to Activity #10.	SAFR	Partially Completed / In Progress	Work continues on this activity through the Governor's Council on Climate Change Working Group Meetings.	Medium	Yes	63
19	Promote the capture and use of hydrologic monitoring data for improved Benefit-Cost Analysis (BCA) model population at the state and local level (e.g., high water marks, gauge data, historical damages from all events, recurrence intervals, etc.). Also, expand efforts to include similar data	DESPP / Emergency Management & Homeland Security	Deferred	No progress but the activity will be carried forward with an updated/revised description.	Medium	Yes	35

2019 Action #	Action Description	Lead Agency	Current Status	Current Status Description	2019 Priority Level	Carry Over	2023 Action Number
	for other hazards, and include the quantification of environmental benefits (according to FEMA Mitigation Policy #FP-108-024-01) to increase Benefit to Cost Ratios for eligible projects.						
20	Assist owners/operators of critical facilities, such as municipal water pollution control facilities (WPCFs), and emergency facilities, to pursue grant funds to relocate, flood proof, or otherwise protect electrical and mechanical systems to minimize or eliminate service disruption during and after potential hazard events.	DEEP- Land and Water Resources Division	Deleted	DEEP's LWRD Division does not currently provide assistance to such facilities. If such a facility does come in for permitting purposes or contacts the agency with a question, they will encourage them to pursue such funding resources; however, they do not actively "assist" such facilities in obtaining such grants.	High	No	N/A
21	Create a central repository and web-based portal dedicated to identifying and procuring funding from all available sources. This activity is linked to Activity #17 and Activity #22.	Governor's Office / OPM	Partially Completed / In Progress	Some initial work has been undertaken but OPM is still in the early stages of implementing this action.	Low	Yes	94
22	Through working with the CT IHMP Planning Team, develop a list of potential funding sources available on a state and federal level for natural hazards mitigation planning activities and projects with emphasis on RL and SRL properties. This activity is linked to Activity #21.	DESPP / Emergency Management & Homeland Security	Partially Completed / In Progress	This is a continuous refinement process and is re-evaluated annually.	Low	Yes	68
23	Assist communities and state agencies to pursue funding opportunities to develop advanced research and plans in the area of natural hazards mitigation. Planning activities included under this section would be: standalone plans which can assist in enhancing existing Natural Hazards Mitigation Plans (e.g., debris management plans, evacuation	DESPP / DEMHS	Partially Completed / In Progress	This is a continuous refinement process and is re-evaluated annually.	Low	Yes	69

2019 Action #	Action Description	Lead Agency	Current Status	Current Status Description	2019 Priority Level	Carry Over	2023 Action Number
	and sheltering plans, hazards studies and evaluations (including recommendations) which are not part of existing approved plans). Promote comprehensive inclusion and connectivity of state, regional, and local hazard mitigation planning, to help strengthen coordination and incorporation of ideas and BMPs and avoid conflicts between various planning efforts.						
24	Encourage communities to pursue funding opportunities to develop FEMA approved Natural Hazards Mitigation Plans which promote addressing RL and SRL properties as well as the integration of climate adaptation strategies with conventional hazard mitigation techniques.	DEEP	Partially Completed / In Progress	Some progress. The SCCOG HMP was transitioned into a HMCAP in 2023-2023.	High	Yes	13
25	Maintain a tracking system of submitted FEMA grant project/planning applications, to help analyze the types of projects and the mitigation needs that continue to exist within the State. This Activity is linked to Activity #27.	DESPP / Emergency Management & Homeland Security	Ongoing / Continuous Activity	This action is now considered a capability.	Low	No	N/A
26	Develop an evaluation process and implement said process to measure the results from the implementation of various activities as listed in the State NHMP.	DEEP / SAFR / CIRCA	Ongoing / Continuous Activity	This action is now considered a capability for DESPP/DEMHS.	Low	No	N/A
27	Continue planning and development of a database to assist with the storage and maintenance of risk and hazard information from local and multi-jurisdictional hazard mitigation plans. This Activity is linked to Activity #25.	DEEP / OPM	Deleted	This activity as proposed is not being done; however, OPM, CIRCA, and other entities are gaining traction in terms of developing database repositories for hazard information.	Low	No	N/A

2019 Action #	Action Description	Lead Agency	Current Status	Current Status Description	2019 Priority Level	Carry Over	2023 Action Number
28	Encourage municipalities and COGs to conduct watershed-based hydrologic and hydraulic studies to evaluate potential flood mitigation alternatives along river and stream corridors.	DEEP- Land and Water Resources Division	Deleted	With the number of active RiskMAP projects open in CT, focus has been on completing these projects instead of encouraging communities and COGs to fund such studies. Depending on the results of the active RiskMAP projects, performing this activity may be revisited in the future.	Low	No	N/A
29	Develop a system to facilitate the rapid capture, delivery, and documentation of post-storm impacts to coastal areas by local teams and citizens in the field and develop an interactive webpage or other medium for collecting flood information from the general public or other entities. This would include photos and other types of information which would be a valuable asset in documenting impacts from natural hazards, collected through various means such as social networking. Use the latest technology, such as iPads and community GIS, to support these initiatives.	DEMHS	Partially Completed / In Progress	DEMHS utilizes various online and electronic damage assessment tools/forms. Looking at implementing *Crisis Track* damage assessment software.	Medium	Yes	70
30	Upon completion of DOT's systems-level vulnerability assessment in support of the Climate Change and Extreme Weather pilot project in Litchfield County, repeat the process in the remainder of the state. This activity is linked to Activity #32.	DOT	Deleted	Removed as the proposed Statewide Transportation Resilience Improvement Plan has beensuggested as a new activity.	Low	No	N/A
31	Increase hydrologic monitoring in the state relative to precipitation, surface groundwater, and tidal gauges to enhance the statewide data collection effort and improve long term trend analysis for climate change assessments, predictive modeling and hazard mitigation.	CIRCA	Partially Completed / In Progress	Progress continues and the activity will be carried forward, but with an updated/revised description to help determine specific locations across the state where monitoring is most needed.	Low	Yes	41

2019 Action #	Action Description	Lead Agency	Current Status	Current Status Description	2019 Priority Level	Carry Over	2023 Action Number
	Communicate with USGS to maintain monitoring stations. This activity is linked with Activity #35.						
32	Develop updated/improved storm surge hazard modeling to supplement sea level rise inundation scenarios. Share this modeling with state agencies and municipalities.	CIRCA	Completed	This activity has been completed.	Medium	No	N/A
33	Use shoreline transect data to map coastal erosion zones and develop applicable outreach products.	DEEP	Partially Completed / In Progress	Partially complete (for example, in West Haven) and this action will continue as an ongoing capability as staffing and other resources allow.	Low	No	N/A
34	Continue to identify head-of-tide habitat within Connecticut and monitor the change in this habitat due to climate change through sentinel monitoring in order to determine those communities that may endure increased risk from coastal storms and associated flooding. LWRD is currently funding multiple monitoring and data synthesis projects in support of this activity.	DEEP - Land and Water Resources Division – Coastal Resources Section	Delete	Some progress has been made, but there are no plans for LWRD to pursue this activity in the next five-year planning cycle.	Low	No	N/A
35	Identify and map the locations of headwater, main stem and coastal dams, culverts, bridges, and other structures or land modifications that contribute to flood damage and act as barriers to habitat connectivity and assess the feasibility of removal or modification of these structures. This activity is linked to Activity #55.	DEEP - Land and Water Resources Division	Partially Completed / In Progress	CIRCA Grants Annually – Completed. Following GC3 recommendations: Ongoing condition assessments of certain culvert types and application for federal funding opportunities. EO 21-3 Sec. 12 directs DOT to identify culverts that need to be repaired or replaced. This action is now considered a capability.	Medium	No	N/A
36	Create a database of survey elevation points in coastal areas.	DOT	Ongoing / Continuous Activity	This is completed on an annual basis. OPM is collecting elevation/LiDAR data in 2023 and will continue doing so. This action is now considered a capability.	Medium	No	N/A

2019 Action #	Action Description	Lead Agency	Current Status	Current Status Description	2019 Priority Level	Carry Over	2023 Action Number
37	Create a literature review of various FEMA publications to be placed on CT DEEP's flood management webpage. Include a short description of the publication and a direct link for convenient downloading of the document, or a note to contact CT DEEP's Flood Management Section to obtain a copy.	DEEP - Land and Water Resources Division	Partially Completed / In Progress	Ongoing activity, however, with all the publications online through FEMA's website DEEP does not order hard copies or distribute them anymore. This activity will be carried forward with an updated/revised description.	Low	Yes	91
38	Finalize StormSmart Coasts CT site and perform outreach to encourage use by local communities and others to reduce risk.	DEEP - Land and Water Resources Division	Deleted	No action has been completed due to personnel time constraints, and there are no plans to start this initiative.	Low	No	N/A
39	In coordination with local communities, recommend categorical (e.g., wastewater, energy) and site-specific options for adaptation from the projected impacts of climate change and occurrence of natural hazards for public infrastructure (including flood protection structures). Adaptation and hazard mitigation alternatives should include the estimated costs associated with the options evaluated to be the most viable for implementation purposes.	DEEP - Land and Water Resources Division	Deferred	No reported progress since 2019 but the activity will be carried forward through updated/revised actions focused on invasive species assessment, management, and mitigation activities	Low	Yes	37
40	Encourage education and community participation in adaptation, low impact development, and flood management through existing networks and partnerships including the CT Climate Education Communication Committee. This includes coordinating LWRD's coastal community adaptation and risk mitigation work with educational place-based student experiences through CT Green Leaf in K-12 to increase	DEEP - Land and Water Resources Division	Deleted	Due to lack of staff this has not been performed yet. This activity will not be continued at this time but may be revisited in future years depending on staff capabilities and agency capacity.	Low	No	N/A

2019 Action #	Action Description	Lead Agency	Current Status	Current Status Description	2019 Priority Level	Carry Over	2023 Action Number
	participation and maximize local solutions.						
41	Develop and deliver Micro-grid Pilot Program Trainings.	DEEP / Bureau of Energy and Technology	Deferred	No reported progress since 2019 but the activity will be carried forward.	Medium	Yes	65
42	Coordinate with water utilities to more actively promote water conservation measures with their customers, especially now that new legislation allows them to recover revenue while encouraging conservation.	DPH / Drinking Water Section	Deferred	No reported progress but this action will be handled by the Water Planning Council and its member agencies (DPH, DEEP, OPM, and PURA) under existing programs. Now considered a capability versus a mitigation action.	Medium	No	N/A
43	Local School Construction Grant Program and School Safety Infrastructure Council: • Identify and assess existing public school facilities that could be impacted by natural hazards (including climate change). Correlate identified schools with the School Building Project Priority Lists; identify mitigation strategies for these projects early on in the grant process. • For new grants involving siting a new school, provide and encourage the use of an interactive web based mapping portal for local school districts to use during site selection. Encourage early coordination with DAS Environmental Planning and GIS Services Unit. • Should facilities be located within natural hazard areas, request an assessment of "no feasible or prudent alternative;" encourage higher design standards above minimum criteria for new schools or "renovated as new." • Identify long-term climate change	DAS / Office of School Facilities	Deferred	No reported progress since 2019 but the activity will be carried forward.	Medium	Yes	50

2019 Action #	Action Description	Lead Agency	Current Status	Current Status Description	2019 Priority Level	Carry Over	2023 Action Number
	adaptation strategies for each structure/facility.						
44	Sustainable State Facilities Initiative: • Identify, develop, and prioritize a plan for state facilities' potentially impacted by natural hazards (including climate change) • Assess the risks in relation to the physical structures, the agency's long-term capital planning plans, building life span, etc. • Develop specific mitigation strategies for each structure/facility as part of the plan utilizing existing hazard data, identify timeframe for implementing the strategies, and include estimated mitigation costs. • Identify long-term climate change adaptation strategies for each structure/facility.	DAS / Environmental Planning & GIS Services Unit	Deferred	This activity will be carried forward with as the Resilient State Facilities Initiative with an updated/revised description that references Executive Order 21-3:11 (State Vulnerability Assessment of state government assets and operations and climate resilience project pipeline).	High	Yes	48
45	Conduct geophysical research to investigate, classify, and map soil stability and susceptibility to liquefaction during seismic events to assist with future hazard mitigation planning efforts.	DEEP / Geological Survey	Deferred	No progress since 2019 but the activity will be carried forward.	Medium	Yes	58
46	Improve identification of escarpments susceptible to landslide and fluvial erosion risk, utilizing geologic, soils, and elevation data. This activity will provide improved landslide and mass wasting risk estimates, to produce a more comprehensive view of landscape stability during extreme weather events and subsequent impacts.	DEEP / Geological Survey	Deferred	No progress since 2019 but the activity will be carried forward.	Medium	Yes	59
47	Identify and map extent of historic underground mining operations in the	DEEP / Geological Survey	Deferred	No progress since 2019 but the activity will be carried forward.	Low	Yes	87

2019 Action #	Action Description	Lead Agency	Current Status	Current Status Description	2019 Priority Level	Carry Over	2023 Action Number
	State; assess reclamation and current land use relative to risk of land subsidence and mine collapse for the estimated 23 historic underground mining operations in Connecticut. Project deliverables will include georeferenced site maps and assessment reports, as well as a summary of current conditions and potential ground collapse hazards in these areas.						
48	Promote consumer awareness of the NFIP and private flood insurance in order to mitigate against the economic impact of natural hazards.	Insurance Department	Ongoing / Continuous Activity	CID has taken action to build resilience to sea level rise and inland flooding by promoting the increased uptake of flood insurance. This includes developing a flood insurance website for consumers that will be regularly updated, in addition to other activities to promote the NFIP and private flood insurance through increased consumer choice and education. The encouragement of private flood insurance options for consumers is now considered a capability.	Medium	No	N/A
49	Compile recent plans that include independent climate change assessments (State Water Plan [Water Planning Council] and Drinking Water Vulnerability Assessment and Resiliency Plan [CIRCA/UConn/CT DPH]) and then use the combined resources to support the action items within those plans.	SAFR	Partially Completed / In Progress	The actions in the State Water Plan and DWVARP are still being added to other plans, and there are now more recent plans than the DWVARP. For example, GC3 Phase 1 Report, Resilient CT (CIRCA), PRFCT Report, Blue Plan, 2022 Drought Plan. This activity will be carried forward with an updated/revised description and possible additional partners (DPH / Drinking Water Section recommended).	Low	Yes	93
50	Evaluate slope failure, soil erosion potential, and escarpment identification hazards in Connecticut through integrated mapping.	DEEP / State Geological Survey	Deferred	No progress since 2019 but the activity will be carried forward.	Medium	Yes	60

2019 Action #	Action Description	Lead Agency	Current Status	Current Status Description	2019 Priority Level	Carry Over	2023 Action Number
51	Support New England Seismic Network with a new technical assistance and maintenance agreement with Weston Observatory of Boston College. This will provide local expertise and rapid response to seismic events in CT.	DEEP / State Geological Survey	Deferred	No progress since 2019 but the activity will be carried forward.	Low	Yes	88
52	Integrate mitigation plan requirements and actions into other appropriate planning mechanisms such as comprehensive plans and capital improvement plans.	OPM	Partially Completed / In Progress	Some initial work has been undertaken but OPM is still in the early stages of implementing this action.	High	Yes	28
53	Support mitigation projects that will result in protection of public or private property from natural hazards. Eligible projects include but are not limited to: 1. Acquisition of flood prone property 2. Elevation of flood prone structures 3. Minor structural flood control projects 4. Relocation of structures from hazard prone areas 5. Retrofitting of existing buildings, facilities, and infrastructure 6. Retrofitting of existing building and facilities for shelter 7. Critical infrastructure protection measures 8. Stormwater management improvements 9. Advanced warning systems and hazard gauging systems (weather radios, reverse-911, stream gauges, I-flows) 10. Targeted hazard education 11. Wastewater and water supply system hardening and mitigation.	CT Interagency Hazard Mitigation Committee / DESPP/DEMHS / DEEP	Partially Completed / In Progress	This activity will be carried forward with an updated/revised description that references Public Law 21–115: An Act Concerning Climate Change Adaptation, and possible additional partners (DPH / Drinking Water Section recommended).	High	Yes	37
54	Conduct new or updated surveys of historic resources to better understand their vulnerability to natural hazards.	DECD-SHPO	Partially Completed / In Progress	Progress has been made in some communities. For example, the City of Norwich developed a local inventory of historic structures specifically with the goal of identifying resources in areas of flood risk.	Medium	Yes	51

2019 Action #	Action Description	Lead Agency	Current Status	Current Status Description	2019 Priority Level	Carry Over	2023 Action Number
				SHPO has also developed GIS assets of historic resources, which will help in future evaluations of vulnerability.			
55	Undertake a targeted outreach of owners and stewards of historic properties to reduce the vulnerability of these assets to natural hazards.	DECD-SHPO	Deferred	No progress since 2019 but the activity will be carried forward.	Low	Yes	85
56	Develop educational materials and conduct outreach to businesses throughout the state promoting toxic chemical reduction, increased safety and use of best management practices in order to increase resilience, reduce potential for pollution from chemical releases and protect public health and the environment especially during flooding events, as well as increase continuity/viability of business operations after a hazard event.	DEEP - Pollution Prevention	Completed	DEEP completed the program that they had started in 2017-2018, and actions were added to the WestCOG, NVCOG, SCRCOG, and NHCOG HMPs. More refined actions were added to the SCCOG HMCAP in 2022-2023. This activity is now considered complete, though progress will continue through local/regional HMPs and the ongoing efforts of other agencies.	Medium	No	N/A
57	Encourage COGs and municipalities to identify businesses at risk from natural hazards and promote utilizing educational materials targeted towards toxic chemical reduction, increased safety and best management practices in order to reduce contamination, mitigate impacts of natural hazards especially during flooding events, as well as increase continuity/viability of business operations after a hazard event.	DEEP - Pollution Prevention	Completed	DEEP completed the program that they had started in 2017-2018, and actions were added to the WestCOG, NVCOG, SCRCOG, and NHCOG HMPs. More refined actions were added to the SCCOG HMCAP in 2022-2023. This activity is now considered complete, though progress will continue through local/regional HMPs and the ongoing efforts of other agencies.	Medium	No	N/A
58	Through the recently institutionalized Silver Jackets initiative, identify at least one to two projects for funding annually in coordination with all members.	DESPP/ DEMHS / USACE	Partially Completed / In Progress	This is an ongoing partnership and effort between DEMHS and USGS. Recently Flood Awareness Toolkit and Flood Awareness Workshops were successful examples of implementation of Silver Jackets Projects.	Medium	Yes	71

2019 Action #	Action Description	Lead Agency	Current Status	Current Status Description	2019 Priority Level	Carry Over	2023 Action Number
59	Increase support for state-level cultural and natural resources initiatives to increase resiliency of cultural and natural resources from disasters. Expand SHPO resiliency-focused technical assistance project completed in 2018 to northern four counties.	DECD-SHPO	Partially Completed / In Progress	SHPO has developed GIS assets of historic resources, which will help in evaluation of vulnerability. SHPO's new GIS system CONNCRIS has been launched, staff is being hired, and they hope to roll out the full system shortly.	Medium	Yes	52
60	Develop standards for building nature-based solutions. This activity is linked to Activity #26.	DAS / DEEP	Deferred	Not started but this activity will be carried forward with an updated/revised description that references Executive Order 21-3, Section 22 which directs DEEP and DAS to develop guidance for state agencies on how to use nature-based solutions for flood and erosion control and stormwater management, integrate coastal marsh migration in state projects, and utilize low impact development and green infrastructure in state construction or redevelopment.	Low	Yes	24
61	Integrate considerations of Public Health into all resilience planning and emergency response. Examples of considerations include drinking water access, widespread contamination and pollution post-natural hazard event, and debris management by municipalities.	DPH / DESPP/ DEMHS	Deferred	This activity will be carried forward with changes to the lead agency and/or partners (DPH / Drinking Water Section recommended as partner if not lead).	Medium	Yes	75
62	Evaluate and improve CT emergency response planning. Considerations should include improvement of rapid communication regarding extreme events (with coordination with organizations such as NWS), quickly reopening blocked roads and evacuation routes, efficient and safe transportation to shelters, use of resilient corridors. Ensure effective	DESPP/ DEMHS / DPW / DOT	Ongoing / Continuous Activity	This is a good activity and is continually ongoing within DEMHS, but it is not necessarily a mitigation-focused activity. This action is now considered a preparedness/response capability.	Medium	No	N/A

2019 Action #	Action Description	Lead Agency	Current Status	Current Status Description	2019 Priority Level	Carry Over	2023 Action Number
	winter storm management, including snow removal and salt use. Focus on vulnerable populations in all emergency response planning.						
63	Update all state and local plans relating to hazard mitigation planning and resilience. Incorporate the latest data on hazards, climate change, land use, built environment, etc. Includes plans such as the CT Climate Preparedness Plan and the State Data Plan.	DESPP/ DEMHS / DEEP / Connecticut Data Analysis Technology Advisory Board	Partially Completed / In Progress	DEMHS continues to support mitigation planning efforts and has staff supporting multiple efforts.	High	Yes	38
64	Bedrock fracture mapping in the Plainfield and Danielson area to better characterize thesubsurface nature of the geology in the area of recent Eastern CT seismic swarm.	DEEP / State Geological Survey	Deferred	No progress since 2019 but the activity will be carried forward.	Low	Yes	89
65	Depth of unconsolidated materials mapping from LIDAR digital elevation models (depth to bedrock)	DEEP / State Geological Survey	Deferred	No progress since 2019 but the activity will be carried forward.	Low	Yes	90
66	In all state and local hazard mitigation plans and updates, include sea level rise scenarios for consideration and analysis, as required by PA 18-82. Plan mitigation efforts to include this analysis as a factor of safety.	DEMHS / COGs	Complete	Considerable progress has been made as se level rise scenarios have been incorporated into the risk assessment for this plan and all local hazard mitigation plans for coastal regions. Now a capability that will be enhanced through updated SLR guidance as required by Public Act 18-82 (and as described in 2023 Action #43).	Medium	No	N/A

5.2 Developing Mitigation Actions Handout

Connecticut Hazard Mitigation Strategy Workshop

August 7, 2023

Developing Mitigation Actions Handout

PRIORITIES

- State-owned Assets
- Vulnerable Populations and Underserved Communities
- Future Conditions and Climate Resilience
- All Natural Hazards

MITIGATION GOALS

Physical Projects

- Considering current and future conditions, protect human life and safety, public infrastructure, private property, and the environment by implementing physical hazard mitigation and climate adaptation projects that effectively and equitably reduce risk.

High Hazard Dams

- Reduce vulnerabilities to and from high hazard potential dams.

Forward-Looking Policy and Planning

- Adapt to climate change and natural hazards through forward-looking policies, plans, regulations, and programs that reduce risk and support long-term resilience.

Awareness and Education

- Increase general awareness of Connecticut's natural and climate-related hazards and promote measures available to reduce risks through educational outreach.

Capability and Capacity Building

- Enhance the capability and capacity of State agencies, regional entities, and local governments to identify vulnerabilities and risks, integrate risk reduction strategies, and implement resilience projects.

Note: Please review these goal statements and let us know if you recommend changes.

EXECUTIVE ORDERS 21-3 AND GC3

- Reduce Greenhouse Gases
- Climate Adaptation and Resilience
- Buildings and Infrastructure
- Clean Transportation
- Community Climate Resilience
- Health, Equity, and Environmental Justice
- Economic Development and Jobs

➔ Natural and Working Lands

FINAL HAZARD RANKING

Hazard	Hazard Score	Updated Hazard Score w/ Climate Weight	Hazard Ranking
Extreme Heat	2.67	3.67	High
Flood	2.65	3.55	High
Drought	2.86	3.47	Medium-High
Tropical Cyclone	3.07	3.39	Medium-High
Thunderstorm	3.01	3.01	Medium-High
Extreme Cold	2.83	2.83	Medium
Tornado	2.70	2.70	Medium
Wildland Fire	2.40	2.69	Medium
Winter Weather	2.45	2.45	Medium-Low
Sea Level Rise	2.20	2.40	Medium-Low
Dam Failure	2.24	2.24	Medium-Low
Earthquake	2.16	2.16	Medium-Low

Problem Statements

Hazard	Problem Statement
Flood	Flood events have impacted state roads, and increasing precipitation intensities due to climate change will continue to affect critical roadways. The State will need to coordinate with COGs to reduce flood impacts on major roadways.
	Aging and under designed stormwater infrastructure may be increasingly inadequate during high-intensity, short-duration (flash flooding) rainfall events.
	Changing weather patterns can increase the frequency and severity of flooding events and communities may not be educated on the consequences and appropriate preparation and response methods.
	In some cases, flood control actions taken by one COG/municipality/community can negatively impact downstream or neighboring communities.
	Storm surge is expected to increase in severity and impact more areas that have not been impacted by storm surge previously.
	State-owned buildings and critical infrastructure (including hazardous materials sites) within each COG are vulnerable to flood damage. Southeastern Connecticut COG has the most critical facilities in flood hazard areas (followed by Naugatuck Valley COG). New London County has the most state-owned buildings in flood hazard areas (followed by Litchfield).

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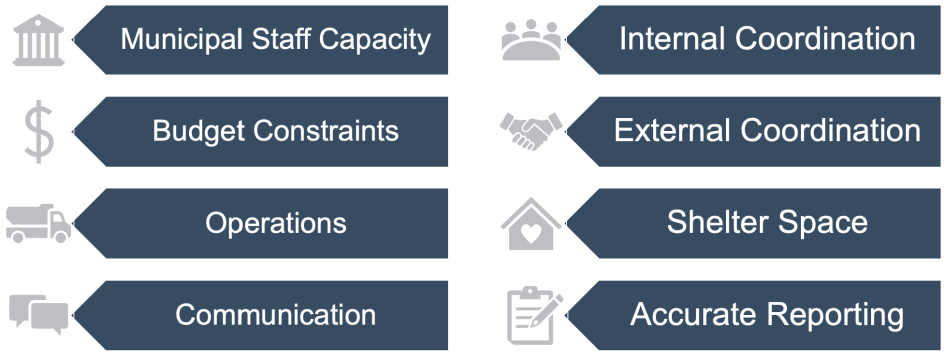
Dam Failure	Residents and business owners may not realize they are located in a dam inundation area which are often different than the 100-year floodplain. They may be impacted during a dam breach causing property and social impacts. High hazard dam inundation areas are found in the Dam's Emergency Action Plan but are not always available to the public.
	Not all dam inundation areas have been mapped for high-hazard dams within the state. There are 189 high-hazard dams in Connecticut, and 22 do not have their inundation areas mapped.
	There are 24 high-hazard potential dams without Emergency Action Plans. One (1) is owned by DEEP. Metropolitan District Commission owns many of the HHPDs without EAPs (7).
	There are high-hazard dams that have concerning condition assessment ratings. 20 HHPDs have "poor" or "unsatisfactory" condition assessments.
	Litchfield County has the most state-owned buildings in dam inundation areas, followed by Fairfield County. Capital Region COG and Naugatuck Valley COG have the most critical facilities in dam inundation areas.
Sea Level Rise	The COG regions most exposed to SLR conditions include Connecticut Metropolitan (MetroCOG), Lower Connecticut River Valley (RiverCOG), Southeastern Connecticut (SCCOG), South Central Regional (SCROG), and Western Connecticut (WestCOG). The COGs with the greatest number of critical facilities exposed to RSLR are the SCCOG and WestCOG,
	Increased awareness regarding sea level rise risk when purchasing or renting property will be needed to protect investments in the future.
Extreme Heat	Extreme heat events are expected to rise in Connecticut, especially impacting vulnerable groups such as unhoused populations and low-income households who may not have access to a cooling center. Annual days with a maximum temperature of more than 90 degrees F are projected to increase by 8 days in the near-term, 18 days by mid-century, and 44 days by late-century.
	Extreme temperatures pose a threat to public health, especially to the elderly or those with medical conditions. Groups that are more likely to live alone, move away from their families/communities, and not integrating into their neighborhoods may not have others to check in on them during a heatwave, which can be a gradual and harder-to-notice hazard.
	Electrical utility infrastructure may not be prepared to handle the increased power demands during heatwave events. Hartford and New Haven are projected to have increased population growth and have the highest heat severity. Socially vulnerable populations are expected to be impacted the worst.
	Cooling centers should be strategically located, especially in urban areas, to maximize coverage for those residents most vulnerable to heat waves. Low-income families may not have the ability to acquire or run air conditioning and may need alternative solutions to mitigate the dangers from heat waves.
	Those most vulnerable to heat waves are often the most difficult to reach with information or warnings about heat waves.

	Heat mitigation measures are not as widely known as more common projects (e.g., for flooding), and they can be harder to secure grant funding for using traditional cost-benefit approaches. Innovative approaches will need to be prioritized and socialized throughout the COGs/municipalities.
Extreme Cold	Vulnerable populations may need support seeking shelter during extreme cold events.
	COGs located along the Long Island Sound may have coastal freezing, which can interfere with the transportation of goods. It can also inhibit fishing and other maritime industries.
	DoT projects/employees may face increased risk and/or delays, along with increasing workload demands due to road damage from freezing conditions.
Winter Weather	Critical facilities may not have emergency backup power or rely on generators that will need to be refueled in 24-72 hours. Increasing demand on utility infrastrcuture may necessitate reliance on alternative energy sources (e.g., solar, backup batteries) or microgrids.
	Debris management/snow removal will likely be a tremendous challenge with the increased potential for high-intensity, short-duration snowfall events.
	Economic impacts from extreme, long-duration winter storms will stress local government resources. Expected annual loss (buildings, agriculture, and population) is expected to be highest in Western Connecticut COG, by far.
	Vulnerable population may need assistance with transportation for essential trips or to move to shelter with adequate heating.
Thunderstorm	Severe thunderstorms may endanger people and cause power outages and property damage due to lightning, flooding, and strong winds. The intensity of individual thunderstorms is projected to increase due to climate change, which may increase the severity of thunderstorm impacts. State-owned buildings and critical facilities should be built to withstand increasingly severe thunderstorm-related impacts.
	Severe thunderstorms with damaging winds and hail are frequent events in each county in Connecticut, most commonly occurring in Litchfield County.
	Cascading impacts of severe thunderstorms can have lasting, cross-jurisdictional impacts. Normal mutual-aid partners or regional resources may be unavailable or unable to support response. Utility outages will likely become a more common occurrence.
Drought	Drought may impact the quantity and quality of the water supply. Vulnerable communities, including populations relying on well water, may have difficulty accessing potable water.
	Capitol Region COG has the highest expected annual loss & highest agricultural value exposed to drought. Residents in this region may experience worse impacts due to drought conditions and may require state assistance. Increasing drought-resistant crops should be considered.
	For agricultural communities, inefficient/aging irrigation systems can waste excessive amounts of water and increase the severity of drought impacts. Older infrastructure could also be impacted by drought conditions (such as soil or substructure constriction).
	Public information campaigns should include water conservation measures.

Tropical Cyclone	Socially vulnerable populations, including those with functional needs or over the age of 65, may be more vulnerable to the effects of tropical cyclones given the financial burden and feasibility of evacuation without assistance in the case of a major storm event. Populations located in communities where access to advanced warnings and evacuation orders may not be available in their spoken language are also at a higher risk due to lack of warning time and advance preparations. Increased event frequency may lead to the public being less likely to take appropriate safety measures (e.g., evacuate) every time it's recommended.
	Flooding may impact state roads that serve as evacuation routes, prohibiting populations from evacuating during a tropical cyclone. Alternative evacuation routes should be identified and publicized.
	Strong winds may bring down trees and debris, causing damage to critical facilities and state-owned buildings. Nearly all state-owned buildings are exposed to hurricane-force winds in Connecticut. Capitol Region COG has the highest number of critical facilities exposed to hurricane-force winds.
	Areas with high population density in tropical cyclone damage areas are at a higher risk for widespread impacts. The South Central Regional COG has the greatest percentage of the population located in high tropical cyclone damage areas.
Earthquake	Earthquakes can cause severe damage to buildings and building foundations. The most important critical facilities in each region should be reviewed for their ability to withstand potential impacts to help avoid increased negative consequences and delayed recoveries. 513 critical facilities are located in areas with a history of the highest ground acceleration during shaking from an earthquake in Connecticut. 44 of the facilities are designated for hazardous materials and 74 are designated as Energy lifelines.
	People requiring short-term shelter due to an earthquake in Connecticut is estimated to be between 5,800 to over 19,300 people, depending on the specific scenario. In addition, the estimated the number of displaced households ranged from roughly 11,900 to 38,400 in total. These estimates indicate that the potential does exist for individual assistance needs such as sufficient temporary shelter accommodations, and household relocation assistance (temporary or possibly permanent relocation).
Wildland Fire	Vulnerable populations may experience higher risk due to wildland fires. Smoke can worsen health problems for people with asthma and other breathing issues. Additionally, lower income residents are less likely to be able to afford the expense of clearing vegetative fuels, evacuating, fire-proofing their homes, or rebuilding after a fire.
	Homes, businesses, and infrastructure without defensible space are most susceptible to wildland fires; this includes pumping stations and water storage tanks in wooded areas.
	Wildland fires may grow in intensity during extreme heat events and become harder to control.

	Northeastern Connecticut COG has the highest number of critical facilities located in the Wildland Urban Interface (WUI), with 91% of all critical facilities in the WUI. Northwest Hills COG has a similarly high percentage of critical facilities in the WUI, at 88%. The critical facilities in these COGs are highly vulnerable to wildland fires and should be fireproofed, relocated, or otherwise helped with a mitigation activity to reduce vulnerability.
	Residents who live in wildland fire hazard areas, or who choose to purchase property in or around the wildland-urban interface, should be informed and educated on the risks of wildland fires and methods to fireproof their properties.
Tornado	Populations located in communities without early warning systems or access to warning systems in their spoken language may be at a higher risk of tornadoes due to lack of warning time. Additionally, populations with functional needs or over the age of 65 may be at higher risk due to inability to evacuate without assistance.
	Roads and bridges can be damaged due to strong wind or debris carried by tornado wind, resulting in road closures. Road closures may impact the movement of essential goods, and impact public transportation routes. Power outages may also occur, which can cause food spoilage at grocery stores and shelters or loss of function for essential equipment at hospitals and other critical facilities.
	Naugatuck Valley COG & Capitol Region COG have the most critical facilities and populations with increased vulnerability to tornadoes. Tornado response and protection measures should be promoted among the public to protect the population in high vulnerability COGs.

LOCAL HAZARD MITIGATION PLAN - IDENTIFIED CHALLENGES



Municipal Staff Capacity – budget for tree and winter operations is sufficient, but the constraint is staffing. Limited staff to operate vehicles, especially during extreme events; few communities explicitly stated training opportunities for municipal staff, adding grant writers could be an opportunity to enhance capabilities (Powerful capability to support communities by advancing hazard mitigation actions and providing more support), more training of municipal staff is needed (only 20 towns reported having official training)

6

Budget: limited funding to upgrade culverts and address undersized drainage systems, ability to implement actions tied to financial limitations, tree trimming budget was mentioned to be insufficient to properly manage trees and no capacity to proactively manage trees

Operations: limited storage areas, sand and salt to treat ice causes drainage concerns by clogging systems, power disruption damages operations, challenge maintaining emergency vehicle access (downed trees, power lines, one-way roads, fire)

Communication: language barrier, emergency communications, power outages impacting communication capacity, CT alert system (some have issues with residents marking as spam, some subscribe but don't use it), some have their own emergency communication protocols that are often limited and affected by power outages

Internal: difficult to have different agencies agree on maintenance required to reduce flooding and other approaches, no defined schedule for culvert and drainage cleaning, opportunity to enhance capabilities by streamlining development process with a development checklist

External: face risks due to influences of hazards in other communities, coordination between staff and local utility companies, coordination with property owners to manage trees, rely on shared contractors or equipment, preparation may rely on resident buy in (educating private communities, cutting trees, fire safety, pesticide use, flood mitigation practices on property)

Limited or insufficient **shelter space**; Concerning that not all communities have designated shelters. This will become a significant issue with rising heat and extreme weather.

Lack of accurate reporting and coordination across municipal efforts: only 5 communities reported having completed CRB workshops, but more than that have completed them. Limited coordination between EOP and CIP programs and the HMP development as few communities reported having EOP and CIP programming. Limited CRS participation is reported in the local plans, some regional CRS efforts exist like in WestCOG.

POSSIBLE ACTIONS FROM THE CAPABILITY ASSESSMENT

- Make progress on GHG reduction targets recommended by the GC3.
- Make progress on climate resilience initiatives recommended by the GC3.
- Support COGS with MJ HMP update planning and coordination
    - **Host an implementation workshop with COGs and decision makers at department/agencies to identify hazard mitigation actions that can be carried forward across regions and through collaborative efforts**
    - Develop a template for local hazard mitigation updates to facilitate consolidating and rolling-up information from each plan.
    - **Work with NECOG to update MJ HMP**
- Improve regional/statewide alert & information sharing technologies
    - **Enhance capabilities of county dispatches to utilize reverse-911 technologies to alert residents to hazards. (eg. Litchfield County Dispatch)**
    - **Improve local and regional coordination for use of CT Alert**
- Make municipal staff training more accessible or conduct trainings at the state level (partner with FEMA and other organizations to host hazard mitigation trainings)

- Incorporate CCVI results into state planning and agency actions
  - **Utilize CCVI results for project prioritization, grant funding prioritization, and other activities**
  - Develop CCVI 3.0 within the next five years with new projections, improved data, improved methodology based on feedback from initial rollout
- Host a workshop around CRS and benefits of enrolling
- Environmental Justice
  - **Improve access to emergency preparedness resources and emergency facilities in underserved communities**
  - Identify opportunities for CEEJAC to engage with local communities and regions
  - Coordinate equity efforts with CIRCA Social CCVI data and CEEJAC
  - Identify vulnerable populations in towns so planners and emergency management is aware of them and can support these populations during extreme heat and weather events (ex. Elderly population, etc.)
- Funding expansion
  - Develop a list of funding sources available to towns and regions so the are aware of the financial support available to them
  - **Develop a fund to support state or municipal acquisition of at-risk properties**
  - Develop a fund to support private elevation of at-risk properties
  - Support regional collaboration for NOAA Coastal Climate Resilience Challenge
- **Improve CT DEEP dam program capabilities and funding to get ahead of dangerous dams**
- Regional and state coordination
  - **Maintain a tracking system of actions and grant pursuits to improve coordination and streamline efforts statewide.**
  - **Develop a tracking system to facilitate the documentation of storm impacts and drainage/infrastructure damages or failures.** (Some towns mentioned having this capability through DPW to track downed trees etc., but it may be beneficial to have this at the state level so the state is aware of vulnerable areas and can communicate this to communities that don't have tracking systems in place.)
- Critical facilities and infrastructure
  - Support the use of StormSmart Tree Management practices, developed by UConn, by state agencies (like DOT), utilities, and local municipalities
  - Plan emergency routes, utilizing best available climate projections
- Railroad Resilience
  - **Coordinate with rail companies to promote resilience, both by reducing risks to railroad infrastructure, and by reducing the impacts of railroads of local hazard exposure (such as underpass flooding).**
  - Support exploration of inland realignment of coastal railroad infrastructure.
- Climate data and knowledge
  - **Update CIRCA climate change projections and expand the scope of projections to better capture future risks from drought, wildfire, and other hazards.**

8

- Municipal Support
  - Identify grant opportunities for towns that lack municipal staff, budget, and equipment to properly manage damage from extreme weather events – many town's rely on shared equipment or do not have enough staff to operate equipment
  - **Develop a statewide grantwriting support grant, similar to recent Long Island Sound programs**
- State building and zoning regulations
  - Develop a regulatory/permit checklist template for municipalities to use to streamline the development process and provide overview of relevant regulations and requirements for developers
  - Create incentives for communities to register for the Sustainable CT program or make progress towards certification.
- Shelter space
  - Encourage communities to create new or upgrade existing shelter spaces so that there is enough capacity for residents in the area or identify opportunities to work with neighboring communities for shelter space
  - **Establish state-run emergency shelters and heating/cooling centers in communities lacking sufficient facilities.**
  - **Coordinate with local communities to create green corridors and increase street tree coverage on State Roads.**
- Drought: Conduct a workshop with local / regional water suppliers on Drought Management and response plans based on recent State Drought Plan
- Public Engagement and Outreach
  - Identify responsible department or agency responsible for sharing educational materials with towns or general public about natural hazards and mitigation actions
  - Conduct public outreach and provide educational opportunities to State agencies, local communities, and other stakeholders on existing natural hazards and the mitigation measures available to reduce hazard risks, including new data from DEEP and CIRCA.
- **Increase capacity of DEEP to conduct RLP inventories and outreach**
- **Revisit findings of SHPO Historic Resource Resilience study and advance/implement**
- **Develop a statewide forest fire mitigation and emergency response plan that considers projected climate change impacts over the coming decade.**
- **Support conversion of brownfields to open space in hazard areas to balance economic pressure to redevelop areas as residential uses, increasing population levels in hazard zones.**

TYPES OF MITIGATION ACTIONS

Plans & Regulations: government authorities, policies, or codes that encourage risk reduction. This may include building codes, state planning regulations, or planning studies.

Structure & Infrastructure Projects: build or modify structures and infrastructure in ways that reduce the impact of hazards.

Natural Systems Protection Projects: minimize losses while also preserving or restoring the function of natural systems.

Education & Awareness Programs: long-term, sustained efforts to inform and educate people about hazards and mitigation options. This could also include training.

Capability and Capacity Building: improve or expand the resources needed to reduce risk and support resilience. This may include people, partnerships, data, funding, etc.

10

ACTION PRIORITIZATION CRITERIA

Prioritization Category	Qualification	Points
Hazard Ranking	What level of risk does the action provide protection against?	High = 4 Medium-High =3 Medium = 2 Medium-Low =1 Low = 0
Estimated Cost	How much will the action cost to implement?	No monetary cost (staff time or in-kind resources) = 4 Low (under $250,000) = 3 Medium ($250,000-$500,000) = 2 High ($500,000 - $1 million) = 1 Very High (Over $1 million) = 0
Life/Safety	How effective is the action at protecting lives and mitigating injuries resulting from the targeted hazard(s)?	Major Support = 3 Moderate Support = 2 Minor Support = 1 None = 0
Equitable Outcomes	Will the action benefit socially vulnerable populations or underserved communities?	Direct Support = 3 Indirect Support = 2 No Support = 0
Protection of Critical Facilities or Infrastructure	Does the action directly protect critical facilities or infrastructure?	Yes = 2 No = 0
Protection of Natural Resources	Does the action protect natural resources?	Yes = 2 No = 0
Alignment with Executive Orders	Does the action align with Executive Orders 21-3 or GC3?	Yes = 2 No = 0
Supports Local Mitigation Efforts	Does the action advance strategies identified in regional/local hazard mitigation plans?	Yes = 2 No = 0
Implementation Timeline	How long will it take for the action to yield benefits from the start of implementation efforts?	1-2 Years = 3 3-4 Years = 2 5 or More Years = 1

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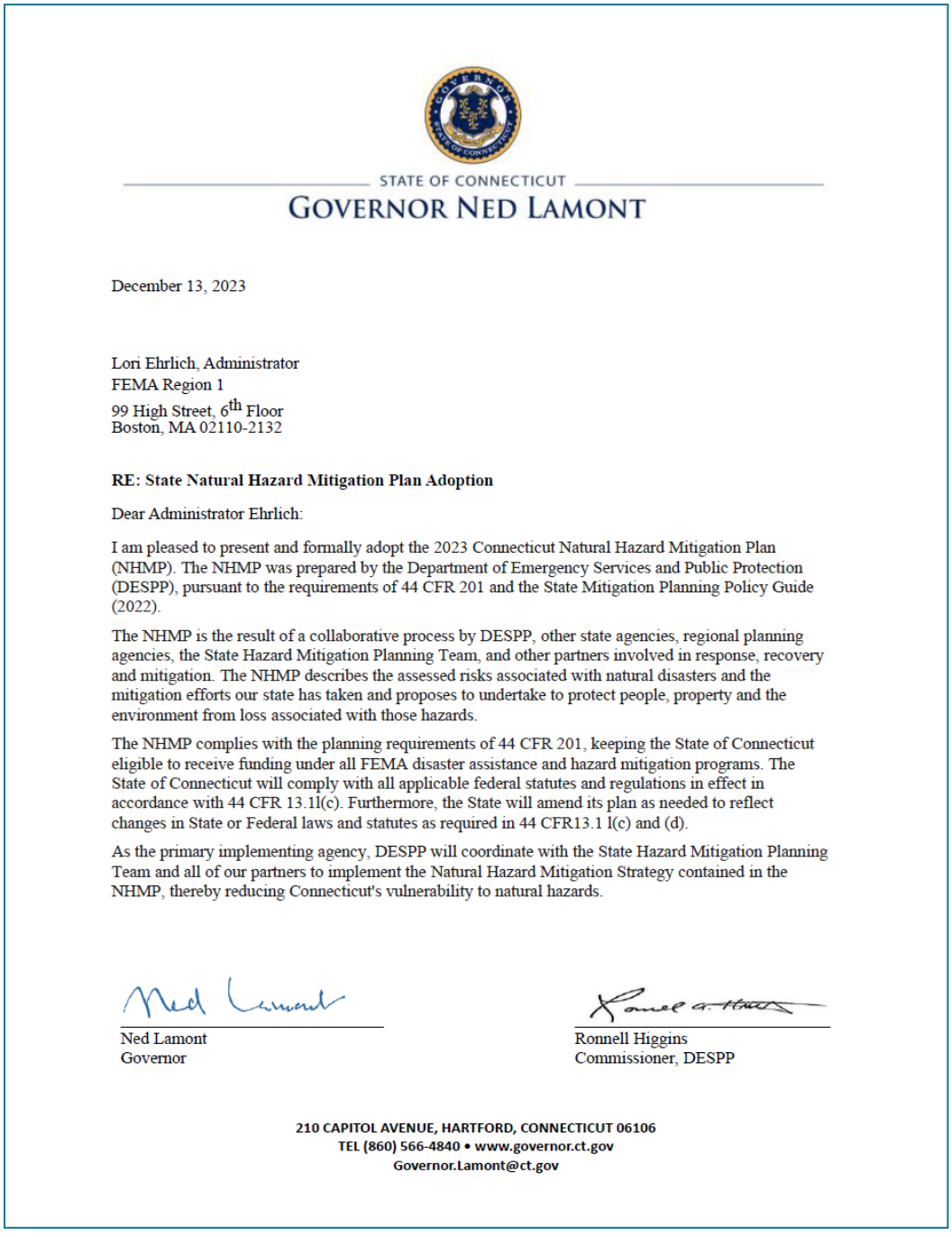
5.3 Suggestions from COGs & Municipalities Breakout Group

Action Title	Action Description
Invasive Species Impact Assessment	Evaluate the impact of invasive species on natural hazard exposure (such as increased risk of treefall due to invasive insects, increased risk of flooding due to invasive plants) as well as invasive species as a natural hazard in of themselves (for examples, invasive insects carrying disease) to better guide mitigation activities.
Invasive Species Management and Mitigation	Compile a comprehensive list of both terrestrial and aquatic invasive species that pose threats t the state's ecosystems, economy, and public health. Develop protocols for early detection, rapic response, and long-term management of these species. Collaborate with relevant agencies, organizations, and experts to establish monitoring programs and implement control measures. Integrate invasive species management into the overall hazard mitigation strategy to safeguard the environment and its resilience to future threats.
Invasive Species PSAs	Implement a targeted public service announcement (PSA) campaign to raise awareness and promote responsible aquatic and wood transport practices. This action aims to prevent the spread of invasive species, protecting the state's ecosystems, water bodies, and forests from potential threats.
Municipal Capacity Support	Provide non-competitive, accessible grant opportunities or direct technical assistance to municipalities to support municipal capacity. Support initiatives may include: - Grant-writing support for state and federal grants - Grant management support - Support for municipal staff recruitment - Coordination for shared positions between municipalities - Increasing participation of Resident State Troopers in local and regional resilience planning
Private Property Flood Mitigation	Develop a comprehensive program targeting flood mitigation of private properties. Aspects may include: - Create a user-friendly guide that educates property owners about available state and federal programs for flood mitigation, including options for elevation and relocation of structures. - Conduct a study to quantify the historic and potential future economic impact of lost tax revenue from flood damages to private property - Establish a regional services grant to assist property owners to undertake flood mitigation measures. - Establish a grant program to support private property elevation. - Conduct private property buyouts and conversion to open space (or supporting municipal buy out programs)
Tree Management	Collaborate with utility companies, arborists, urban planners, and local communities to develop and implement effective tree management practices that balance the benefits of trees with the need to protect critical infrastructure like power lines and roadways. Expanding the use of the UConn "Stormwise Forest Management" approach may help accomplish this action.
Private Trees	Implement regulatory, procedural, or programmatic changes to reduce the ability of private property owners to prevent state, municipal, or utility maintenance of dangerous trees located on private property.
Reduce Risks of Pipe Freezing	Mitigate risks of pipes freezing during winter power outages. Actions may include: - Public Education campaigns about preventing pipe bursts - Require piping be routed through interior rather than exterior walls through the building code

Action Title	Action Description
GridEx Actions	Implement actions identified through the GridEx Exercise completed in 2021 through the North American Electric Reliability Corporation (NERC).
CT Cybersecurity Strategy Actions	Implement actions under "Objective 4: Prepare for cyberattacks through resiliency planning" of the 2022 State of Connecticut Cybersecurity Strategy
Incorporate Natural Hazards into Cybersecurity Strategy	Include natural hazard considerations as a compounding risk factor for cyberattacks on critical infrastructure in the next update of the State of Connecticut Cybersecurity Strategy
Evacuation Routes	Develop a map of statewide evacuation routes that includes local evacuation routes, considers evacuation from different natural hazards (such as coastal flooding, riverine flooding, dam failure, wildfires, etc.), considers potential impacts of natural hazards (roadway flooding, treefall) on evacuation routes and plans for secondary routes as needed, and considers climate change impacts. Partner with local municipalities and Councils of Government. Prioritize roadway maintenance and upgrade funding based on initiative results.
Resilient Power Grid and Infrastructure Protection	Prioritize the resilience of the state's power grid and critical infrastructure in the face of various hazards. Conduct a thorough risk assessment considering both traditional and emerging threats including extreme cold, cyberattacks, and technological vulnerabilities. Develop and implement a comprehensive strategy to modernize and fortify the power grid, especially in areas susceptible to freezing temperatures. Enhance cybersecurity measures to safeguard against potential attacks on the "internet of things" devices. Establish contingency plans for maintaining power supply during extreme events and investing in more reliable renewable energy sources.
Cost Analysis and Funding Mechanism for Heat Mitigation	Conduct a thorough analysis of the economic costs of high heat events in Connecticut, including both direct damage to property and infrastructure, as well as indirect costs from health care expenses, loss of productivity, and strain on emergency services. Incorporate these cost estimates into a Benefit-Cost Analysis (BCA) framework to demonstrate the economic rationale for investing in heat mitigation. Develop funding mechanisms that leverage federal grants, private-sector partnerships, and state budgets to support cost-effective heat mitigation strategies.
Green Bank and CIRCA Funding Integration	Leverage existing funding mechanisms like the Green Bank and the Connecticut Institute for Resilience and Climate Adaptation (CIRCA) to bolster heat mitigation efforts. Collaborate with these entities to allocate funding specifically for heat resilience projects that align with their missions. Explore partnerships that enable leveraging state funds to attract private investment in heat mitigation initiatives. Ensure a streamlined application process for municipalities, community organizations, and businesses seeking funding for projects that enhance heat resilience and reduce the urban heat island effect. Coordinate efforts to prioritize projects that offer multiple benefits, such as improved air quality, enhanced quality of life, and increased community resilience.

6 | Plan Implementation Appendix

6.1 Letter of Adoption



STATE OF CONNECTICUT

GOVERNOR NED LAMONT

December 13, 2023

Lori Ehrlich, Administrator
FEMA Region 1
99 High Street, 6th Floor
Boston, MA 02110-2132

RE: State Natural Hazard Mitigation Plan Adoption

Dear Administrator Ehrlich:

I am pleased to present and formally adopt the 2023 Connecticut Natural Hazard Mitigation Plan (NHMP). The NHMP was prepared by the Department of Emergency Services and Public Protection (DESPP), pursuant to the requirements of 44 CFR 201 and the State Mitigation Planning Policy Guide (2022).

The NHMP is the result of a collaborative process by DESPP, other state agencies, regional planning agencies, the State Hazard Mitigation Planning Team, and other partners involved in response, recovery and mitigation. The NHMP describes the assessed risks associated with natural disasters and the mitigation efforts our state has taken and proposes to undertake to protect people, property and the environment from loss associated with those hazards.

The NHMP complies with the planning requirements of 44 CFR 201, keeping the State of Connecticut eligible to receive funding under all FEMA disaster assistance and hazard mitigation programs. The State of Connecticut will comply with all applicable federal statutes and regulations in effect in accordance with 44 CFR 13.11(c). Furthermore, the State will amend its plan as needed to reflect changes in State or Federal laws and statutes as required in 44 CFR13.1 l(c) and (d).

As the primary implementing agency, DESPP will coordinate with the State Hazard Mitigation Planning Team and all of our partners to implement the Natural Hazard Mitigation Strategy contained in the NHMP, thereby reducing Connecticut's vulnerability to natural hazards.

Ned Lamont
Governor

Ronnell Higgins
Commissioner, DESPP

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Hazus: Flood Global Risk Report

Region Name: CT_SLOSH_CAT1

Flood Scenario: Cat 1

Print Date: Friday, April 21, 2023

Disclaimer:

Totals only reflect data for those census tracts/blocks included in the user's study region.

The estimates of social and economic impacts contained in this report were produced using Hazus loss estimation methodology software which is based on current scientific and engineering knowledge. There are uncertainties inherent in any loss estimation technique. Therefore, there may be significant differences between the modeled results contained in this report and the actual social and economic losses following a specific Flood. These results can be improved by using enhanced inventory data and flood hazard information.

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General Description of the Region

Hazus is a regional multi-hazard loss estimation model that was developed by the Federal Emergency Management Agency (FEMA) and the National Institute of Building Sciences (NIBS). The primary purpose of Hazus is to provide a methodology and software application to develop multi-hazard losses at a regional scale. These loss estimates would be used primarily by local, state and regional officials to plan and stimulate efforts to reduce risks from multi-hazards and to prepare for emergency response and recovery.

The flood loss estimates provided in this report were based on a region that included 8 county(ies) from the following state(s):

- Connecticut

Note:
Appendix A contains a complete listing of the counties contained in the region.

The geographical size of the region is approximately 821 square miles and contains 45,565 census blocks. The region contains over 1,418 thousand households and has a total population of 3,604,191 people. The distribution of population by State and County for the study region is provided in Appendix B.

There are an estimated 1,150,568 buildings in the region with a total building replacement value (excluding contents) of 706,160 million dollars. Approximately 86.71% of the buildings (and 63.78% of the building value) are associated with residential housing.

Building Inventory

General Building Stock

Hazus estimates that there are 1,150,568 buildings in the region which have an aggregate total replacement value of 706,160 million dollars. Table 1 and Table 2 present the relative distribution of the value with respect to the general occupancies by Study Region and Scenario respectively. Appendix B provides a general distribution of the building value by State and County.

Table 1
Building Exposure by Occupancy Type for the Study Region

Occupancy	Exposure ($1000)	Percent of Total
Residential	450,421,306	63.8%
Commercial	141,769,502	20.1%
Industrial	39,791,295	5.6%
Agricultural	1,665,206	0.2%
Religion	9,363,313	1.3%
Government	18,572,316	2.6%
Education	44,577,144	6.3%
Total	**706,160,082**	**100%**

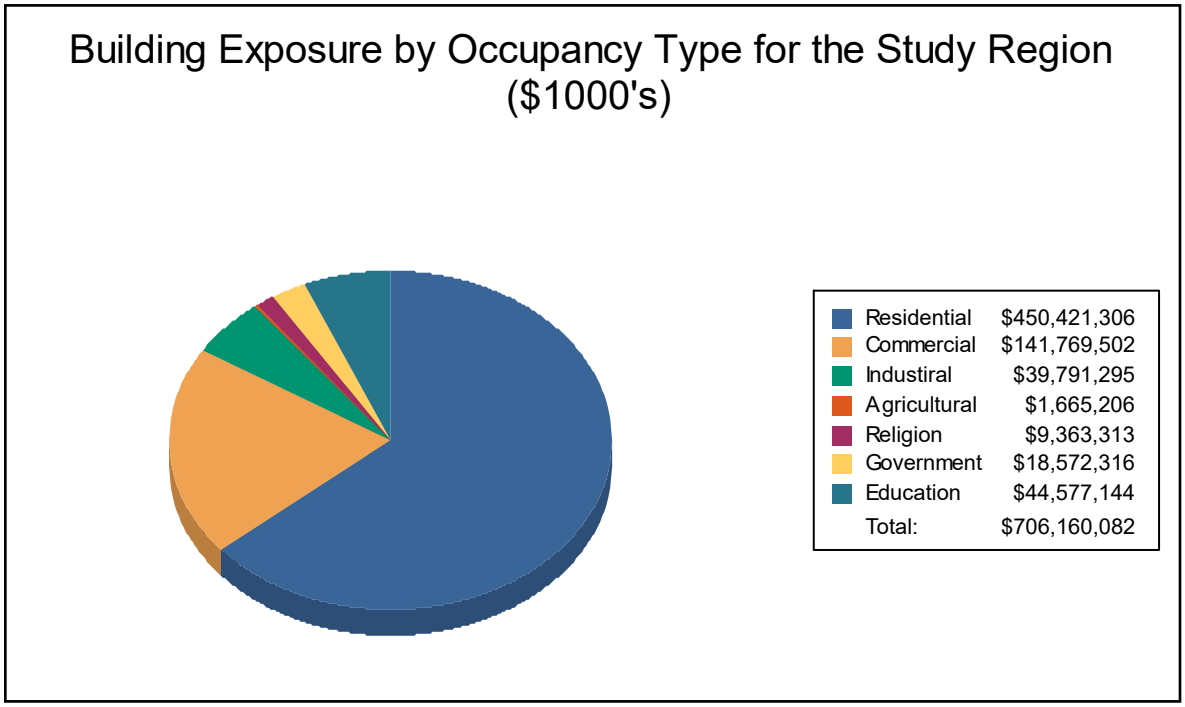
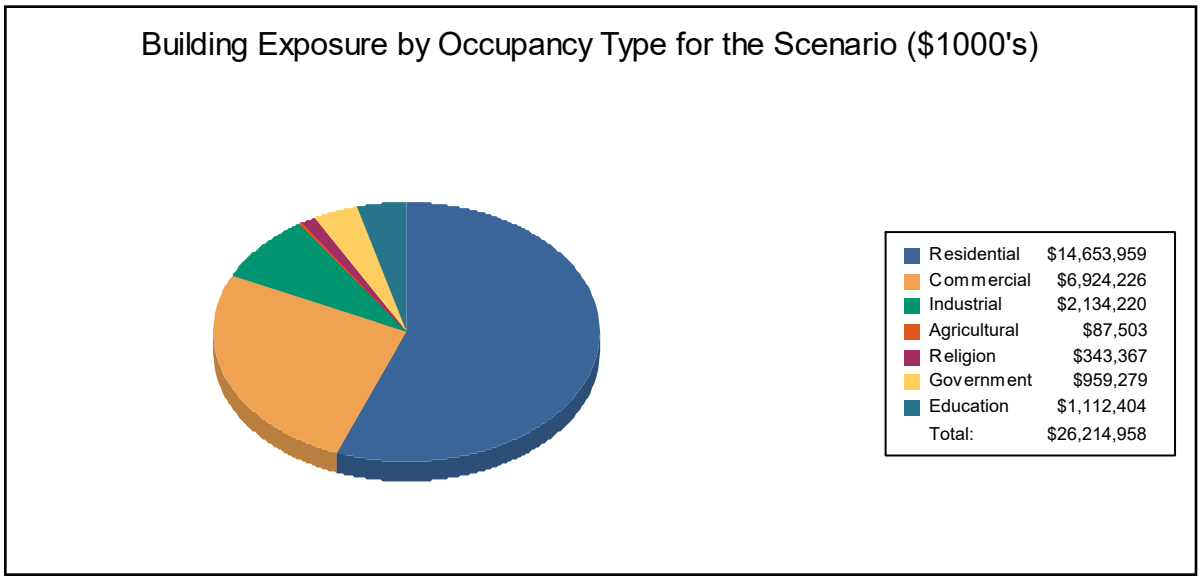


Table 2
Building Exposure by Occupancy Type for the Scenario

Occupancy	Exposure ($1000)	Percent of Total
Residential	33,477,612	57.0%
Commercial	14,368,824	24.5%
Industrial	5,615,110	9.6%
Agricultural	158,567	0.3%
Religion	741,000	1.3%
Government	2,045,573	3.5%
Education	2,305,099	3.9%
Total	**58,711,785**	**100%**



Essential Facility Inventory

For essential facilities, there are 54 hospitals in the region with a total bed capacity of 10,483 beds.
There are 1,350 schools, 569 fire stations, 198 police stations and 174 emergency operation centers.

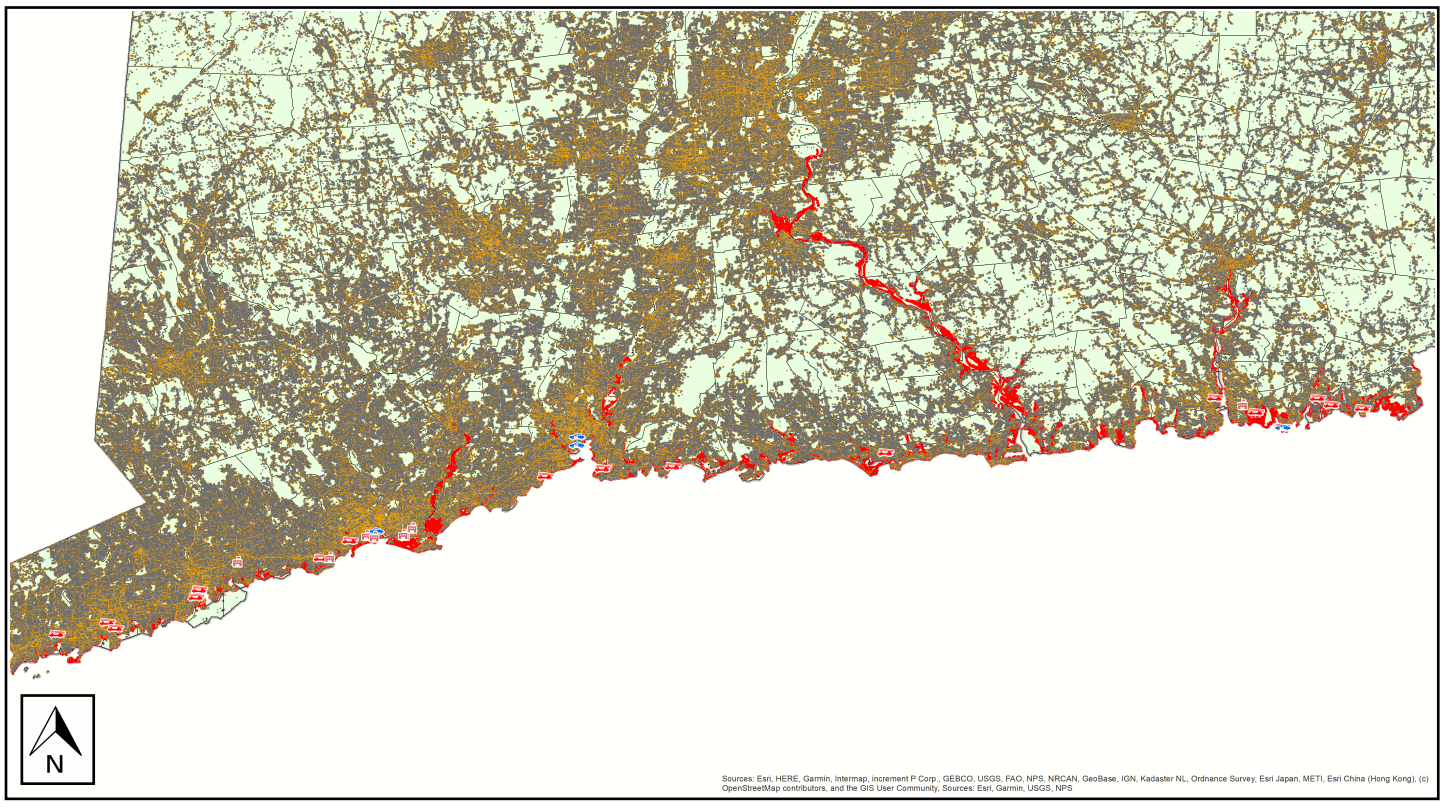
Flood Scenario Parameters

Hazus used the following set of information to define the flood parameters for the flood loss estimate provided in this report.

Study Region Name:	CT_SLOSH_CAT1
Scenario Name:	Cat 1
Return Period Analyzed:	100
Analysis Options Analyzed:	No What-Ifs

Study Region Overview Map

Illustrating scenario flood extent, as well as exposed essential facilities and total exposure



Building Damage

General Building Stock Damage

Hazus estimates that about 6,456 buildings will be at least moderately damaged. This is over 47% of the total number of buildings in the scenario. There are an estimated 550 buildings that will be completely destroyed. The definition of the 'damage states' is provided in the Hazus Flood Technical Manual. Table 3 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4 summarizes the expected damage by general building type.

Total Economic Loss (1 dot = $300K) Overview Map

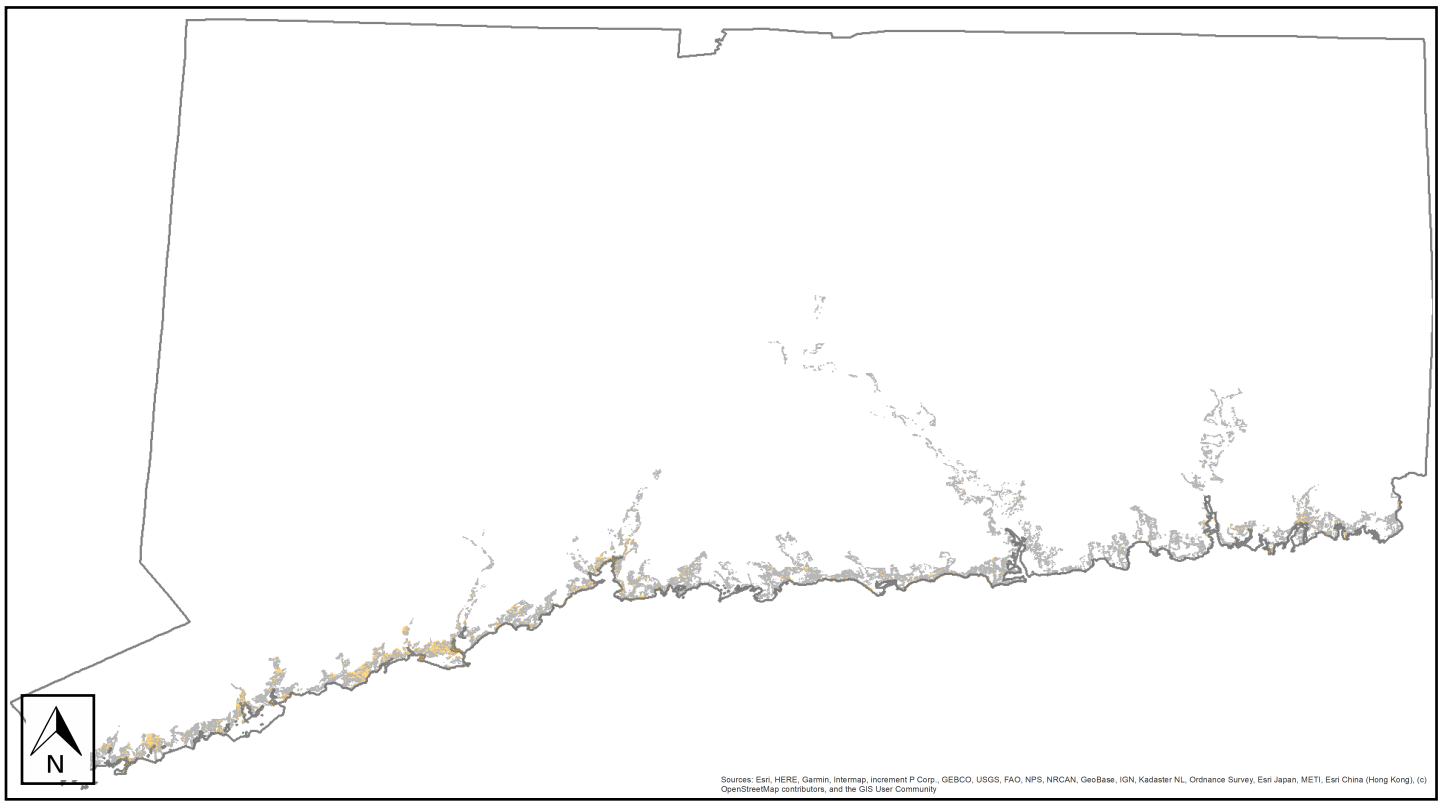


Table 3: Expected Building Damage by Occupancy

	1-10		11-20		21-30		31-40		41-50		>50	
Occupancy	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Agriculture	0	0	1	100	0	0	0	0	0	0	0	0
Commercial	60	14	270	65	59	14	21	5	4	1	0	0
Education	3	100	0	0	0	0	0	0	0	0	0	0
Government	42	35	77	65	0	0	0	0	0	0	0	0
Industrial	45	22	75	37	50	25	17	8	10	5	4	2
Religion	1	7	14	93	0	0	0	0	0	0	0	0
Residential	1,674	22	3,083	41	1,982	26	101	1	142	2	546	7
Total	**1,825**		**3,520**		**2,091**		**139**		**156**		**550**	

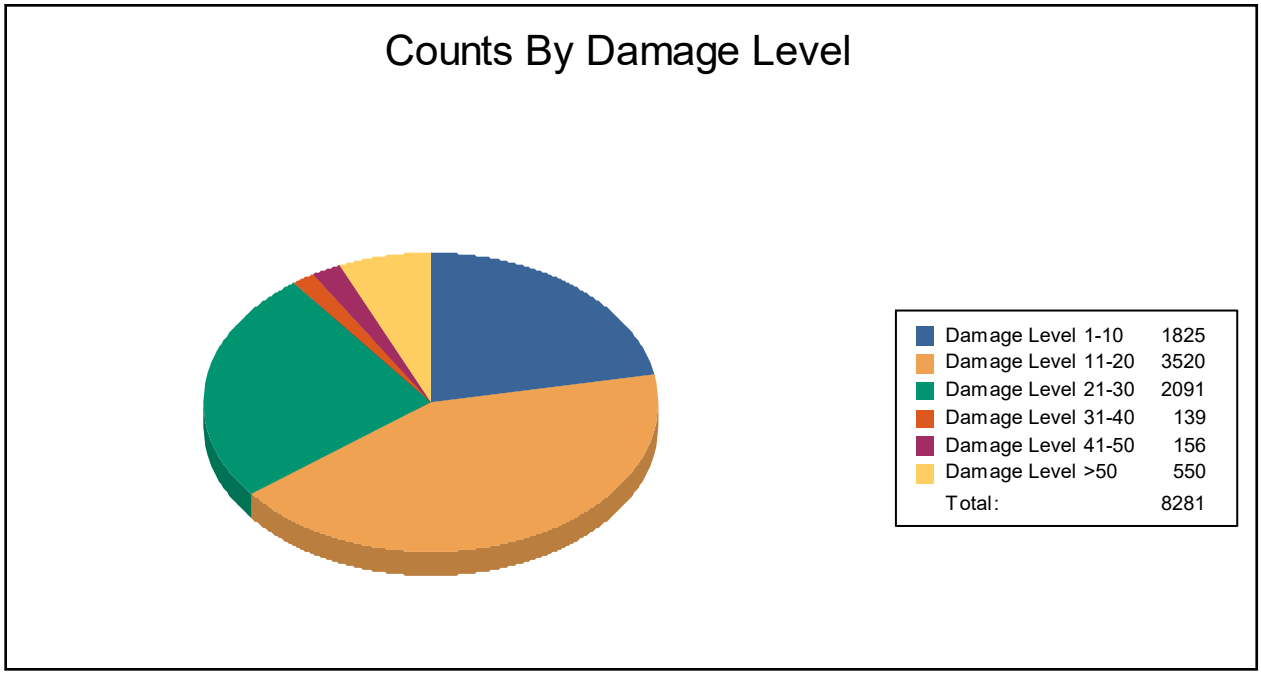




Table 4: Expected Building Damage by Building Type

Building Type	1-10		11-20		21-30		31-40		41-50		>50	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Concrete	6	19	23	72	3	9	0	0	0	0	0	0
ManufHousing	0	0	0	0	0	0	0	0	0	0	2	100
Masonry	42	11	217	58	99	26	10	3	5	1	4	1
Steel	100	24	231	56	50	12	17	4	9	2	2	0
Wood	1,672	23	3,005	41	1,918	26	99	1	140	2	541	7

Essential Facility Damage

Before the flood analyzed in this scenario, the region had 10,483 hospital beds available for use. On the day of the scenario flood event, the model estimates that 10,483 hospital beds are available in the region.

Table 5: Expected Damage to Essential Facilities

		# Facilities		
Classification	Total	At Least Moderate	At Least Substantial	Loss of Use
Emergency Operation Centers	174	0	0	0
Fire Stations	569	17	0	10
Hospitals	54	1	0	0
Police Stations	198	4	0	4
Schools	1,350	9	0	9

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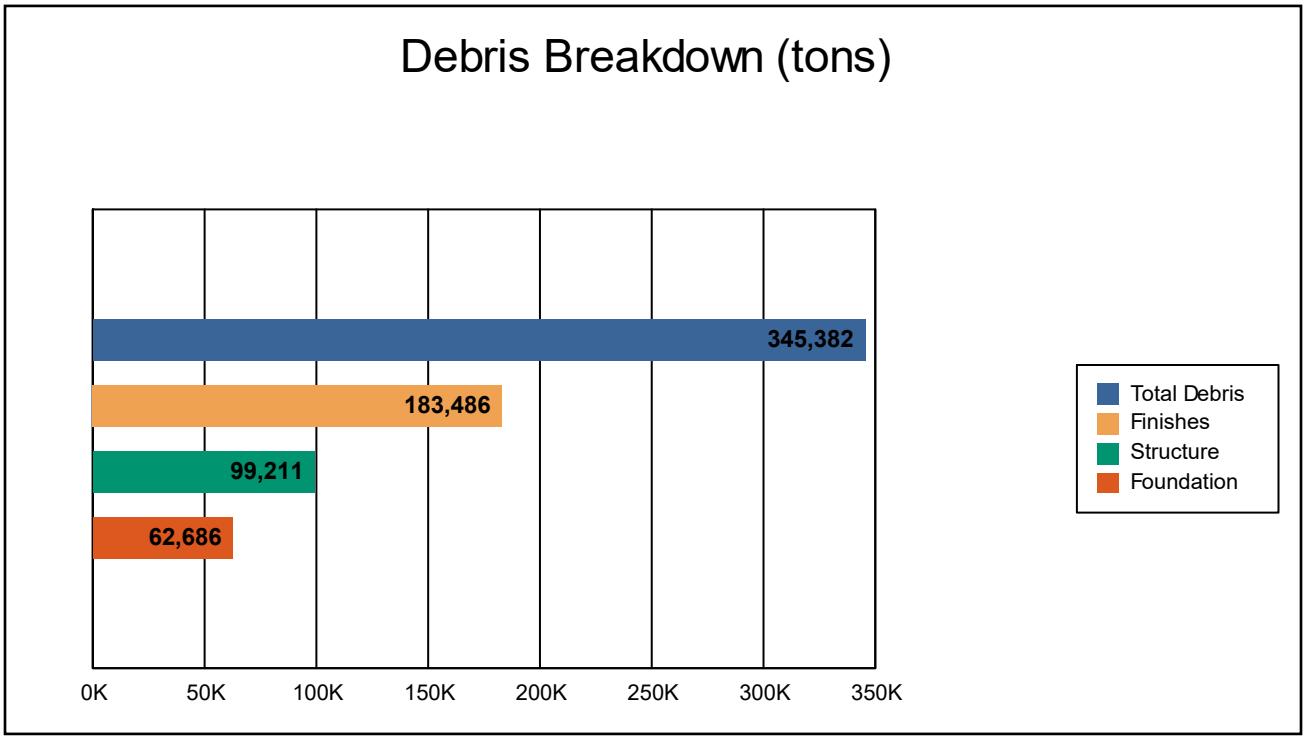
(1) None of your facilities were flooded. This can be checked by mapping the inventory data on the depth grid.

(2) The analysis was not run. This can be tested by checking the run box on the Analysis Menu and seeing if a message box asks you to replace the existing results.

Induced Flood Damage

Debris Generation

Hazus estimates the amount of debris that will be generated by the flood. The model breaks debris into three general categories: 1) Finishes (dry wall, insulation, etc.), 2) Structural (wood, brick, etc.) and 3) Foundations (concrete slab, concrete block, rebar, etc.). This distinction is made because of the different types of material handling equipment required to handle the debris.

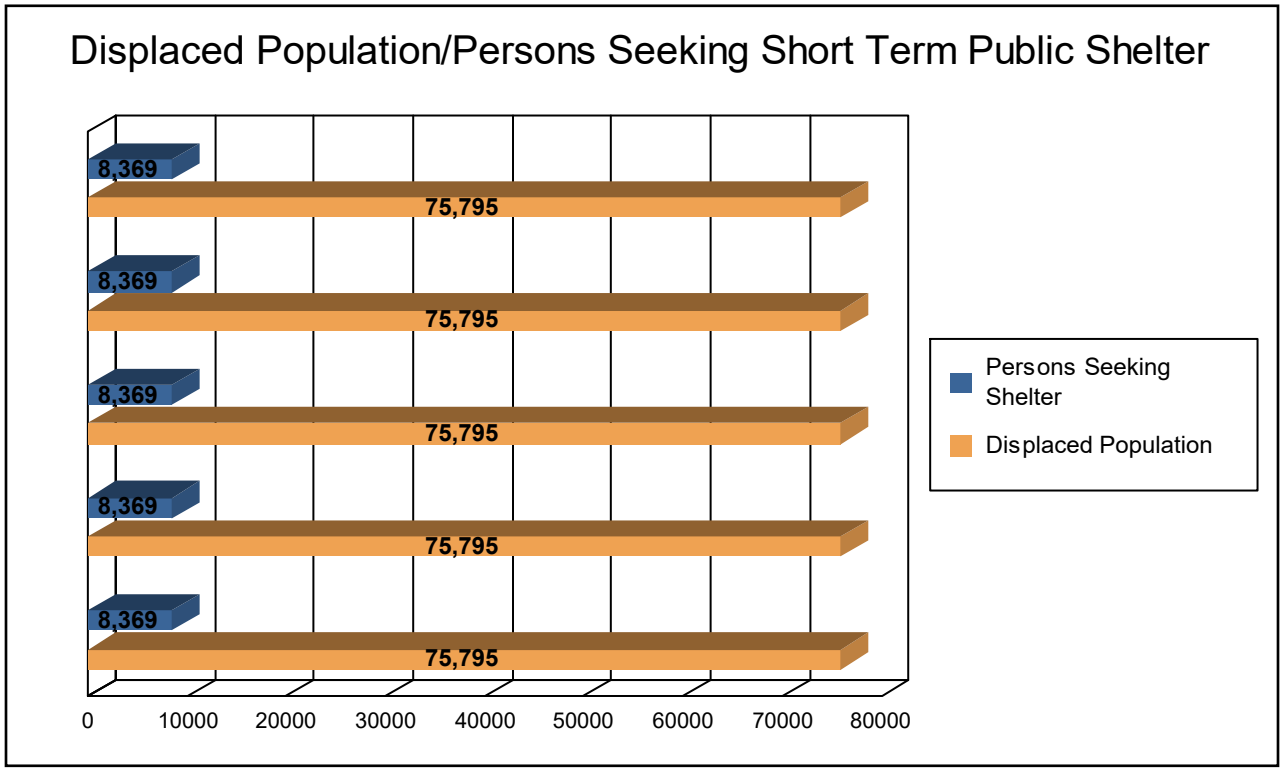


The model estimates that a total of 345,382 tons of debris will be generated. Of the total amount, Finishes comprises 53% of the total, Structure comprises 29% of the total, and Foundation comprises 18%. If the debris tonnage is converted into an estimated number of truckloads, it will require 13816 truckloads (@25 tons/truck) to remove the debris generated by the flood.

Social Impact

Shelter Requirements

Hazus estimates the number of households that are expected to be displaced from their homes due to the flood and the associated potential evacuation. Hazus also estimates those displaced people that will require accommodations in temporary public shelters. The model estimates 25,265 households (or 75,795 of people) will be displaced due to the flood. Displacement includes households evacuated from within or very near to the inundated area. Of these, 8,369 people (out of a total population of 3,604,191) will seek temporary shelter in public shelters.



Economic Loss

The total economic loss estimated for the flood is 15,548.57 million dollars, which represents 26.48 % of the total replacement value of the scenario buildings.

Building-Related Losses

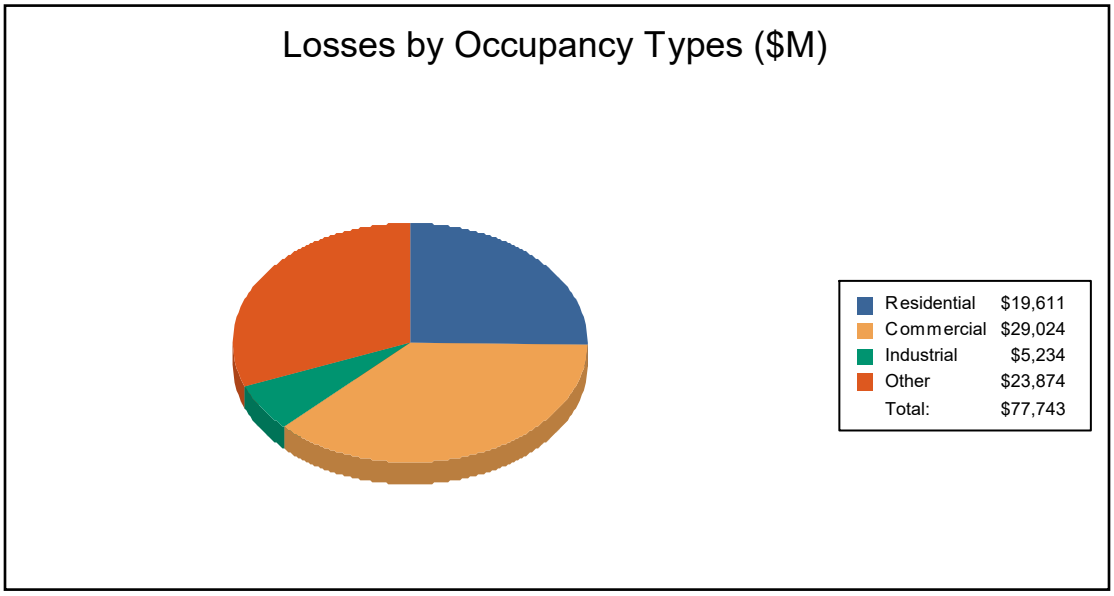
The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the flood. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the flood.

The total building-related losses were 7,071.73 million dollars. 55% of the estimated losses were related to the business interruption of the region. The residential occupancies made up 25.22% of the total loss. Table 6 below provides a summary of the losses associated with the building damage.

Table 6: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Building Loss						
	Building	8,040.75	2,548.19	1,247.45	512.78	12,349.17
	Content	7,296.22	7,593.59	2,997.04	3,135.62	21,022.46
	Inventory	0.00	1,459.01	432.95	95.08	1,987.04
	Subtotal	**15,336.97**	**11,600.78**	**4,677.44**	**3,743.48**	**35,358.66**
Business Interruption						
	Income	159.13	6,766.56	134.76	1,307.35	8,367.80
	Relocation	2,396.47	2,088.04	169.41	1,047.56	5,701.47
	Rental Income	1,342.48	1,517.60	41.04	264.43	3,165.55
	Wage	375.47	7,051.11	211.66	17,511.15	25,149.38
	Subtotal	**4,273.55**	**17,423.30**	**556.86**	**20,130.49**	**42,384.19**
ALL	**Total**	**19,610.52**	**29,024.08**	**5,234.30**	**23,873.96**	**77,742.85**





Appendix A: County Listing for the Region

Connecticut

- Fairfield
- Hartford
- Litchfield
- Middlesex
- New Haven
- New London
- Tolland
- Windham

Appendix B: Regional Population and Building Value Data

		Building Value (thousands of dollars)		
	Population	Residential	Non-Residential	Total
Connecticut				
Fairfield	957,322	138,194,741	64,130,883	202,325,624
Hartford	898,547	103,342,410	67,428,923	170,771,333
Litchfield	185,062	28,640,303	14,482,112	43,122,415
Middlesex	164,179	22,029,748	10,971,271	33,001,019
New Haven	864,495	92,884,699	61,151,656	154,036,355
New London	268,434	32,861,791	18,758,064	51,619,855
Tolland	149,768	19,494,697	9,788,429	29,283,126
Windham	116,384	12,972,917	9,027,438	22,000,355
Total	**3,604,191**	**450,421,306**	**255,738,776**	**706,160,082**
Total Study Region	**3,604,191**	**450,421,306**	**255,738,776**	**706,160,082**

Hazus: Flood Global Risk Report

Region Name: CT_SLOSH_CAT2

Flood Scenario: Cat 2

Print Date: Friday, April 21, 2023

Disclaimer:

Totals only reflect data for those census tracts/blocks included in the user's study region.

The estimates of social and economic impacts contained in this report were produced using Hazus loss estimation methodology software which is based on current scientific and engineering knowledge. There are uncertainties inherent in any loss estimation technique. Therefore, there may be significant differences between the modeled results contained in this report and the actual social and economic losses following a specific Flood. These results can be improved by using enhanced inventory data and flood hazard information.

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General Description of the Region

Hazus is a regional multi-hazard loss estimation model that was developed by the Federal Emergency Management Agency (FEMA) and the National Institute of Building Sciences (NIBS). The primary purpose of Hazus is to provide a methodology and software application to develop multi-hazard losses at a regional scale. These loss estimates would be used primarily by local, state and regional officials to plan and stimulate efforts to reduce risks from multi-hazards and to prepare for emergency response and recovery.

The flood loss estimates provided in this report were based on a region that included 8 county(ies) from the following state(s):

- Connecticut

Note:
Appendix A contains a complete listing of the counties contained in the region.

The geographical size of the region is approximately 821 square miles and contains 45,565 census blocks. The region contains over 1,418 thousand households and has a total population of 3,604,191 people. The distribution of population by State and County for the study region is provided in Appendix B.

There are an estimated 1,150,568 buildings in the region with a total building replacement value (excluding contents) of 706,160 million dollars. Approximately 86.71% of the buildings (and 63.78% of the building value) are associated with residential housing.

Building Inventory

General Building Stock

Hazus estimates that there are 1,150,568 buildings in the region which have an aggregate total replacement value of 706,160 million dollars. Table 1 and Table 2 present the relative distribution of the value with respect to the general occupancies by Study Region and Scenario respectively. Appendix B provides a general distribution of the building value by State and County.

Table 1
Building Exposure by Occupancy Type for the Study Region

Occupancy	Exposure ($1000)	Percent of Total
Residential	450,421,306	63.8%
Commercial	141,769,502	20.1%
Industrial	39,791,295	5.6%
Agricultural	1,665,206	0.2%
Religion	9,363,313	1.3%
Government	18,572,316	2.6%
Education	44,577,144	6.3%
Total	**706,160,082**	**100%**

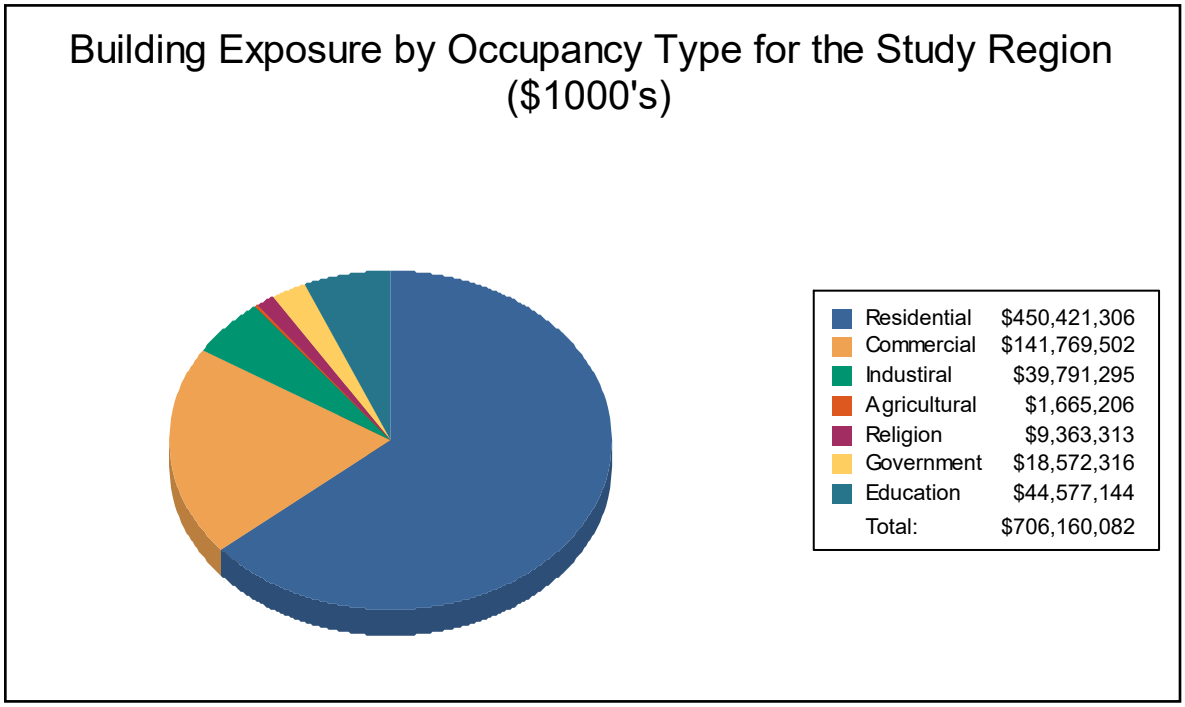
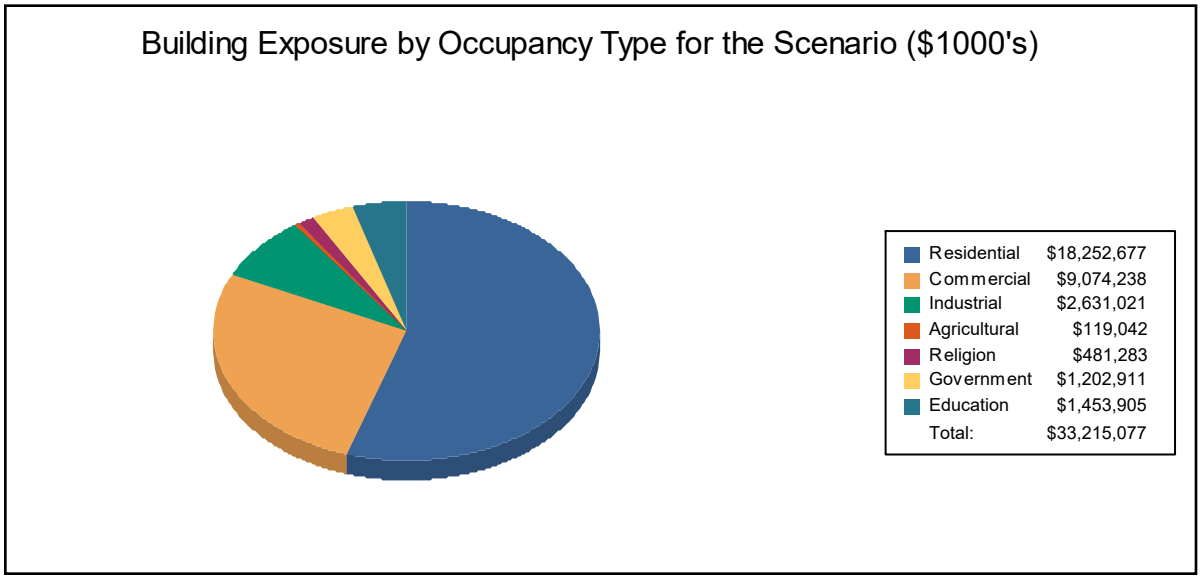


Table 2
Building Exposure by Occupancy Type for the Scenario

Occupancy	Exposure ($1000)	Percent of Total
Residential	41,023,889	56.2%
Commercial	18,688,891	25.6%
Industrial	6,581,597	9.0%
Agricultural	206,666	0.3%
Religion	955,918	1.3%
Government	2,517,539	3.4%
Education	3,075,196	4.2%
Total	**73,049,696**	**100%**



Essential Facility Inventory

For essential facilities, there are 54 hospitals in the region with a total bed capacity of 10,483 beds.
There are 1,350 schools, 569 fire stations, 198 police stations and 174 emergency operation centers.

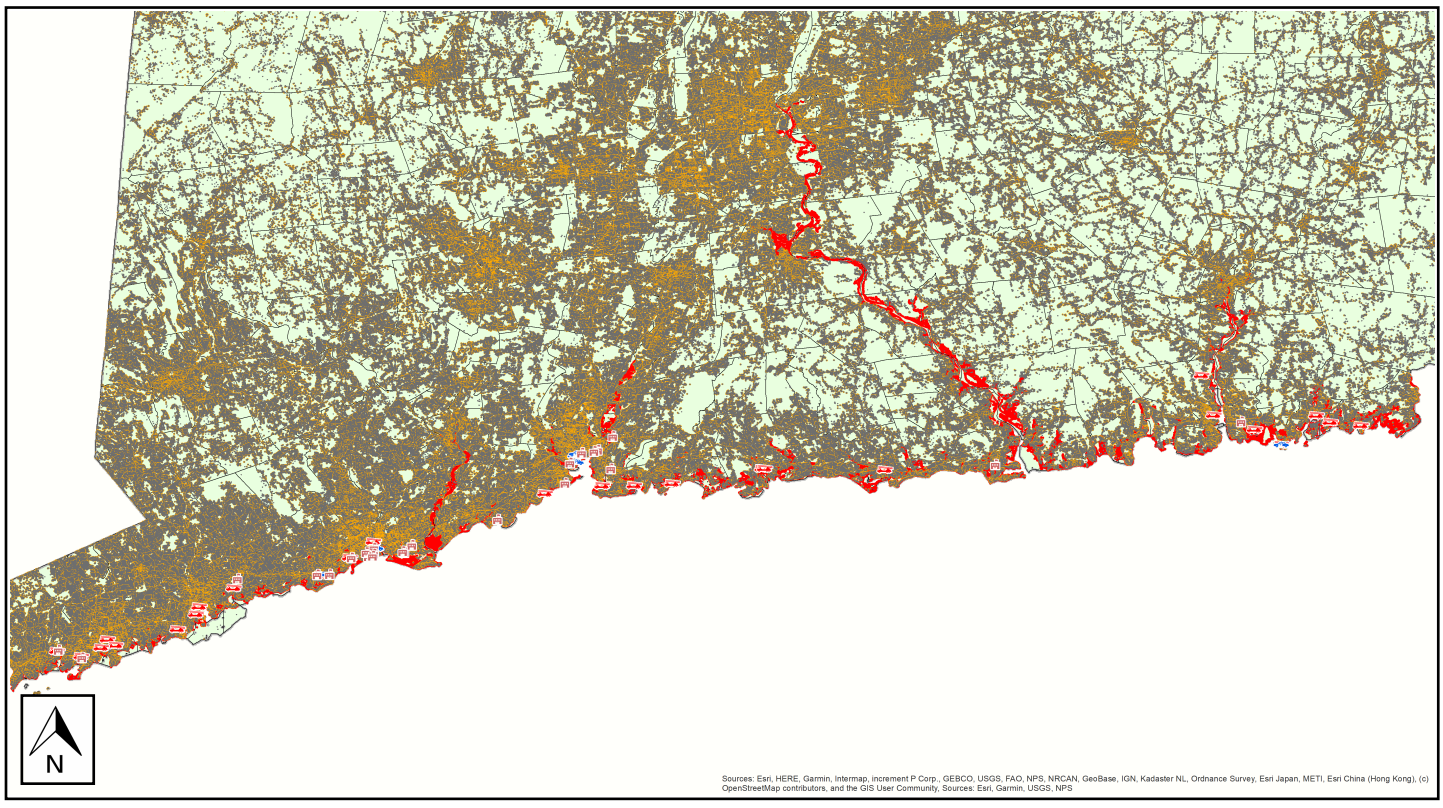
Flood Scenario Parameters

Hazus used the following set of information to define the flood parameters for the flood loss estimate provided in this report.

Study Region Name:	CT_SLOSH_CAT2
Scenario Name:	Cat 2
Return Period Analyzed:	100
Analysis Options Analyzed:	No What-Ifs

Study Region Overview Map

Illustrating scenario flood extent, as well as exposed essential facilities and total exposure



Building Damage

General Building Stock Damage

Hazus estimates that about 16,629 buildings will be at least moderately damaged. This is over 50% of the total number of buildings in the scenario. There are an estimated 2,678 buildings that will be completely destroyed. The definition of the 'damage states' is provided in the Hazus Flood Technical Manual. Table 3 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4 summarizes the expected damage by general building type.

Total Economic Loss (1 dot = $300K) Overview Map

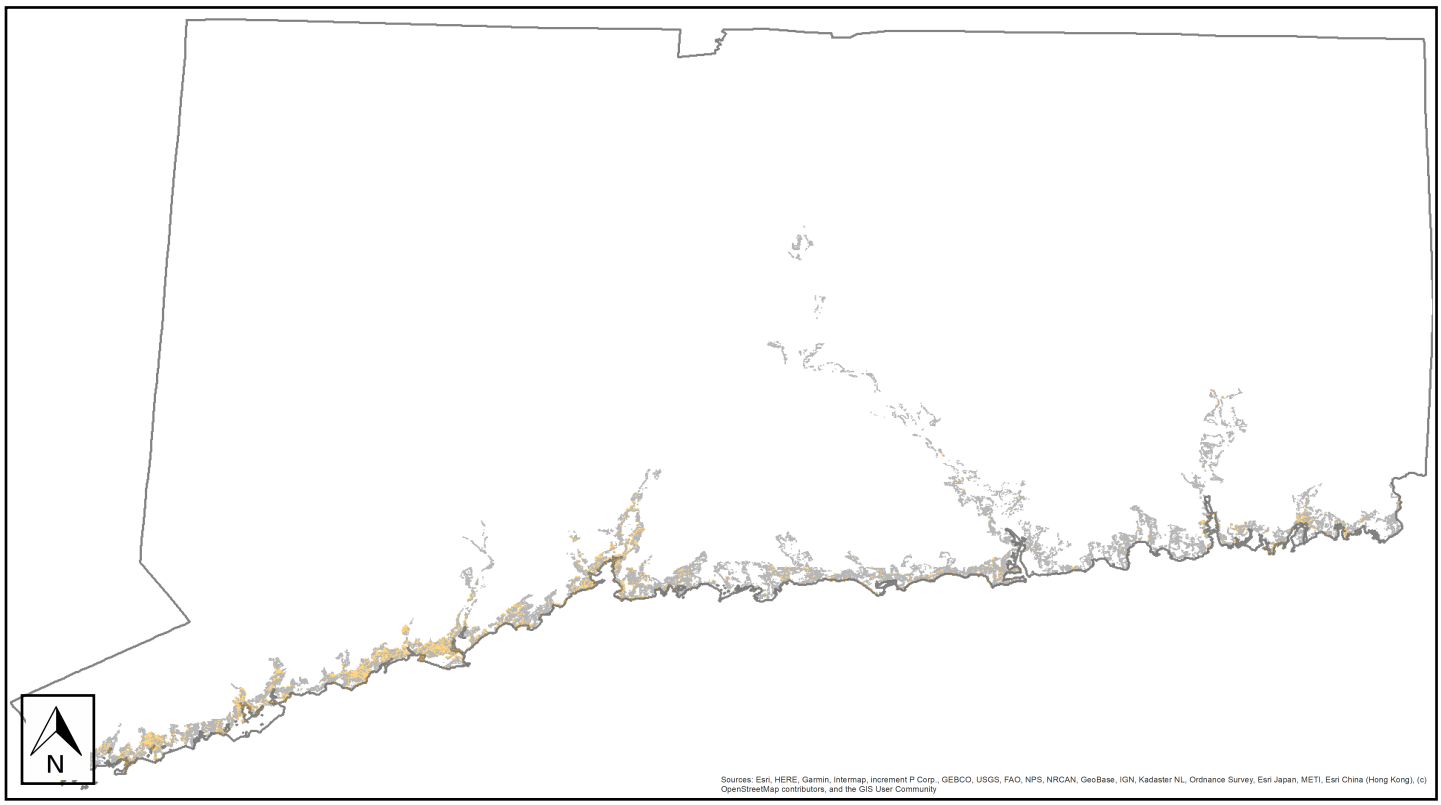


Table 3: Expected Building Damage by Occupancy

	1-10		11-20		21-30		31-40		41-50		>50	
Occupancy	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Agriculture	0	0	0	0	1	100	0	0	0	0	0	0
Commercial	60	6	578	55	181	17	89	9	127	12	7	1
Education	0	0	2	100	0	0	0	0	0	0	0	0
Government	45	14	261	81	10	3	5	2	0	0	0	0
Industrial	26	6	77	18	122	29	119	28	39	9	37	9
Religion	0	0	44	100	0	0	0	0	0	0	0	0
Residential	1,705	10	4,533	27	4,993	30	1,557	9	1,213	7	2,634	16
Total	**1,836**		**5,495**		**5,307**		**1,770**		**1,379**		**2,678**	

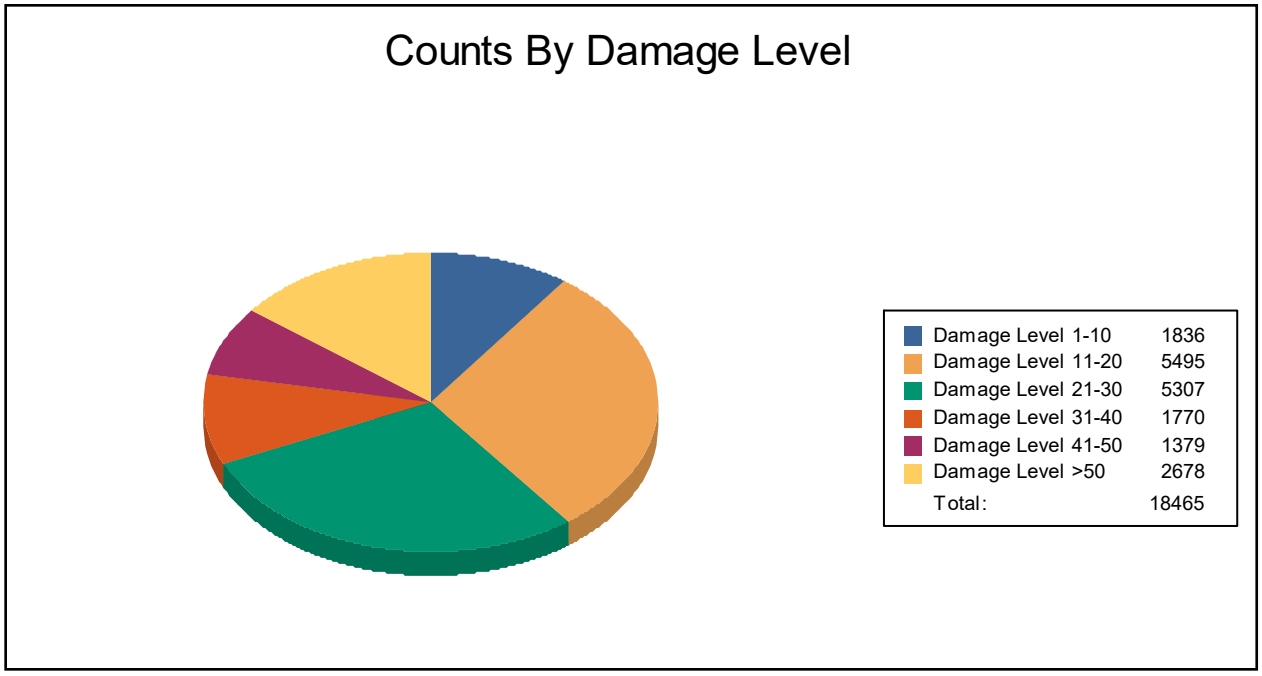




Table 4: Expected Building Damage by Building Type

Building Type	1-10		11-20		21-30		31-40		41-50		>50	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Concrete	3	3	51	59	19	22	9	10	5	6	0	0
ManufHousing	3	8	0	0	0	0	0	0	2	5	34	87
Masonry	29	3	410	41	265	27	114	12	112	11	58	6
Steel	94	10	523	53	170	17	104	11	58	6	32	3
Wood	1,700	11	4,443	27	4,818	30	1,509	9	1,151	7	2,544	16

Essential Facility Damage

Before the flood analyzed in this scenario, the region had 10,483 hospital beds available for use. On the day of the scenario flood event, the model estimates that 10,483 hospital beds are available in the region.

Table 5: Expected Damage to Essential Facilities

		# Facilities		
Classification	Total	At Least Moderate	At Least Substantial	Loss of Use
Emergency Operation Centers	174	0	0	0
Fire Stations	569	26	0	23
Hospitals	54	2	0	1
Police Stations	198	6	0	6
Schools	1,350	27	0	27

If this report displays all zeros or is blank, two possibilities can explain this.

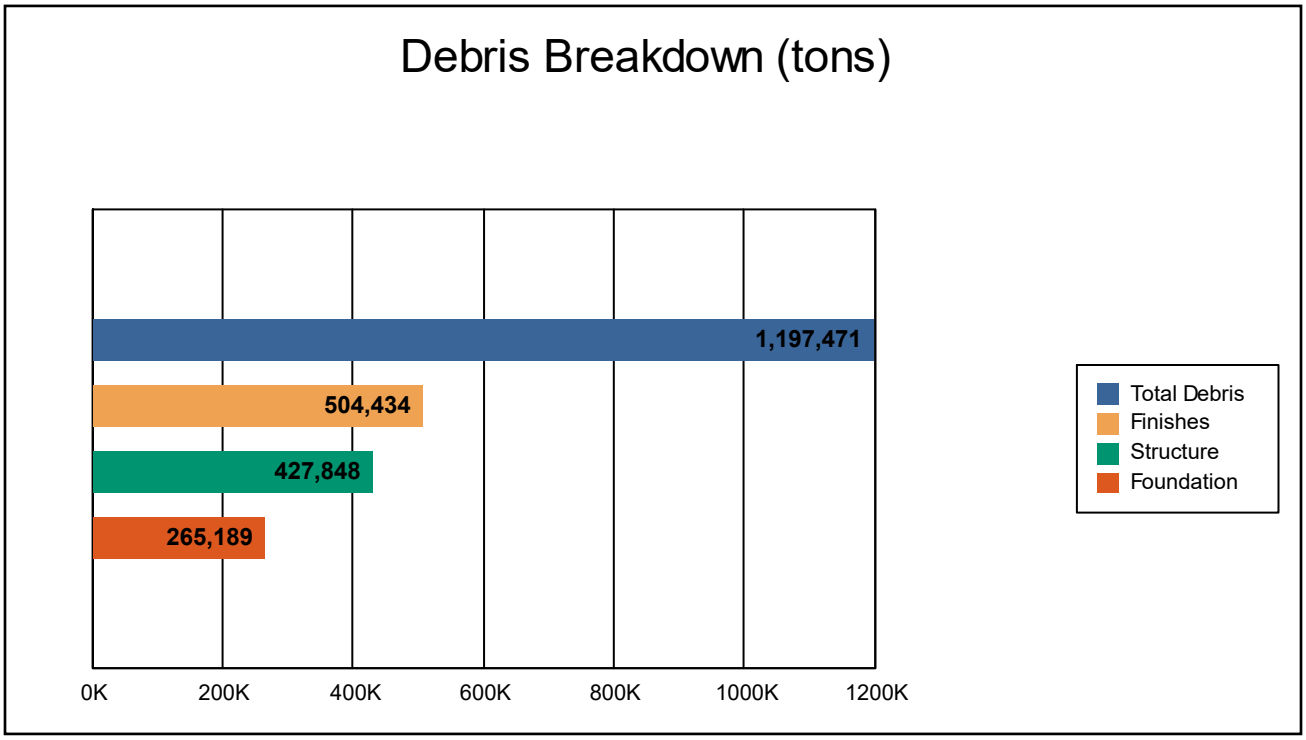
(1) None of your facilities were flooded. This can be checked by mapping the inventory data on the depth grid.

(2) The analysis was not run. This can be tested by checking the run box on the Analysis Menu and seeing if a message box asks you to replace the existing results.

Induced Flood Damage

Debris Generation

Hazus estimates the amount of debris that will be generated by the flood. The model breaks debris into three general categories: 1) Finishes (dry wall, insulation, etc.), 2) Structural (wood, brick, etc.) and 3) Foundations (concrete slab, concrete block, rebar, etc.). This distinction is made because of the different types of material handling equipment required to handle the debris.

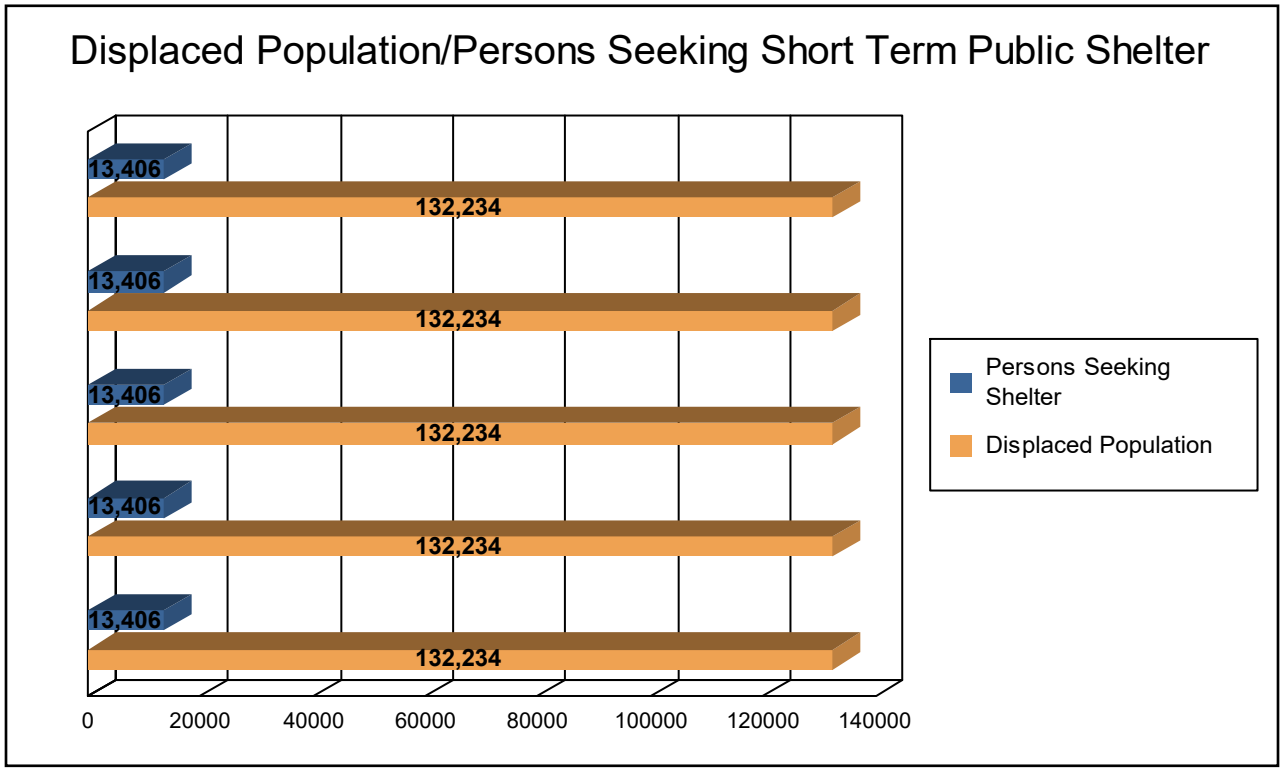


The model estimates that a total of 1,197,471 tons of debris will be generated. Of the total amount, Finishes comprises 42% of the total, Structure comprises 36% of the total, and Foundation comprises 22%. If the debris tonnage is converted into an estimated number of truckloads, it will require 47899 truckloads (@25 tons/truck) to remove the debris generated by the flood.

Social Impact

Shelter Requirements

Hazus estimates the number of households that are expected to be displaced from their homes due to the flood and the associated potential evacuation. Hazus also estimates those displaced people that will require accommodations in temporary public shelters. The model estimates 44,078 households (or 132,234 of people) will be displaced due to the flood. Displacement includes households evacuated from within or very near to the inundated area. Of these, 13,406 people (out of a total population of 3,604,191) will seek temporary shelter in public shelters.



Economic Loss

The total economic loss estimated for the flood is 35,351.43 million dollars, which represents 48.39 % of the total replacement value of the scenario buildings.

Building-Related Losses

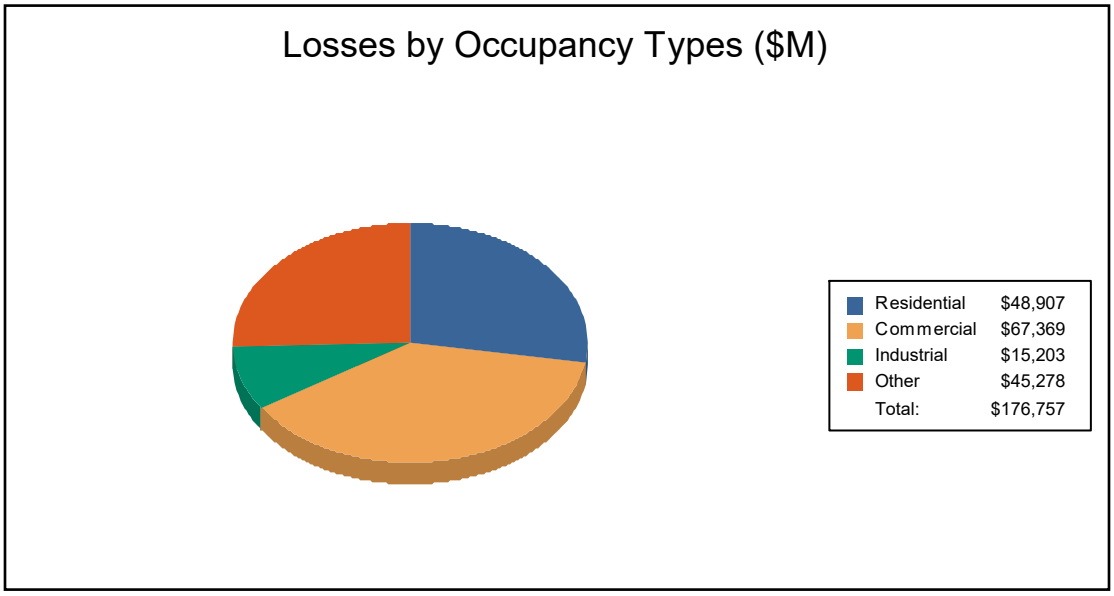
The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the flood. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the flood.

The total building-related losses were 19,813.55 million dollars. 44% of the estimated losses were related to the business interruption of the region. The residential occupancies made up 27.67% of the total loss. Table 6 below provides a summary of the losses associated with the building damage.

Table 6: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Building Loss						
	Building	21,825.55	7,832.43	3,771.36	1,547.54	34,976.88
	Content	19,031.83	21,465.99	9,233.76	8,679.52	58,411.10
	Inventory	0.00	4,189.17	1,259.20	231.40	5,679.77
	Subtotal	**40,857.38**	**33,487.59**	**14,264.32**	**10,458.46**	**99,067.74**
Business Interruption						
	Income	271.35	13,023.88	233.18	2,530.23	16,058.62
	Relocation	4,522.02	4,056.18	272.41	1,855.96	10,706.56
	Rental Income	2,616.71	2,936.37	71.42	434.71	6,059.20
	Wage	639.79	13,865.07	361.75	29,998.42	44,865.02
	Subtotal	**8,049.87**	**33,881.49**	**938.75**	**34,819.30**	**77,689.40**
ALL	**Total**	**48,907.25**	**67,369.07**	**15,203.07**	**45,277.76**	**176,757.14**





Appendix A: County Listing for the Region

Connecticut

- Fairfield
- Hartford
- Litchfield
- Middlesex
- New Haven
- New London
- Tolland
- Windham

Appendix B: Regional Population and Building Value Data

		Building Value (thousands of dollars)		
	Population	Residential	Non-Residential	Total
Connecticut				
Fairfield	957,322	138,194,741	64,130,883	202,325,624
Hartford	898,547	103,342,410	67,428,923	170,771,333
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Windham	116,384	12,972,917	9,027,438	22,000,355
Total	**3,604,191**	**450,421,306**	**255,738,776**	**706,160,082**
Total Study Region	**3,604,191**	**450,421,306**	**255,738,776**	**706,160,082**

Hazus: Flood Global Risk Report

Region Name: CT_SLOSH_CAT3

Flood Scenario: Cat 3

Print Date: Friday, April 21, 2023

Disclaimer:

Totals only reflect data for those census tracts/blocks included in the user's study region.

The estimates of social and economic impacts contained in this report were produced using Hazus loss estimation methodology software which is based on current scientific and engineering knowledge. There are uncertainties inherent in any loss estimation technique. Therefore, there may be significant differences between the modeled results contained in this report and the actual social and economic losses following a specific Flood. These results can be improved by using enhanced inventory data and flood hazard information.

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General Description of the Region

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The flood loss estimates provided in this report were based on a region that included 8 county(ies) from the following state(s):

- Connecticut

Note:
Appendix A contains a complete listing of the counties contained in the region.

The geographical size of the region is approximately 821 square miles and contains 45,565 census blocks. The region contains over 1,418 thousand households and has a total population of 3,604,191 people. The distribution of population by State and County for the study region is provided in Appendix B.

There are an estimated 1,150,568 buildings in the region with a total building replacement value (excluding contents) of 706,160 million dollars. Approximately 86.71% of the buildings (and 63.78% of the building value) are associated with residential housing.

Building Inventory

General Building Stock

Hazus estimates that there are 1,150,568 buildings in the region which have an aggregate total replacement value of 706,160 million dollars. Table 1 and Table 2 present the relative distribution of the value with respect to the general occupancies by Study Region and Scenario respectively. Appendix B provides a general distribution of the building value by State and County.

Table 1
Building Exposure by Occupancy Type for the Study Region

Occupancy	Exposure ($1000)	Percent of Total
Residential	450,421,306	63.8%
Commercial	141,769,502	20.1%
Industrial	39,791,295	5.6%
Agricultural	1,665,206	0.2%
Religion	9,363,313	1.3%
Government	18,572,316	2.6%
Education	44,577,144	6.3%
Total	**706,160,082**	**100%**

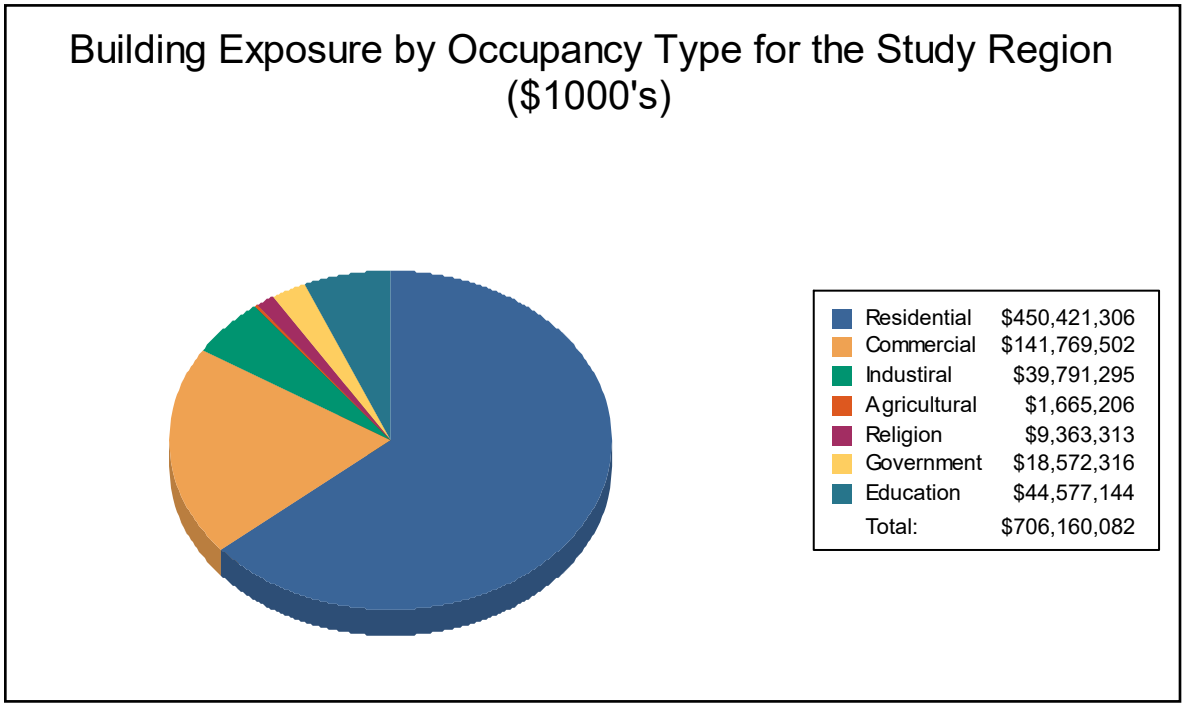
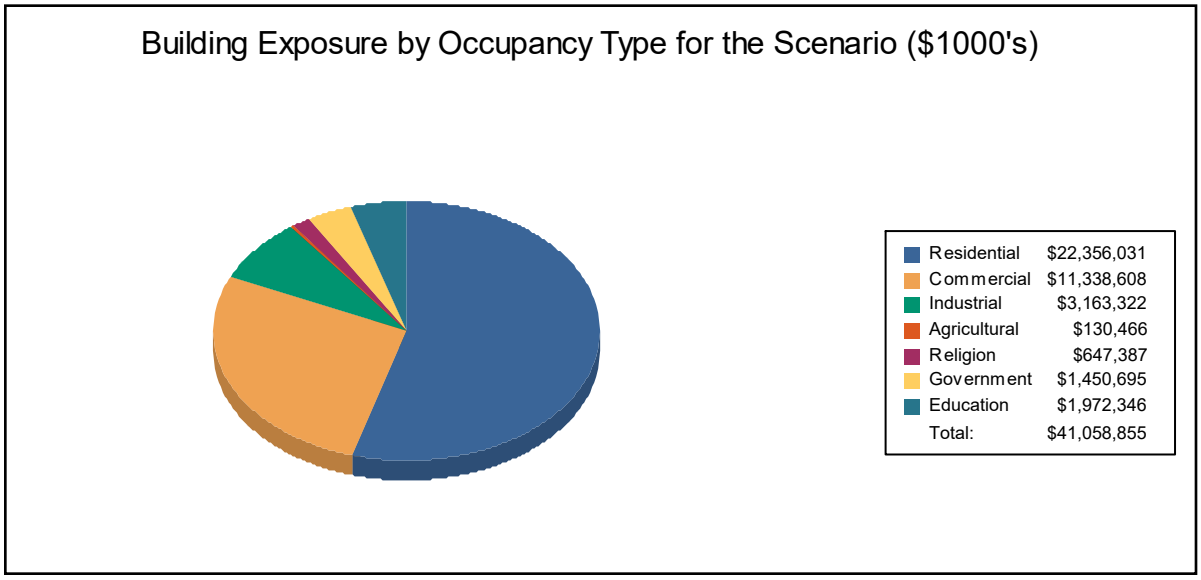


Table 2
Building Exposure by Occupancy Type for the Scenario

Occupancy	Exposure ($1000)	Percent of Total
Residential	50,256,804	55.3%
Commercial	23,913,363	26.3%
Industrial	7,846,565	8.6%
Agricultural	231,200	0.3%
Religion	1,244,559	1.4%
Government	3,053,470	3.4%
Education	4,272,869	4.7%
Total	**90,818,830**	**100%**



Essential Facility Inventory

For essential facilities, there are 54 hospitals in the region with a total bed capacity of 10,483 beds.
There are 1,350 schools, 569 fire stations, 198 police stations and 174 emergency operation centers.

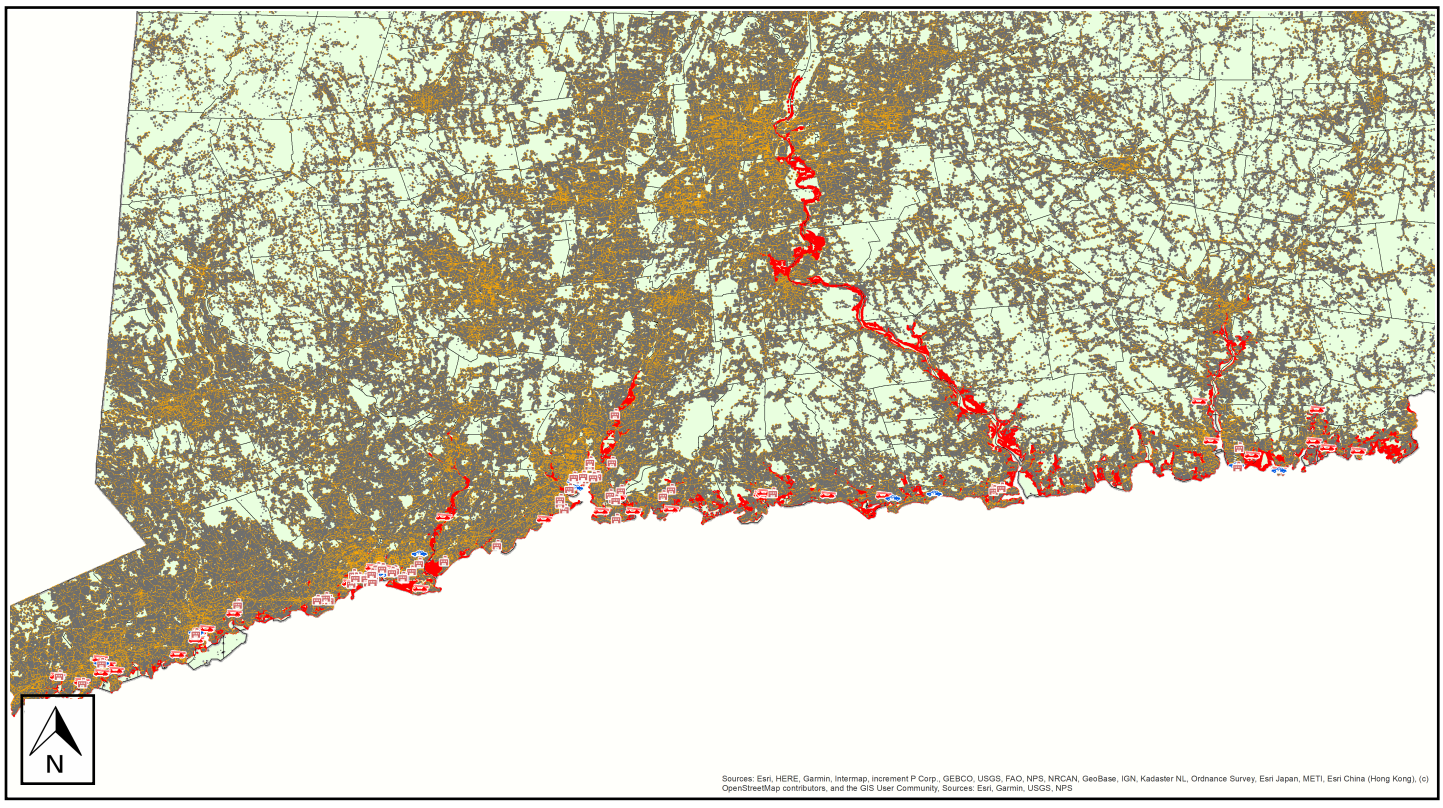
Flood Scenario Parameters

Hazus used the following set of information to define the flood parameters for the flood loss estimate provided in this report.

Study Region Name:	CT_SLOSH_CAT3
Scenario Name:	Cat 3
Return Period Analyzed:	100
Analysis Options Analyzed:	No What-Ifs

Study Region Overview Map

Illustrating scenario flood extent, as well as exposed essential facilities and total exposure



Building Damage

General Building Stock Damage

Hazus estimates that about 28,452 buildings will be at least moderately damaged. This is over 38% of the total number of buildings in the scenario. There are an estimated 7,623 buildings that will be completely destroyed. The definition of the 'damage states' is provided in the Hazus Flood Technical Manual. Table 3 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4 summarizes the expected damage by general building type.

Total Economic Loss (1 dot = $300K) Overview Map

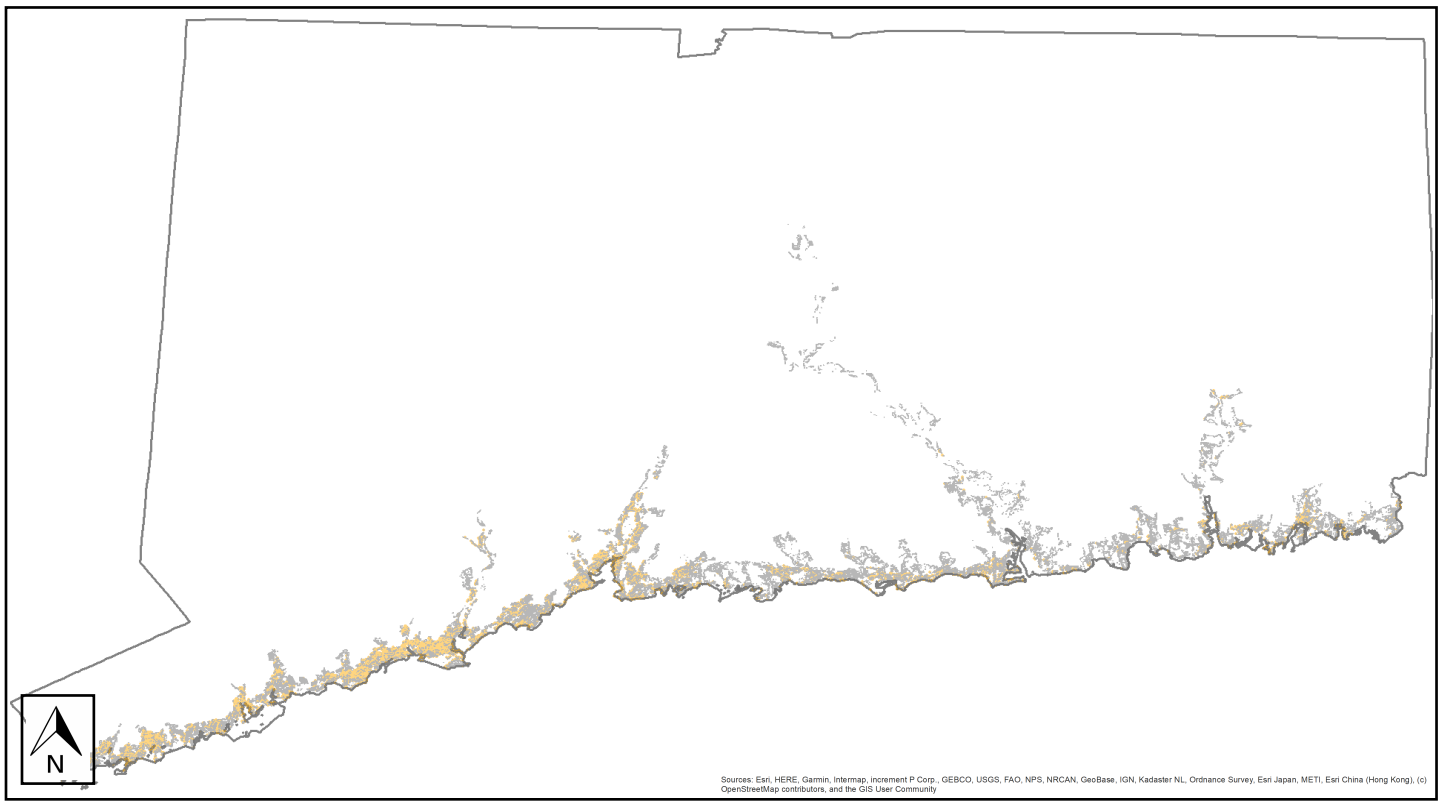


Table 3: Expected Building Damage by Occupancy

	1-10		11-20		21-30		31-40		41-50		>50	
Occupancy	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Agriculture	0	0	0	0	0	0	0	0	0	0	2	100
Commercial	52	3	550	34	302	19	165	10	340	21	206	13
Education	2	100	0	0	0	0	0	0	0	0	0	0
Government	17	5	196	57	54	16	48	14	13	4	18	5
Industrial	5	1	19	3	85	14	179	30	167	28	148	25
Religion	1	1	86	97	1	1	1	1	0	0	0	0
Residential	1,421	5	4,506	17	6,523	24	3,530	13	4,064	15	7,249	27
Total	**1,498**		**5,357**		**6,965**		**3,923**		**4,584**		**7,623**	

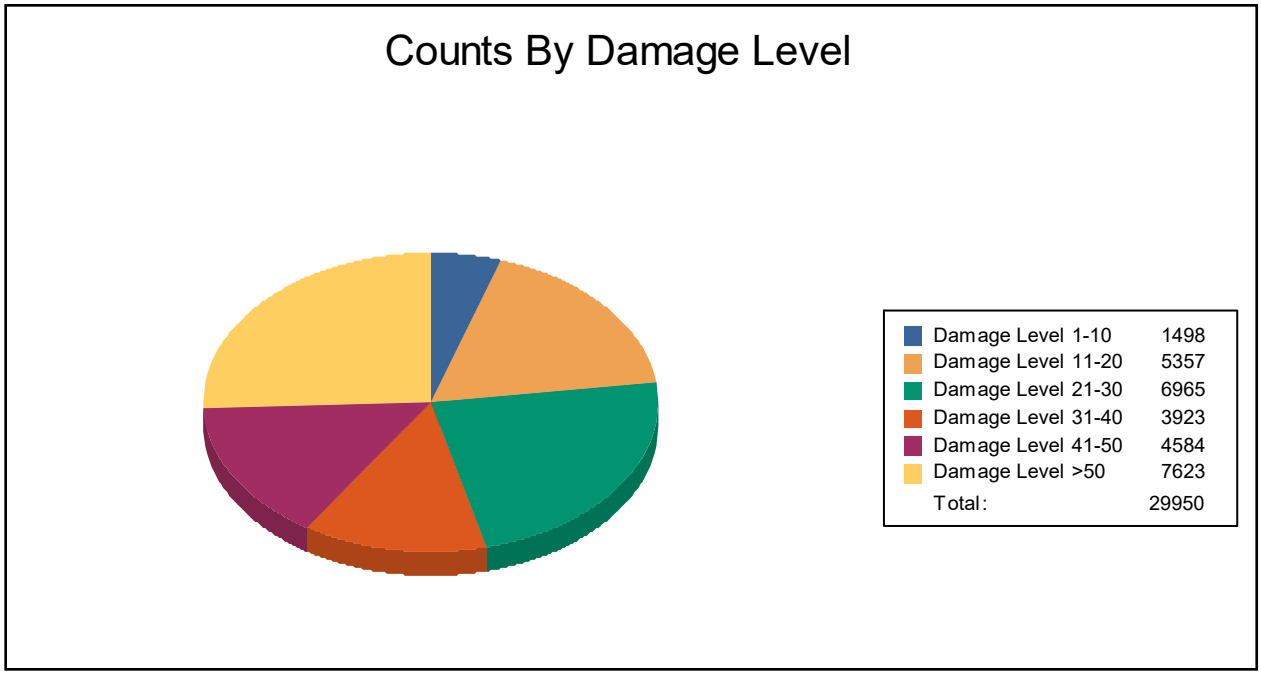




Table 4: Expected Building Damage by Building Type

Building Type	1-10		11-20		21-30		31-40		41-50		>50	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Concrete	0	0	39	30	18	14	19	15	36	28	17	13
ManufHousing	1	1	0	0	0	0	0	0	2	2	118	98
Masonry	17	1	430	24	358	20	203	11	476	26	340	19
Steel	56	4	435	32	252	18	210	15	220	16	198	14
Wood	1,416	5	4,343	17	6,274	24	3,440	13	3,736	14	6,889	26

Essential Facility Damage

Before the flood analyzed in this scenario, the region had 10,483 hospital beds available for use. On the day of the scenario flood event, the model estimates that 10,483 hospital beds are available in the region.

Table 5: Expected Damage to Essential Facilities

		# Facilities		
Classification	Total	At Least Moderate	At Least Substantial	Loss of Use
Emergency Operation Centers	174	5	0	2
Fire Stations	569	32	4	31
Hospitals	54	2	0	2
Police Stations	198	12	2	14
Schools	1,350	60	0	60

If this report displays all zeros or is blank, two possibilities can explain this.

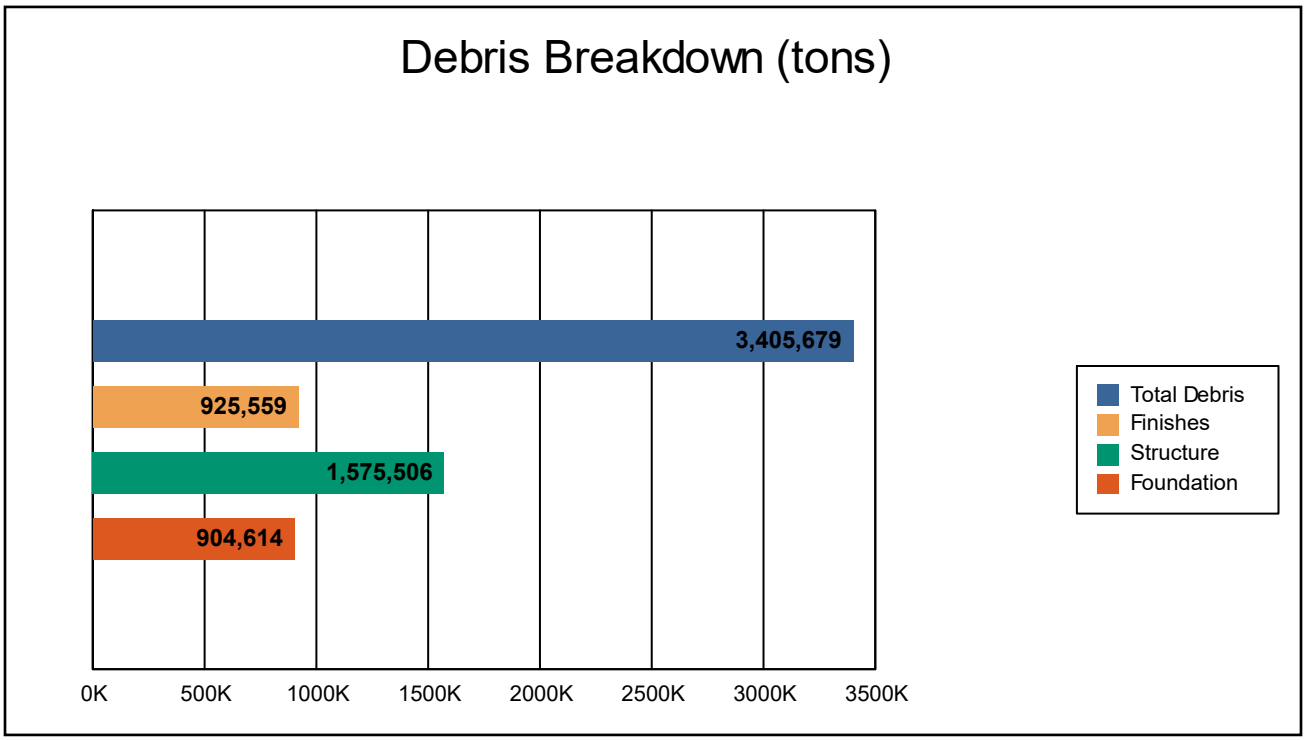
(1) None of your facilities were flooded. This can be checked by mapping the inventory data on the depth grid.

(2) The analysis was not run. This can be tested by checking the run box on the Analysis Menu and seeing if a message box asks you to replace the existing results.

Induced Flood Damage

Debris Generation

Hazus estimates the amount of debris that will be generated by the flood. The model breaks debris into three general categories: 1) Finishes (dry wall, insulation, etc.), 2) Structural (wood, brick, etc.) and 3) Foundations (concrete slab, concrete block, rebar, etc.). This distinction is made because of the different types of material handling equipment required to handle the debris.

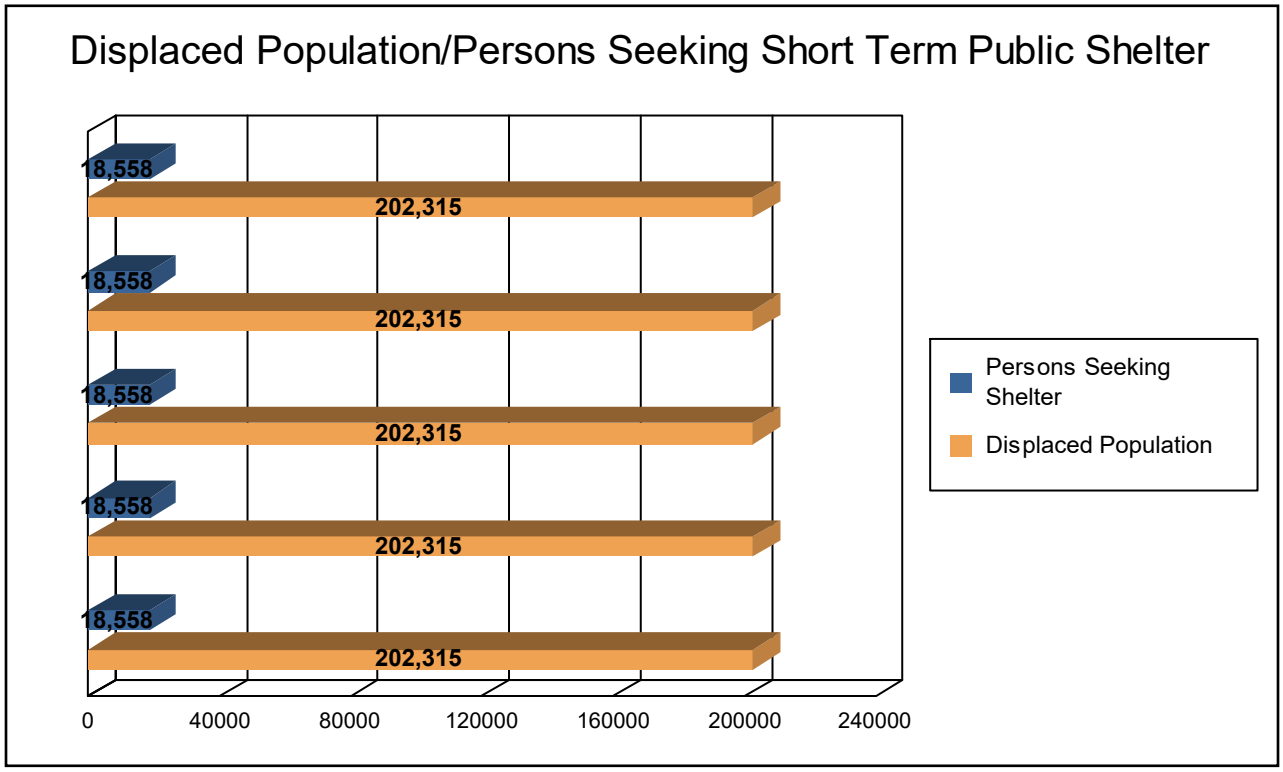


The model estimates that a total of 3,405,679 tons of debris will be generated. Of the total amount, Finishes comprises 27% of the total, Structure comprises 46% of the total, and Foundation comprises 27%. If the debris tonnage is converted into an estimated number of truckloads, it will require 136228 truckloads (@25 tons/truck) to remove the debris generated by the flood.

Social Impact

Shelter Requirements

Hazus estimates the number of households that are expected to be displaced from their homes due to the flood and the associated potential evacuation. Hazus also estimates those displaced people that will require accommodations in temporary public shelters. The model estimates 67,438 households (or 202,315 of people) will be displaced due to the flood. Displacement includes households evacuated from within or very near to the inundated area. Of these, 18,558 people (out of a total population of 3,604,191) will seek temporary shelter in public shelters.



Economic Loss

The total economic loss estimated for the flood is 63,170.40 million dollars, which represents 69.56 % of the total replacement value of the scenario buildings.

Building-Related Losses

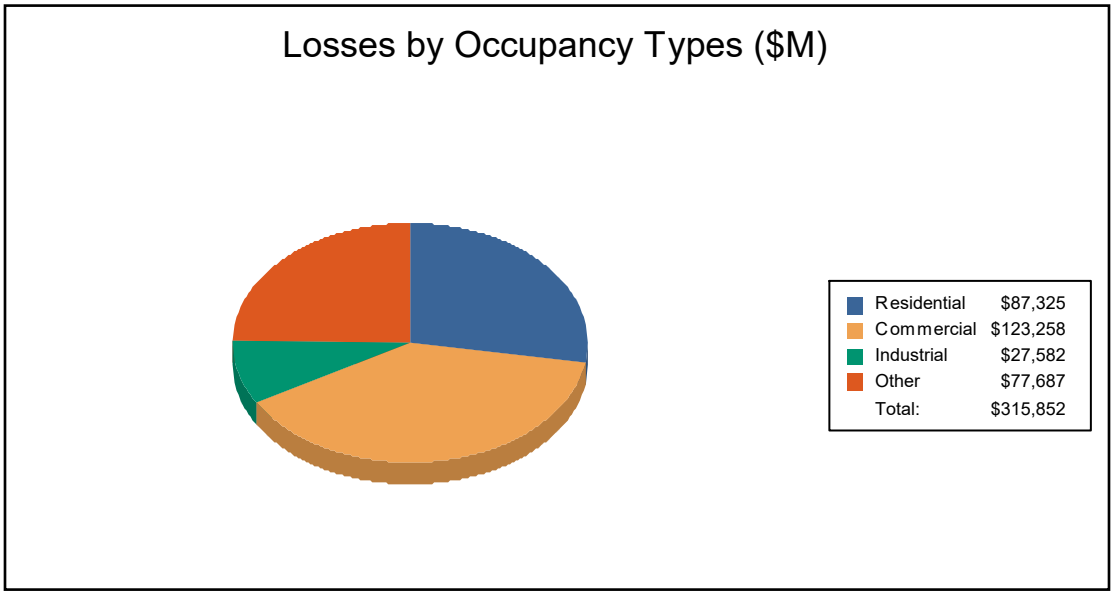
The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the flood. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the flood.

The total building-related losses were 37,655.87 million dollars. 40% of the estimated losses were related to the business interruption of the region. The residential occupancies made up 27.65% of the total loss. Table 6 below provides a summary of the losses associated with the building damage.

Table 6: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Building Loss						
	Building	41,353.73	17,352.64	7,218.04	3,823.44	69,747.84
	Content	33,387.46	41,072.17	16,829.84	16,768.91	108,058.37
	Inventory	0.00	7,914.76	2,187.58	370.79	10,473.13
	Subtotal	**74,741.18**	**66,339.57**	**26,235.46**	**20,963.14**	**188,279.34**
Business Interruption						
	Income	419.82	21,650.34	342.16	5,210.91	27,623.22
	Relocation	6,959.50	6,742.32	374.31	3,267.88	17,344.01
	Rental Income	4,215.01	4,896.09	105.05	688.72	9,904.86
	Wage	989.42	23,629.64	524.94	47,556.61	72,700.60
	Subtotal	**12,583.74**	**56,918.38**	**1,346.46**	**56,724.11**	**127,572.68**
ALL	**Total**	**87,324.92**	**123,257.95**	**27,581.91**	**77,687.24**	**315,852.01**





Appendix A: County Listing for the Region

Connecticut

- Fairfield
- Hartford
- Litchfield
- Middlesex
- New Haven
- New London
- Tolland
- Windham

Appendix B: Regional Population and Building Value Data

		Building Value (thousands of dollars)		
	Population	Residential	Non-Residential	Total
Connecticut				
Fairfield	957,322	138,194,741	64,130,883	202,325,624
Hartford	898,547	103,342,410	67,428,923	170,771,333
Litchfield	185,062	28,640,303	14,482,112	43,122,415
Middlesex	164,179	22,029,748	10,971,271	33,001,019
New Haven	864,495	92,884,699	61,151,656	154,036,355
New London	268,434	32,861,791	18,758,064	51,619,855
Tolland	149,768	19,494,697	9,788,429	29,283,126
Windham	116,384	12,972,917	9,027,438	22,000,355
Total	**3,604,191**	**450,421,306**	**255,738,776**	**706,160,082**
Total Study Region	**3,604,191**	**450,421,306**	**255,738,776**	**706,160,082**

Hazus: Flood Global Risk Report

Region Name: CT_SLOSH_CAT4

Flood Scenario: Cat 4

Print Date: Thursday, April 20, 2023

Disclaimer:
Totals only reflect data for those census tracts/blocks included in the user's study region.

The estimates of social and economic impacts contained in this report were produced using Hazus loss estimation methodology software which is based on current scientific and engineering knowledge. There are uncertainties inherent in any loss estimation technique. Therefore, there may be significant differences between the modeled results contained in this report and the actual social and economic losses following a specific Flood. These results can be improved by using enhanced inventory data and flood hazard information.

FEMA

RiskMAP
Increasing Resilience Together

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General Description of the Region

Hazus is a regional multi-hazard loss estimation model that was developed by the Federal Emergency Management Agency (FEMA) and the National Institute of Building Sciences (NIBS). The primary purpose of Hazus is to provide a methodology and software application to develop multi-hazard losses at a regional scale. These loss estimates would be used primarily by local, state and regional officials to plan and stimulate efforts to reduce risks from multi-hazards and to prepare for emergency response and recovery.

The flood loss estimates provided in this report were based on a region that included 8 county(ies) from the following state(s):

- Connecticut

Note:
Appendix A contains a complete listing of the counties contained in the region.

The geographical size of the region is approximately 821 square miles and contains 45,565 census blocks. The region contains over 1,418 thousand households and has a total population of 3,604,191 people. The distribution of population by State and County for the study region is provided in Appendix B.

There are an estimated 1,150,568 buildings in the region with a total building replacement value (excluding contents) of 706,160 million dollars. Approximately 86.71% of the buildings (and 63.78% of the building value) are associated with residential housing.

Building Inventory

General Building Stock

Hazus estimates that there are 1,150,568 buildings in the region which have an aggregate total replacement value of 706,160 million dollars. Table 1 and Table 2 present the relative distribution of the value with respect to the general occupancies by Study Region and Scenario respectively. Appendix B provides a general distribution of the building value by State and County.

Table 1
Building Exposure by Occupancy Type for the Study Region

Occupancy	Exposure ($1000)	Percent of Total
Residential	450,421,306	63.8%
Commercial	141,769,502	20.1%
Industrial	39,791,295	5.6%
Agricultural	1,665,206	0.2%
Religion	9,363,313	1.3%
Government	18,572,316	2.6%
Education	44,577,144	6.3%
Total	**706,160,082**	**100%**

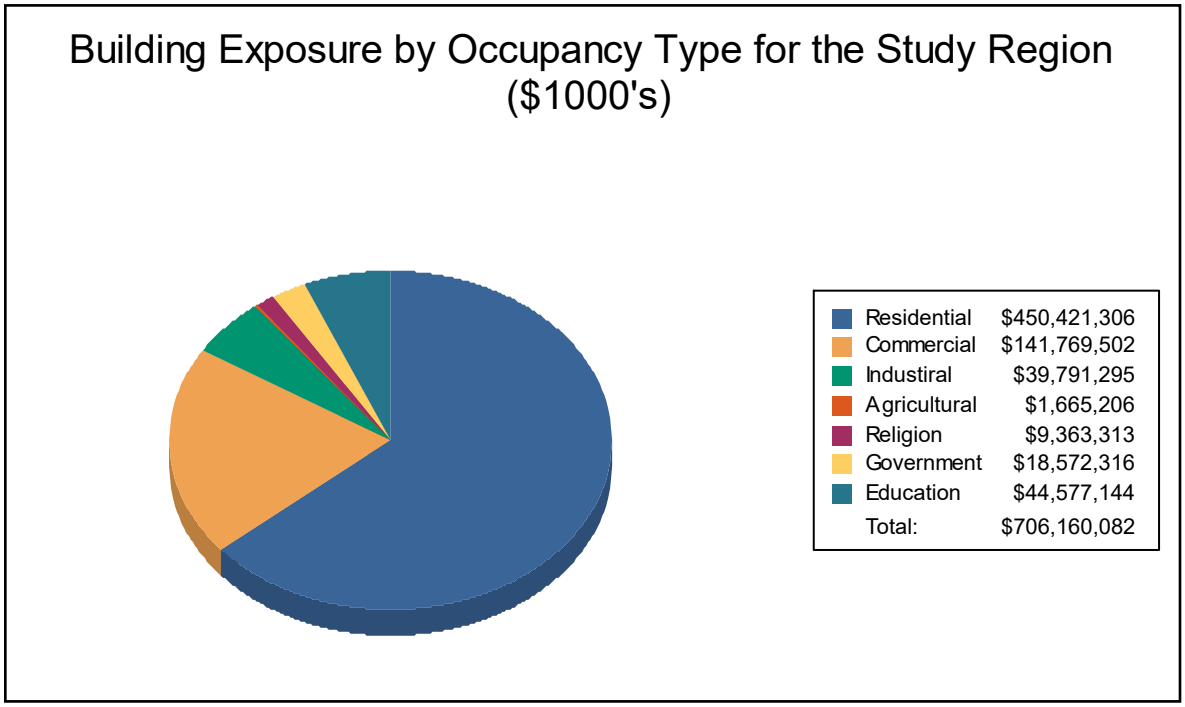
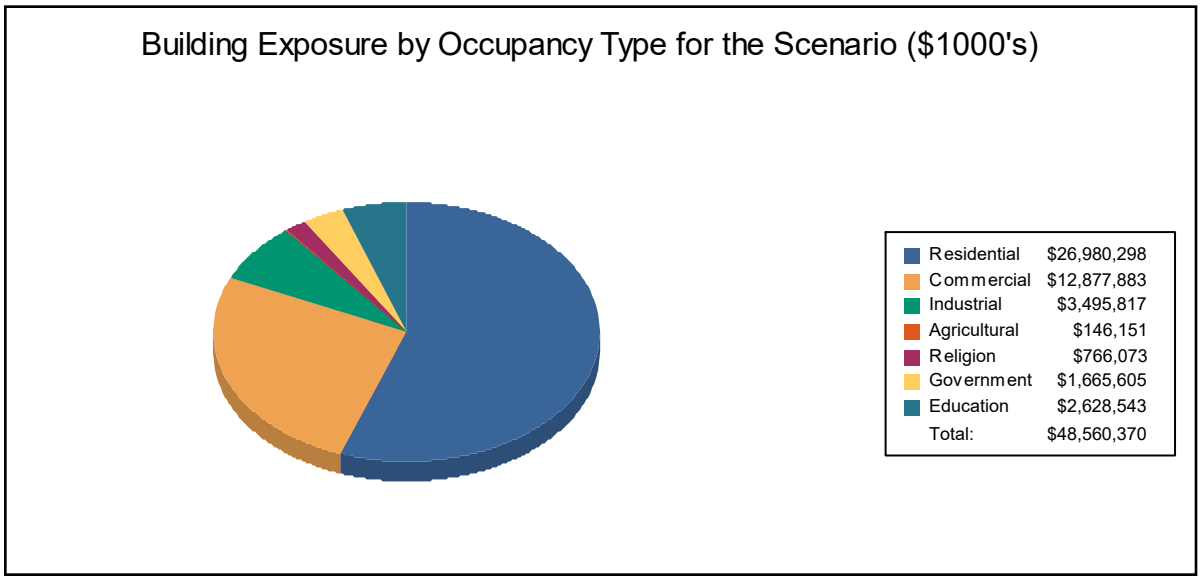


Table 2
Building Exposure by Occupancy Type for the Scenario

Occupancy	Exposure ($1000)	Percent of Total
Residential	60,118,093	54.9%
Commercial	28,196,557	25.8%
Industrial	8,721,837	8.0%
Agricultural	265,131	0.2%
Religion	1,526,549	1.4%
Government	3,544,833	3.2%
Education	7,113,325	6.5%
Total	**109,486,325**	**100%**



Essential Facility Inventory

For essential facilities, there are 54 hospitals in the region with a total bed capacity of 10,483 beds.
There are 1,350 schools, 569 fire stations, 198 police stations and 174 emergency operation centers.

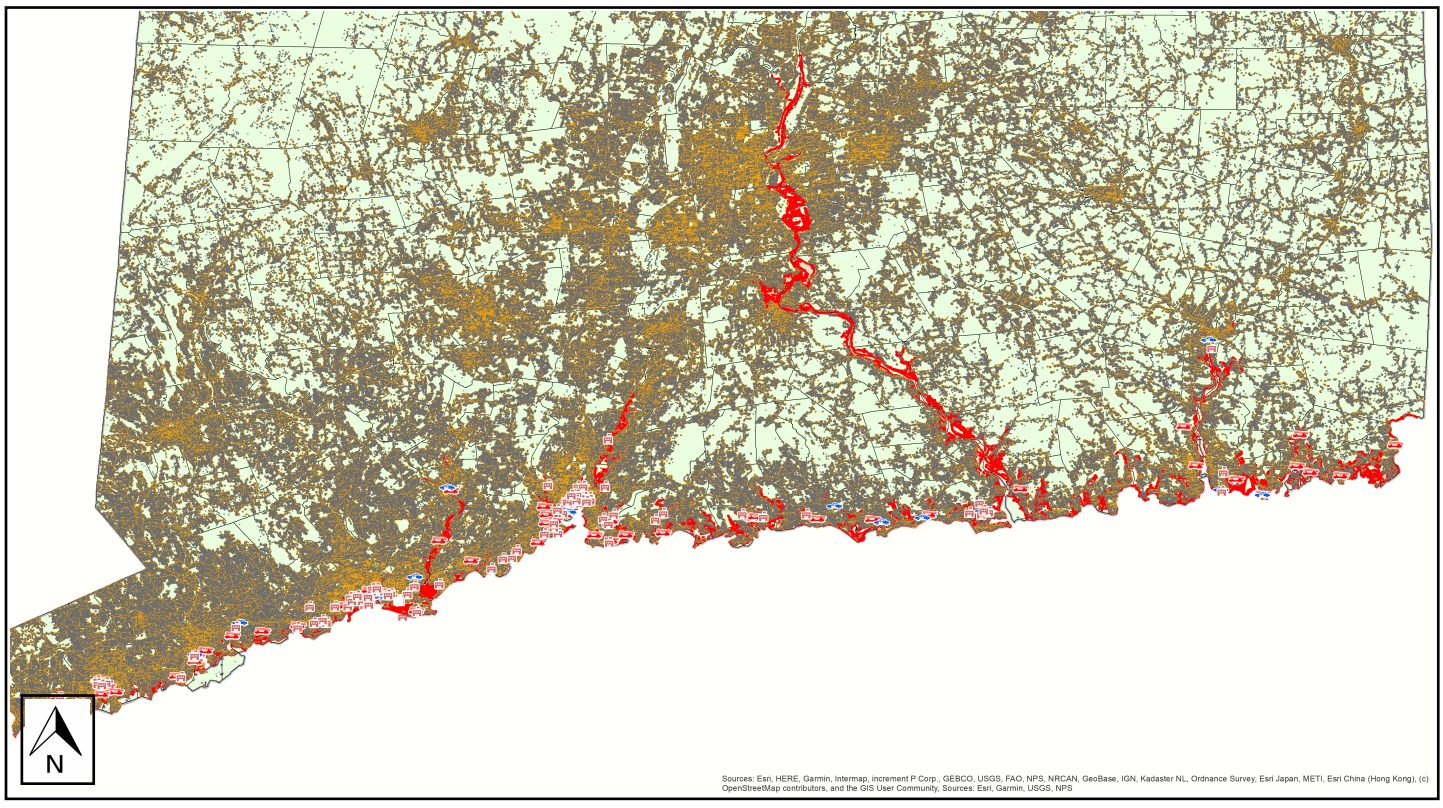
Flood Scenario Parameters

Hazus used the following set of information to define the flood parameters for the flood loss estimate provided in this report.

Study Region Name:	CT_SLOSH_CAT4
Scenario Name:	Cat 4
Return Period Analyzed:	100
Analysis Options Analyzed:	No What-Ifs

Study Region Overview Map

Illustrating scenario flood extent, as well as exposed essential facilities and total exposure



Building Damage

General Building Stock Damage

Hazus estimates that about 45,285 buildings will be at least moderately damaged. This is over 25% of the total number of buildings in the scenario. There are an estimated 19,412 buildings that will be completely destroyed. The definition of the 'damage states' is provided in the Hazus Flood Technical Manual. Table 3 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4 summarizes the expected damage by general building type.

Total Economic Loss (1 dot = $300K) Overview Map

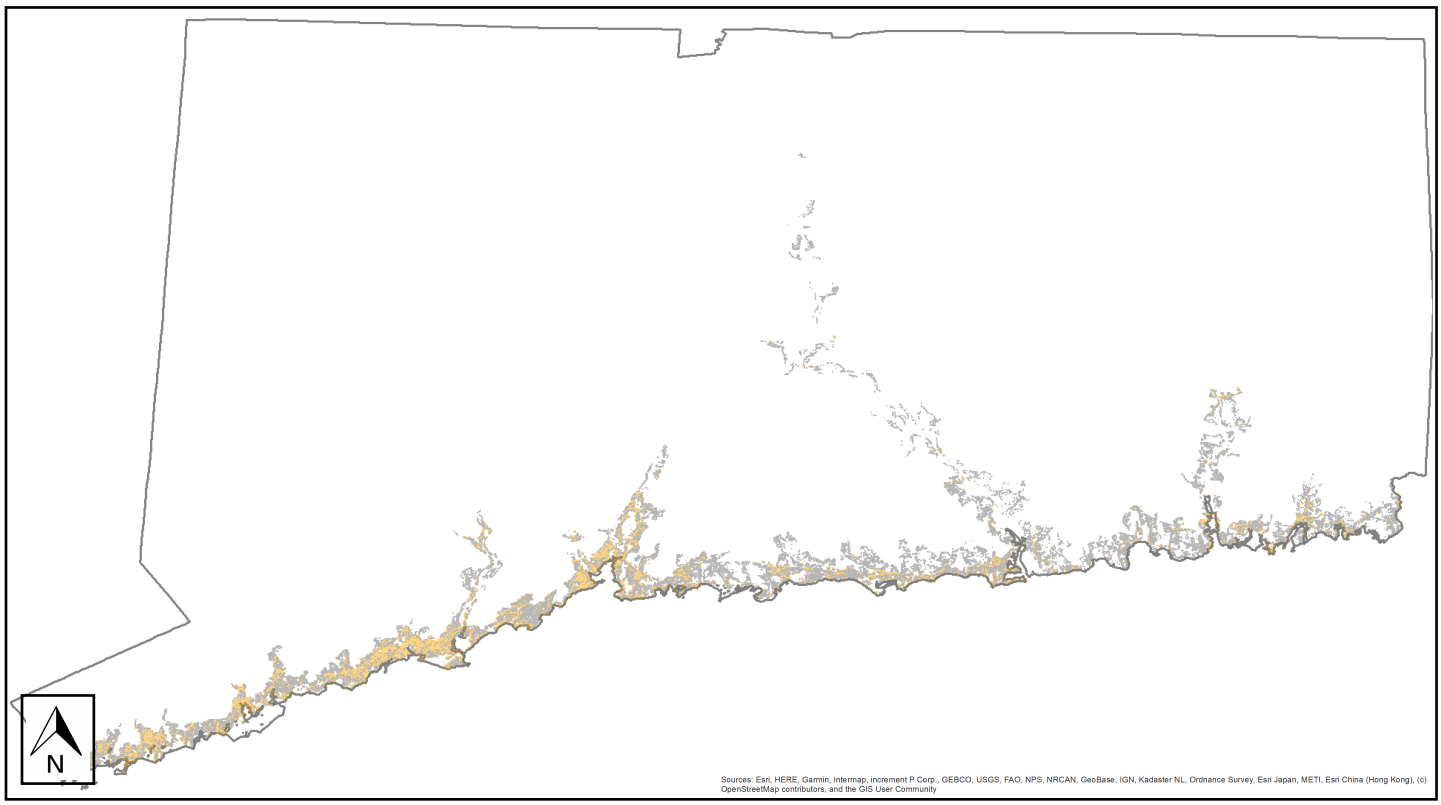


Table 3: Expected Building Damage by Occupancy

	1-10		11-20		21-30		31-40		41-50		>50	
Occupancy	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Agriculture	0	0	1	20	0	0	0	0	0	0	4	80
Commercial	45	2	501	19	255	10	203	8	391	15	1,180	46
Education	3	75	1	25	0	0	0	0	0	0	0	0
Government	8	2	96	25	18	5	25	6	11	3	231	59
Industrial	3	0	10	1	36	4	70	8	161	19	548	66
Religion	0	0	113	88	2	2	0	0	2	2	12	9
Residential	981	2	4,356	10	6,478	15	4,115	10	9,028	21	17,437	41
Total	**1,040**		**5,078**		**6,789**		**4,413**		**9,593**		**19,412**	

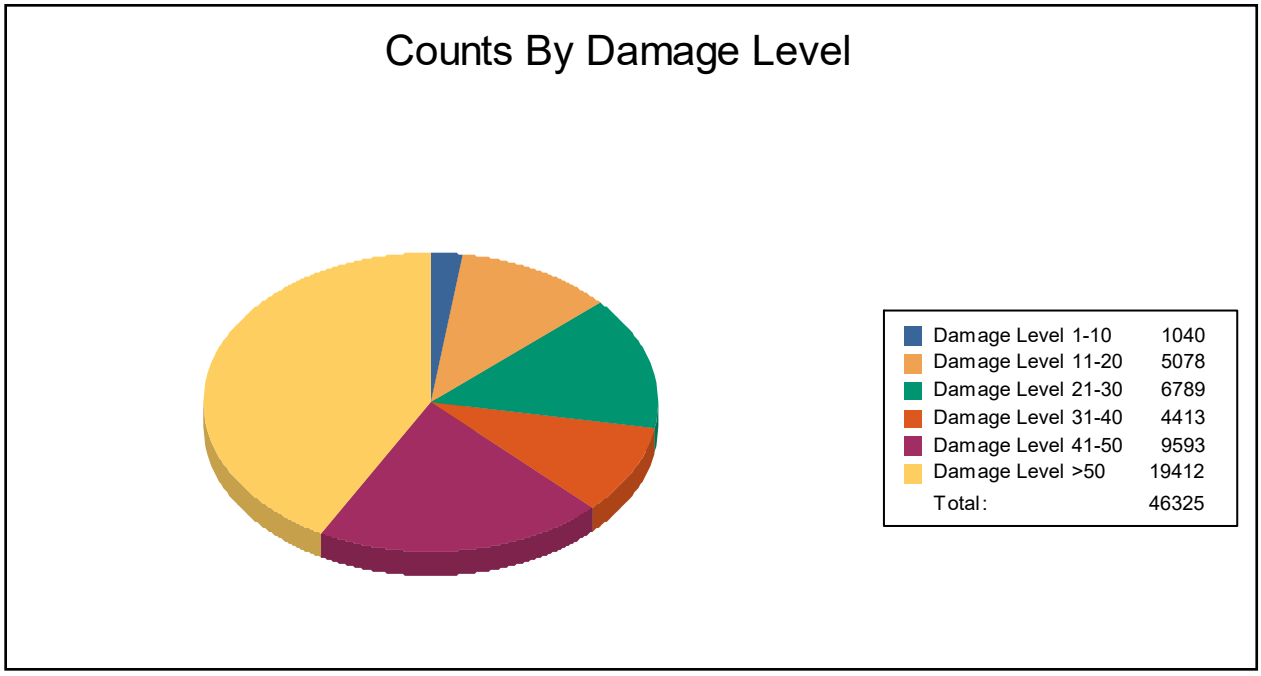




Table 4: Expected Building Damage by Building Type

Building Type	1-10		11-20		21-30		31-40		41-50		>50	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Concrete	1	1	28	14	7	4	9	5	39	20	114	58
ManufHousing	2	1	0	0	0	0	0	0	4	1	271	98
Masonry	8	0	514	16	311	10	195	6	756	23	1,471	45
Steel	44	2	341	17	156	8	151	8	282	14	1,023	51
Wood	976	2	4,089	10	6,236	16	4,000	10	8,386	21	16,262	41

Essential Facility Damage

Before the flood analyzed in this scenario, the region had 10,483 hospital beds available for use. On the day of the scenario flood event, the model estimates that 10,483 hospital beds are available in the region.

Table 5: Expected Damage to Essential Facilities

		# Facilities		
Classification	Total	At Least Moderate	At Least Substantial	Loss of Use
Emergency Operation Centers	174	9	0	8
Fire Stations	569	32	19	46
Hospitals	54	1	2	3
Police Stations	198	15	6	20
Schools	1,350	76	16	92

If this report displays all zeros or is blank, two possibilities can explain this.

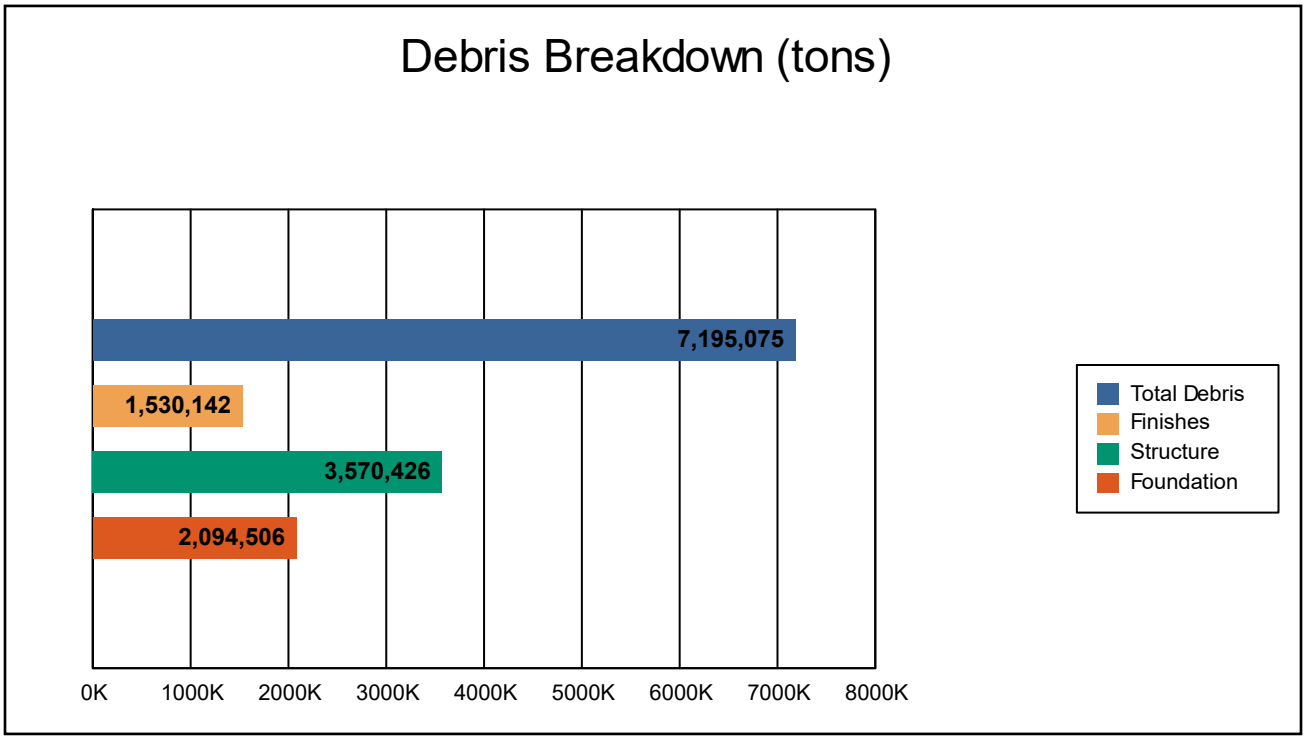
(1) None of your facilities were flooded. This can be checked by mapping the inventory data on the depth grid.

(2) The analysis was not run. This can be tested by checking the run box on the Analysis Menu and seeing if a message box asks you to replace the existing results.

Induced Flood Damage

Debris Generation

Hazus estimates the amount of debris that will be generated by the flood. The model breaks debris into three general categories: 1) Finishes (dry wall, insulation, etc.), 2) Structural (wood, brick, etc.) and 3) Foundations (concrete slab, concrete block, rebar, etc.). This distinction is made because of the different types of material handling equipment required to handle the debris.

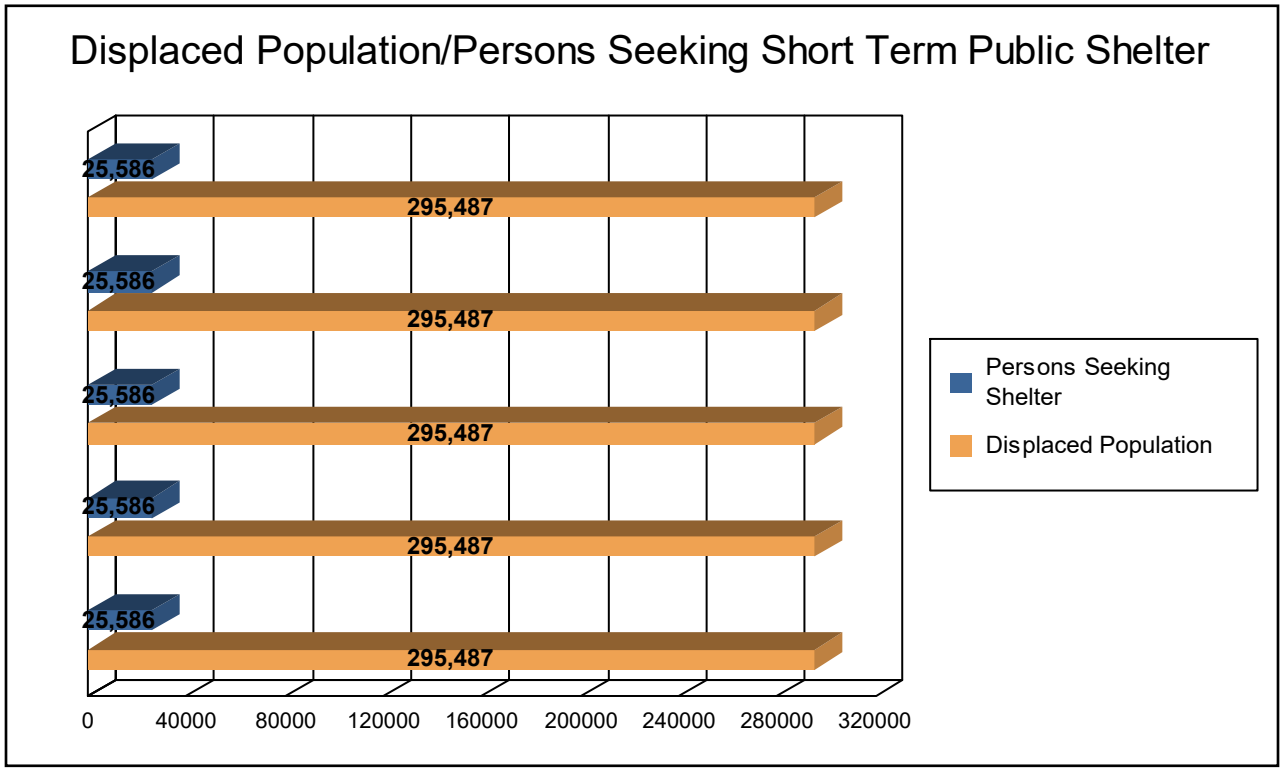


The model estimates that a total of 7,195,075 tons of debris will be generated. Of the total amount, Finishes comprises 21% of the total, Structure comprises 50% of the total, and Foundation comprises 29%. If the debris tonnage is converted into an estimated number of truckloads, it will require 287803 truckloads (@25 tons/truck) to remove the debris generated by the flood.

Social Impact

Shelter Requirements

Hazus estimates the number of households that are expected to be displaced from their homes due to the flood and the associated potential evacuation. Hazus also estimates those displaced people that will require accommodations in temporary public shelters. The model estimates 98,496 households (or 295,487 of people) will be displaced due to the flood. Displacement includes households evacuated from within or very near to the inundated area. Of these, 25,586 people (out of a total population of 3,604,191) will seek temporary shelter in public shelters.



Economic Loss

The total economic loss estimated for the flood is 100,757.30 million dollars, which represents 92.03 % of the total replacement value of the scenario buildings.

Building-Related Losses

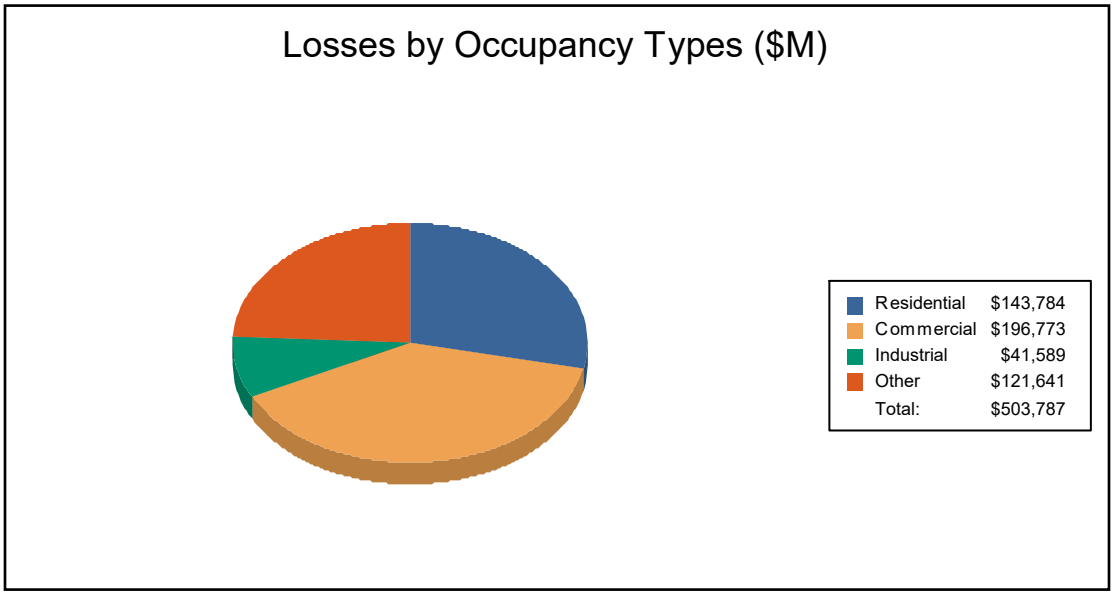
The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the flood. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the flood.

The total building-related losses were 62,635.92 million dollars. 38% of the estimated losses were related to the business interruption of the region. The residential occupancies made up 28.54% of the total loss. Table 6 below provides a summary of the losses associated with the building damage.

Table 6: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Building Loss						
	Building	72,058.74	34,275.49	11,655.77	9,525.24	127,515.23
	Content	52,857.63	65,182.54	24,977.89	27,463.25	170,481.30
	Inventory	0.00	11,505.39	3,182.34	495.36	15,183.09
	Subtotal	**124,916.37**	**110,963.42**	**39,815.99**	**37,483.85**	**313,179.62**
Business Interruption						
	Income	659.34	32,561.84	454.41	8,168.88	41,844.46
	Relocation	10,166.05	10,022.00	487.17	4,917.59	25,592.80
	Rental Income	6,488.97	7,307.07	138.89	972.88	14,907.81
	Wage	1,553.18	35,918.24	692.91	70,097.52	108,261.84
	Subtotal	**18,867.53**	**85,809.14**	**1,773.37**	**84,156.86**	**190,606.90**
ALL	**Total**	**143,783.90**	**196,772.56**	**41,589.36**	**121,640.70**	**503,786.51**





Appendix A: County Listing for the Region

Connecticut

- Fairfield
- Hartford
- Litchfield
- Middlesex
- New Haven
- New London
- Tolland
- Windham

Appendix B: Regional Population and Building Value Data

		Building Value (thousands of dollars)		
	Population	Residential	Non-Residential	Total
Connecticut				
Fairfield	957,322	138,194,741	64,130,883	202,325,624
Hartford	898,547	103,342,410	67,428,923	170,771,333
Litchfield	185,062	28,640,303	14,482,112	43,122,415
Middlesex	164,179	22,029,748	10,971,271	33,001,019
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Windham	116,384	12,972,917	9,027,438	22,000,355
Total	**3,604,191**	**450,421,306**	**255,738,776**	**706,160,082**
Total Study Region	**3,604,191**	**450,421,306**	**255,738,776**	**706,160,082**

Quick Assessment Report

April 21, 2023

Study Region : CT_SLOSH_CAT1
Scenario : Cat 1
Return Period: 100
Analysis Option: 0

Regional Statistics

Area (Square Miles)	821
Number of Census Blocks	45,565
Number of Buildings	
Residential	997,684
Total	1,150,568
Number of People in the Region (x 1000)	3,604
Building Exposure ($ Millions)	
Residential	450,421
Total	706,160

Scenario Results

Shelter Requirements	
Displaced Population (# Households)	25,265
Short Term Shelter (# People)	8,369
Economic Loss	
Residential Property (Capital Stock) Losses ($ Millions)	3,067
Total Property (Capital Stock) Losses ($ Millions)	7,072
Business Interruption (Income) Losses ($ Millions)	8,477

Disclaimer:

Totals only reflect data for those census tracts/blocks included in the user's study region.

The estimates of social and economic impacts contained in this report were produced using Hazus loss estimation methodology software which is based on current scientific and engineering knowledge. There are uncertainties inherent in any loss estimation technique. Therefore, there may be significant differences between the modeled results contained in this report and the actual social and economic losses following a specific flood. These results can be improved by using enhanced inventory data and flood hazard information.

Quick Assessment Report

April 21, 2023

Study Region : CT_SLOSH_CAT2
Scenario : Cat 2
Return Period: 100
Analysis Option: 0

Regional Statistics

Area (Square Miles)	821
Number of Census Blocks	45,565
Number of Buildings	
Residential	997,684
Total	1,150,568
Number of People in the Region (x 1000)	3,604
Building Exposure ($ Millions)	
Residential	450,421
Total	706,160

Scenario Results

Shelter Requirements

Displaced Population (# Households)	44,078
Short Term Shelter (# People)	13,406

Economic Loss

Residential Property (Capital Stock) Losses ($ Millions)	8,171
Total Property (Capital Stock) Losses ($ Millions)	19,814
Business Interruption (Income) Losses ($ Millions)	15,538

Disclaimer:

Totals only reflect data for those census tracts/blocks included in the user's study region.

The estimates of social and economic impacts contained in this report were produced using Hazus loss estimation methodology software which is based on current scientific and engineering knowledge. There are uncertainties inherent in any loss estimation technique. Therefore, there may be significant differences between the modeled results contained in this report and the actual social and economic losses following a specific flood. These results can be improved by using enhanced inventory data and flood hazard information.

Quick Assessment Report

April 21, 2023

Study Region : CT_SLOSH_CAT3
Scenario : Cat 3
Return Period: 100
Analysis Option: 0

Regional Statistics

Area (Square Miles)	821
Number of Census Blocks	45,565
Number of Buildings	
Residential	997,684
Total	1,150,568
Number of People in the Region (x 1000)	3,604
Building Exposure ($ Millions)	
Residential	450,421
Total	706,160

Scenario Results

Shelter Requirements

Displaced Population (# Households)	67,438
Short Term Shelter (# People)	18,558

Economic Loss

Residential Property (Capital Stock) Losses ($ Millions)	14,948
Total Property (Capital Stock) Losses ($ Millions)	37,656
Business Interruption (Income) Losses ($ Millions)	25,515

Disclaimer:

Totals only reflect data for those census tracts/blocks included in the user's study region.

The estimates of social and economic impacts contained in this report were produced using Hazus loss estimation methodology software which is based on current scientific and engineering knowledge. There are uncertainties inherent in any loss estimation technique. Therefore, there may be significant differences between the modeled results contained in this report and the actual social and economic losses following a specific flood. These results can be improved by using enhanced inventory data and flood hazard information.

Quick Assessment Report

April 20, 2023

Study Region : CT_SLOSH_CAT4
Scenario : Cat 4
Return Period: 100
Analysis Option: 0

Regional Statistics

Area (Square Miles)	821
Number of Census Blocks	45,565
Number of Buildings	
Residential	997,684
Total	1,150,568
Number of People in the Region (x 1000)	3,604
Building Exposure ($ Millions)	
Residential	450,421
Total	706,160

Scenario Results

Shelter Requirements

Displaced Population (# Households)	98,496
Short Term Shelter (# People)	25,586

Economic Loss

Residential Property (Capital Stock) Losses ($ Millions)	24,983
Total Property (Capital Stock) Losses ($ Millions)	62,636
Business Interruption (Income) Losses ($ Millions)	38,121

Disclaimer:

Totals only reflect data for those census tracts/blocks included in the user's study region.

The estimates of social and economic impacts contained in this report were produced using Hazus loss estimation methodology software which is based on current scientific and engineering knowledge. There are uncertainties inherent in any loss estimation technique. Therefore, there may be significant differences between the modeled results contained in this report and the actual social and economic losses following a specific flood. These results can be improved by using enhanced inventory data and flood hazard information.

Hazus: Earthquake Global Risk Report

Region Name: CT_EQ_Prblstc

Earthquake Scenario: CT_Probabilistic

Print Date: April 28, 2023

Disclaimer:
Totals only reflect data for those census tracts/blocks included in the user's study region.

The estimates of social and economic impacts contained in this report were produced using Hazus loss estimation methodology software which is based on current scientific and engineering knowledge. There are uncertainties inherent in any loss estimation technique. Therefore, there may be significant differences between the modeled results contained in this report and the actual social and economic losses following a specific earthquake. These results can be improved by using enhanced inventory, geotechnical, and observed ground motion data.

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General Description of the Region

Hazus-MH is a regional earthquake loss estimation model that was developed by the Federal Emergency Management Agency (FEMA) and the National Institute of Building Sciences. The primary purpose of Hazus is to provide a methodology and software application to develop multi-hazard losses at a regional scale. These loss estimates would be used primarily by local, state and regional officials to plan and stimulate efforts to reduce risks from multi-hazards and to prepare for emergency response and recovery.

The earthquake loss estimates provided in this report was based on a region that includes 8 county(ies) from the following state(s):

Connecticut

Note:
Appendix A contains a complete listing of the counties contained in the region.

The geographical size of the region is 4,989.48 square miles and contains 878 census tracts. There are over 1,418 thousand households in the region which has a total population of 3,605,944 peopleF. The distribution of population by Total Region and County is provided in Appendix B.

There are an estimated 1,150 thousand buildings in the region with a total building replacement value (excluding contents) of 706,231 (millions of dollars). Approximately 87.00 % of the buildings (and 64.00% of the building value) are associated with residential housing.

The replacement value of the transportation and utility lifeline systems is estimated to be 104,555 and 35,869 (millions of dollars) , respectively.

Building and Lifeline Inventory

Building Inventory

Hazus estimates that there are 1,150 thousand buildings in the region which have an aggregate total replacement value of 706,231 (millions of dollars) . Appendix B provides a general distribution of the building value by Total Region and County.

In terms of building construction types found in the region, wood frame construction makes up 81% of the building inventory. The remaining percentage is distributed between the other general building types.

Critical Facility Inventory

Hazus breaks critical facilities into two (2) groups: essential facilities and high potential loss facilities (HPL). Essential facilities include hospitals, medical clinics, schools, fire stations, police stations and emergency operations facilities. High potential loss facilities include dams, levees, military installations, nuclear power plants and hazardous material sites.

For essential facilities, there are 54 hospitals in the region with a total bed capacity of 10,483 beds. There are 1,350 schools, 569 fire stations, 198 police stations and 174 emergency operation facilities. With respect to high potential loss facilities (HPL), there are no dams identified within the inventory. The inventory also includes no hazardous material sites, no military installations and no nuclear power plants.

Transportation and Utility Lifeline Inventory

Within Hazus, the lifeline inventory is divided between transportation and utility lifeline systems. There are seven (7) transportation systems that include highways, railways, light rail, bus, ports, ferry and airports. There are six (6) utility systems that include potable water, wastewater, natural gas, crude & refined oil, electric power and communications. The lifeline inventory data are provided in Tables 1 and 2.

The total value of the lifeline inventory is over 140,424.00 (millions of dollars). This inventory includes over 2,753.29 miles of highways, 4,361 bridges, 42,625.43 miles of pipes.

Table 1: Transportation System Lifeline Inventory

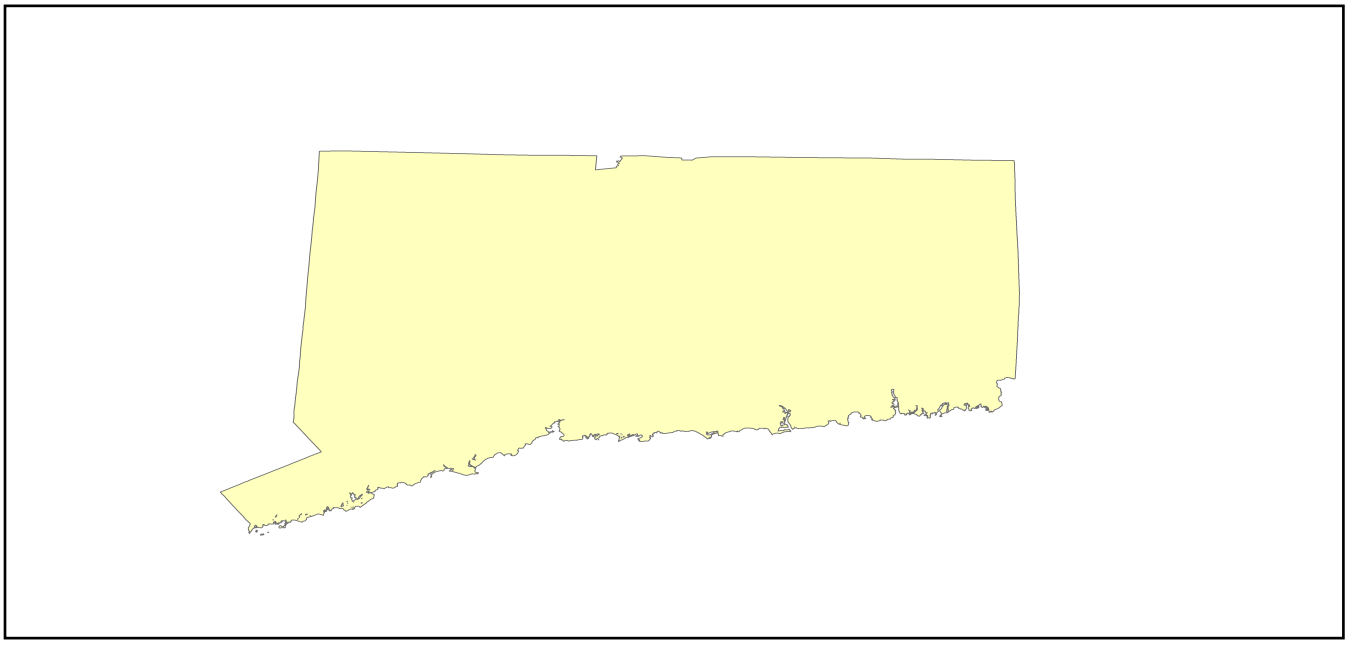
System	Component	# Locations/ # Segments	Replacement value (millions of dollars)
Highway	Bridges	4,361	19517.4512
	Segments	2,070	27492.4546
	Tunnels	7	56.0245
		Subtotal	**47065.9303**
Railways	Bridges	463	2412.2300
	Facilities	20	53.2600
	Segments	427	53524.7609
	Tunnels	0	0.0000
		Subtotal	**55990.2509**
Light Rail	Bridges	0	0.0000
	Facilities	0	0.0000
	Segments	0	0.0000
	Tunnels	0	0.0000
		Subtotal	**0.0000**
Bus	Facilities	5	10.3109
		Subtotal	**10.3109**
Ferry	Facilities	10	13.3100
		Subtotal	**13.3100**
Port	Facilities	283	987.7501
		Subtotal	**987.7501**
Airport	Facilities	12	318.5866
	Runways	26	169.3324
		Subtotal	**487.9190**
		Total	**104,555.50**

Table 2: Utility System Lifeline Inventory

System	Component	# Locations / Segments	Replacement value (millions of dollars)
Potable Water	Distribution Lines	NA	849.3453
	Facilities	11	421.2450
	Pipelines	0	0.0000
		Subtotal	**1270.5903**
Waste Water	Distribution Lines	NA	509.6072
	Facilities	89	14012.7118
	Pipelines	0	0.0000
		Subtotal	**14522.3190**
Natural Gas	Distribution Lines	NA	339.7381
	Facilities	5	402.3145
	Pipelines	508	4102.1934
		Subtotal	**4844.2460**
Oil Systems	Facilities	1	0.1150
	Pipelines	0	0.0000
		Subtotal	**0.1150**
Electrical Power	Facilities	84	15218.7350
		Subtotal	**15218.7350**
Communication	Facilities	113	12.9950
		Subtotal	**12.9950**
		Total	**35,869.00**

Earthquake Scenario

Hazus uses the following set of information to define the earthquake parameters used for the earthquake loss estimate provided in this report.



Scenario Name	CT_Probabilistic
Type of Earthquake	Probabilistic
Fault Name	NA
Historical Epicenter ID #	NA
Probabilistic Return Period	Annualized
Longitude of Epicenter	NA
Latitude of Epicenter	NA
Earthquake Magnitude	NA
Depth (km)	NA
Rupture Length (Km)	NA
Rupture Orientation (degrees)	NA
Attenuation Function	NA

Direct Earthquake Damage

Building Damage

Hazus estimates that about buildings will be at least moderately damaged. This is over % of the buildings in the region. There are an estimated buildings that will be damaged beyond repair. The definition of the 'damage states' is provided in Volume 1: Chapter 5 of the Hazus technical manual. Table 3 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4 below summarizes the expected damage by general building type.

Damage Categories by General Occupancy Type



Table 3: Expected Building Damage by Occupancy

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Total										

Table 4: Expected Building Damage by Building Type (All Design Levels)

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Total										

*Note:
RM Reinforced Masonry
URM Unreinforced Masonry
MH Manufactured Housing

Essential Facility Damage

Before the earthquake, the region had 10,483 hospital beds available for use. On the day of the earthquake, the model estimates that only 0 hospital beds (0.00%) are available for use by patients already in the hospital and those injured by the earthquake. After one week, 0.00% of the beds will be back in service. By 30 days, 0.00% will be operational.

Table 5: Expected Damage to Essential Facilities

Classification	Total	# Facilities		
		At Least Moderate Damage > 50%	Complete Damage > 50%	With Functionality > 50% on day 1
Hospitals	54	0	0	0
Schools	1,350	0	0	0
EOCs	174	0	0	0
PoliceStations	198	0	0	0
FireStations	569	0	0	0

Transportation Lifeline Damage

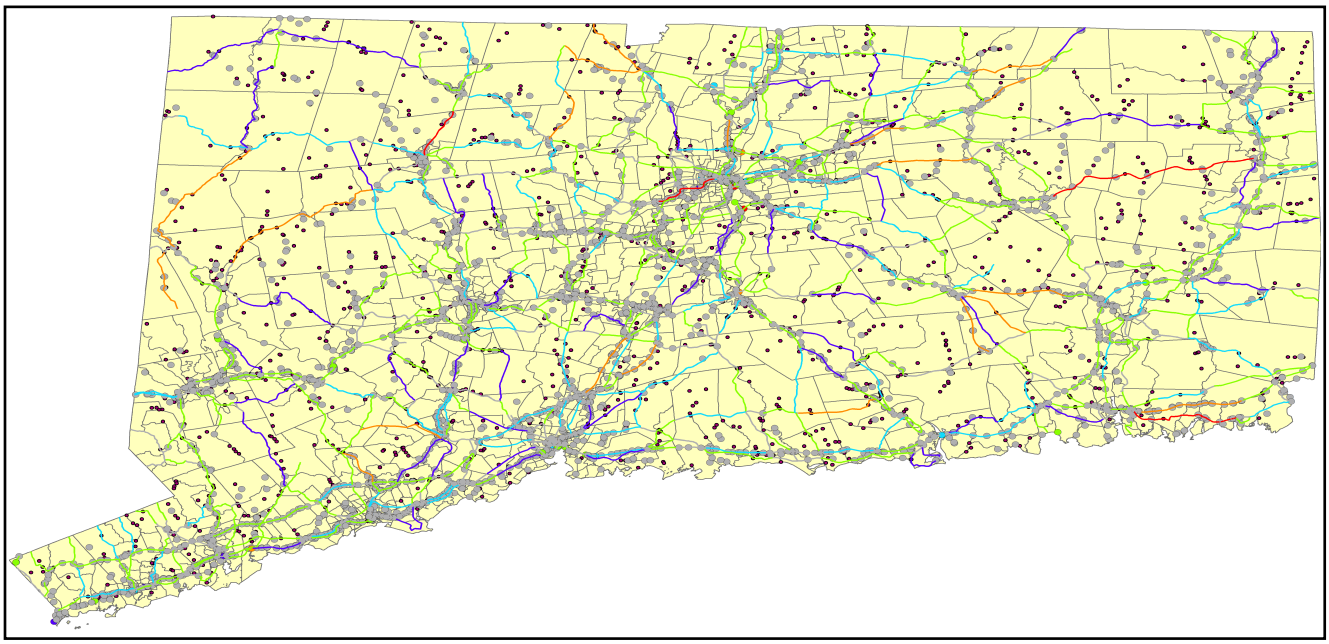


Table 6: Expected Damage to the Transportation Systems

System	Component		Number of Locations			
		Locations/ Segments	With at Least Mod. Damage	With Complete Damage	With Functionality > 50 % After Day 1	With Functionality > 50 % After Day 7
Highway	Segments	2,070	0	0	0	0
	Bridges	4,361	0	0	0	0
	Tunnels	7	0	0	0	0
Railways	Segments	427	0	0	0	0
	Bridges	463	0	0	0	0
	Tunnels	0	0	0	0	0
	Facilities	20	0	0	0	0
Light Rail	Segments	0	0	0	0	0
	Bridges	0	0	0	0	0
	Tunnels	0	0	0	0	0
	Facilities	0	0	0	0	0
Bus	Facilities	5	0	0	0	0
Ferry	Facilities	10	0	0	0	0
Port	Facilities	283	0	0	0	0
Airport	Facilities	12	0	0	0	0
	Runways	26	0	0	0	0

Table 6 provides damage estimates for the transportation system.

Note: Roadway segments, railroad tracks and light rail tracks are assumed to be damaged by ground failure only. If ground failure maps are not provided, damage estimates to these components will not be computed.

Tables 7-9 provide information on the damage to the utility lifeline systems. Table 7 provides damage to the utility system facilities. Table 8 provides estimates on the number of leaks and breaks by the pipelines of the utility systems. For electric power and potable water, Hazus performs a simplified system performance analysis. Table 9 provides a summary of the system performance information.

Table 7 : Expected Utility System Facility Damage

System	# of Locations				
	Total #	With at Least Moderate Damage	With Complete Damage	with Functionality > 50 %	
				After Day 1	After Day 7
Potable Water	11	0	0	0	0
Waste Water	89	0	0	0	0
Natural Gas	5	0	0	0	0
Oil Systems	1	0	0	0	0
Electrical Power	84	0	0	0	0
Communication	113	0	0	0	0

Table 8 : Expected Utility System Pipeline Damage (Site Specific)

System	Total Pipelines Length (miles)	Number of Leaks	Number of Breaks
Potable Water	26,388	0	0
Waste Water	15,833	0	0
Natural Gas	405	0	0
Oil	0	0	0

Table 9: Expected Potable Water and Electric Power System Performance

	Total # of Households	Number of Households without Service				
		At Day 1	At Day 3	At Day 7	At Day 30	At Day 90
Potable Water						
Electric Power						

Induced Earthquake Damage

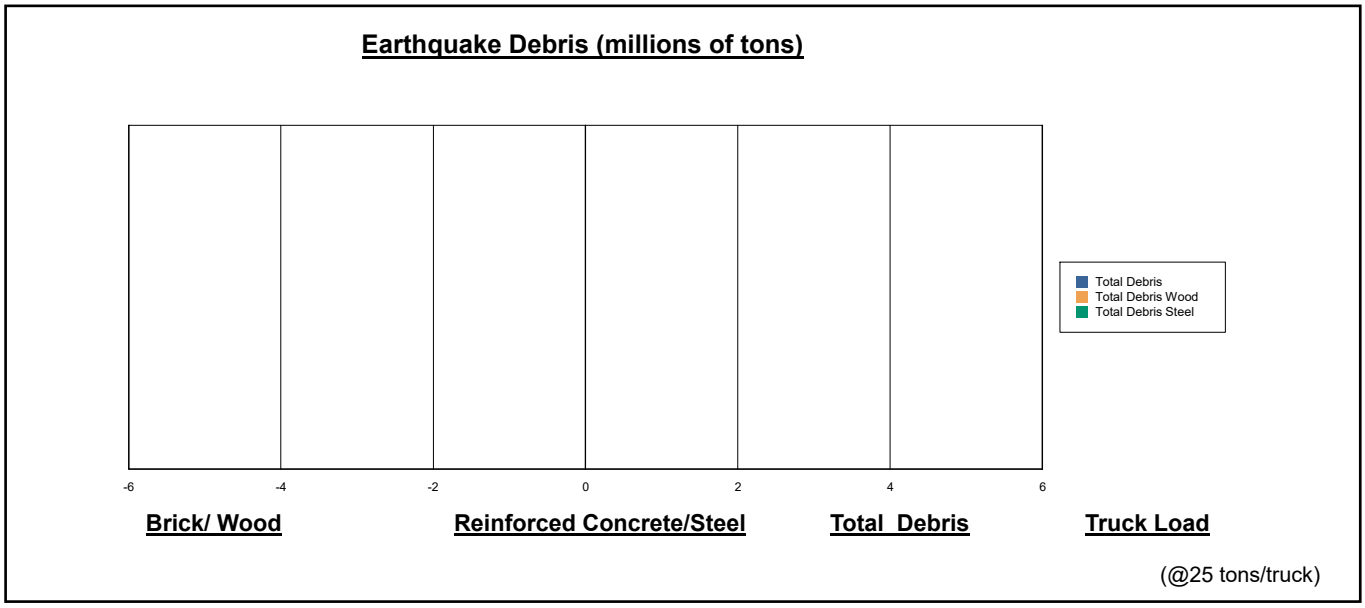
Fire Following Earthquake

Fires often occur after an earthquake. Because of the number of fires and the lack of water to fight the fires, they can often burn out of control. Hazus uses a Monte Carlo simulation model to estimate the number of ignitions and the amount of burnt area. For this scenario, the model estimates that there will be 0 ignitions that will burn about sq. mi % of the region's total area.) The model also estimates that the fires will displace about 0 people and burn about 0 (millions of dollars) of building value.

Debris Generation

Hazus estimates the amount of debris that will be generated by the earthquake. The model breaks the debris into two general categories: a) Brick/Wood and b) Reinforced Concrete/Steel. This distinction is made because of the different types of material handling equipment required to handle the debris.

The model estimates that a total of tons of debris will be generated. Of the total amount, Brick/Wood comprises % of the total, with the remainder being Reinforced Concrete/Steel. If the debris tonnage is converted to an estimated number of truckloads, it will require truckloads (@25 tons/truck) to remove the debris generated by the earthquake.

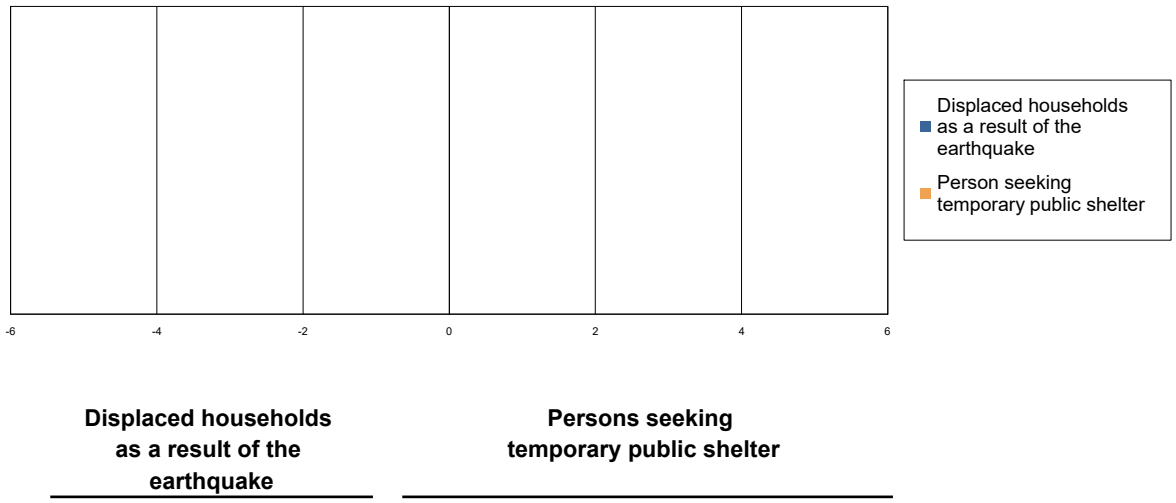


Social Impact

Shelter Requirement

Hazus estimates the number of households that are expected to be displaced from their homes due to the earthquake and the number of displaced people that will require accommodations in temporary public shelters. The model estimates households to be displaced due to the earthquake. Of these, people (out of a total population of 3,605,944) will seek temporary shelter in public shelters.

Displaced Households/ Persons Seeking Short Term Public Shelter



Casualties

Hazus estimates the number of people that will be injured and killed by the earthquake. The casualties are broken down into four (4) severity levels that describe the extent of the injuries. The levels are described as follows;

- Severity Level 1: Injuries will require medical attention but hospitalization is not needed.
- Severity Level 2: Injuries will require hospitalization but are not considered life-threatening
- Severity Level 3: Injuries will require hospitalization and can become life threatening if not promptly treated.
- Severity Level 4: Victims are killed by the earthquake.

The casualty estimates are provided for three (3) times of day: 2:00 AM, 2:00 PM and 5:00 PM. These times represent the periods of the day that different sectors of the community are at their peak occupancy loads. The 2:00 AM estimate considers that the residential occupancy load is maximum, the 2:00 PM estimate considers that the educational, commercial and industrial sector loads are maximum and 5:00 PM represents peak commute time.

Table 10 provides a summary of the casualties estimated for this earthquake

Table 10: Casualty Estimates

		Level 1	Level 2	Level 3	Level 4
2 AM	Commercial	0.01	0.00	0.00	0.00
	Commuting	0.00	0.00	0.00	0.00
	Educational	0.00	0.00	0.00	0.00
	Hotels	0.00	0.00	0.00	0.00
	Industrial	0.01	0.00	0.00	0.00
	Other-Residential	0.34	0.04	0.00	0.01
	Single Family	0.18	0.02	0.00	0.00
	Total	**1**	**0**	**0**	**0**
2 PM	Commercial	0.67	0.08	0.01	0.01
	Commuting	0.00	0.00	0.00	0.00
	Educational	0.23	0.03	0.00	0.00
	Hotels	0.00	0.00	0.00	0.00
	Industrial	0.06	0.01	0.00	0.00
	Other-Residential	0.11	0.01	0.00	0.00
	Single Family	0.05	0.01	0.00	0.00
	Total	**1**	**0**	**0**	**0**
5 PM	Commercial	0.44	0.05	0.00	0.01
	Commuting	0.00	0.00	0.00	0.00
	Educational	0.04	0.01	0.00	0.00
	Hotels	0.00	0.00	0.00	0.00
	Industrial	0.04	0.00	0.00	0.00
	Other-Residential	0.13	0.02	0.00	0.00
	Single Family	0.07	0.01	0.00	0.00
	Total	**1**	**0**	**0**	**0**

Economic Loss

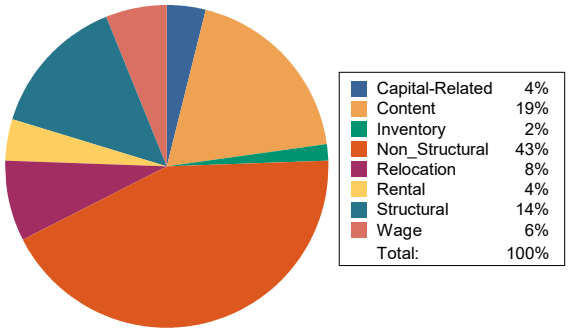
The total economic loss estimated for the earthquake is 6.32 (millions of dollars), which includes building and lifeline related losses based on the region's available inventory. The following three sections provide more detailed information about these losses.

Building-Related Losses

The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the earthquake. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the earthquake.

The total building-related losses were 6.32 (millions of dollars); 22 % of the estimated losses were related to the business interruption of the region. By far, the largest loss was sustained by the residential occupancies which made up over 39 % of the total loss. Table 11 below provides a summary of the losses associated with the building damage.

Earthquake Losses by Loss Type ($ millions)



Earthquake Losses by Occupancy Type ($ millions)

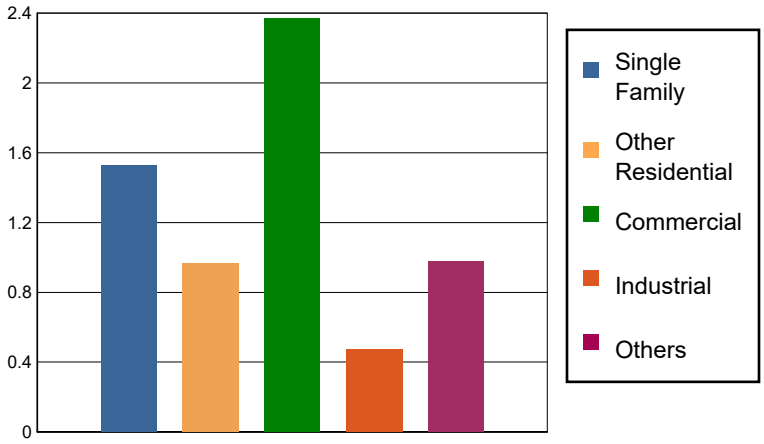


Table 11: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Single Family	Other Residential	Commercial	Industrial	Others	Total
Income Losses							
	Wage	0.0000	0.0282	0.2920	0.0083	0.0575	0.3860
	Capital-Related	0.0000	0.0119	0.2208	0.0048	0.0111	0.2486
	Rental	0.0197	0.0874	0.1432	0.0047	0.0214	0.2764
	Relocation	0.0659	0.0570	0.2029	0.0260	0.1465	0.4983
	Subtotal	**0.0856**	**0.1845**	**0.8589**	**0.0438**	**0.2365**	**1.4093**
Capital Stock Losses							
	Structural	0.1928	0.1379	0.3452	0.0744	0.1395	0.8898
	Non_Structural	0.9173	0.5167	0.7116	0.2016	0.3871	2.7343
	Content	0.3329	0.1265	0.3837	0.1342	0.2131	1.1904
	Inventory	0.0000	0.0000	0.0734	0.0210	0.0037	0.0981
	Subtotal	**1.4430**	**0.7811**	**1.5139**	**0.4312**	**0.7434**	**4.9126**
	Total	**1.53**	**0.97**	**2.37**	**0.48**	**0.98**	**6.32**

Transportation and Utility Lifeline Losses

For the transportation and utility lifeline systems, Hazus computes the direct repair cost for each component only. There are no losses computed by Hazus for business interruption due to lifeline outages. Tables 12 & 13 provide a detailed breakdown in the expected lifeline losses.

Table 12: Transportation System Economic Losses

(Millions of dollars)

System	Component	Inventory Value	Economic Loss	Loss Ratio (%)
Highway	Segments	27492.4546	0.0000	0.00
	Bridges	19517.4512	0.0000	0.00
	Tunnels	56.0245	0.0000	0.00
	Subtotal	**47065.9303**	**0.0000**	
Railways	Segments	53524.7609	0.0000	0.00
	Bridges	2412.2300	0.0000	0.00
	Tunnels	0.0000	0.0000	0.00
	Facilities	53.2600	0.0000	0.00
	Subtotal	**55990.2509**	**0.0000**	
Light Rail	Segments	0.0000	0.0000	0.00
	Bridges	0.0000	0.0000	0.00
	Tunnels	0.0000	0.0000	0.00
	Facilities	0.0000	0.0000	0.00
	Subtotal	**0.0000**	**0.0000**	
Bus	Facilities	10.3109	0.0000	0.00
	Subtotal	**10.3109**	**0.0000**	
Ferry	Facilities	13.3100	0.0000	0.00
	Subtotal	**13.3100**	**0.0000**	
Port	Facilities	987.7501	0.0000	0.00
	Subtotal	**987.7501**	**0.0000**	
Airport	Facilities	318.5866	0.0000	0.00
	Runways	169.3324	0.0000	0.00
	Subtotal	**487.9190**	**0.0000**	
	Total	**104,555.47**	**0.00**	

Table 13: Utility System Economic Losses

(Millions of dollars)

System	Component	Inventory Value	Economic Loss	Loss Ratio (%)
Potable Water	Pipelines	0.0000	0.0000	0.00
	Facilities	421.2450	0.0000	0.00
	Distribution Lines	849.3453	0.0000	0.00
	Subtotal	**1270.5903**	**0.0000**	
Waste Water	Pipelines	0.0000	0.0000	0.00
	Facilities	14012.7118	0.0000	0.00
	Distribution Lines	509.6072	0.0000	0.00
	Subtotal	**14522.3190**	**0.0000**	
Natural Gas	Pipelines	4102.1934	0.0000	0.00
	Facilities	402.3145	0.0000	0.00
	Distribution Lines	339.7381	0.0000	0.00
	Subtotal	**4844.2460**	**0.0000**	
Oil Systems	Pipelines	0.0000	0.0000	0.00
	Facilities	0.1150	0.0000	0.00
	Subtotal	**0.1150**	**0.0000**	
Electrical Power	Facilities	15218.7350	0.0000	0.00
	Subtotal	**15218.7350**	**0.0000**	
Communication	Facilities	12.9950	0.0000	0.00
	Subtotal	**12.9950**	**0.0000**	
	Total	**35,869.00**	**0.00**	

Appendix A: County Listing for the Region

Fairfield,CT

Hartford,CT

Litchfield,CT

Middlesex,CT

New Haven,CT

New London,CT

Tolland,CT

Windham,CT

Appendix B: Regional Population and Building Value Data

State	County Name	Population	Building Value (millions of dollars)		
			Residential	Non-Residential	Total
Connecticut					
	Fairfield	957,419	138,202	64,140	202,343
	Hartford	899,498	103,349	67,437	170,787
	Litchfield	185,186	28,643	14,484	43,128
	Middlesex	164,245	22,031	10,973	33,004
	New Haven	864,835	92,892	61,159	154,052
	New London	268,555	32,865	18,760	51,625
	Tolland	149,788	19,496	9,789	29,285
	Windham	116,418	12,974	9,028	22,003
Total Region		**3,605,944**	**450,452**	**255,770**	**706,227**

Hazus: Earthquake Global Risk Report

Region Name: CT_EQ_E_Haddam_64

Earthquake Scenario: East_Haddam_6.4

Print Date: April 28, 2023

Disclaimer:
Totals only reflect data for those census tracts/blocks included in the user's study region.

The estimates of social and economic impacts contained in this report were produced using Hazus loss estimation methodology software which is based on current scientific and engineering knowledge. There are uncertainties inherent in any loss estimation technique. Therefore, there may be significant differences between the modeled results contained in this report and the actual social and economic losses following a specific earthquake. These results can be improved by using enhanced inventory, geotechnical, and observed ground motion data.

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General Description of the Region

Hazus-MH is a regional earthquake loss estimation model that was developed by the Federal Emergency Management Agency (FEMA) and the National Institute of Building Sciences. The primary purpose of Hazus is to provide a methodology and software application to develop multi-hazard losses at a regional scale. These loss estimates would be used primarily by local, state and regional officials to plan and stimulate efforts to reduce risks from multi-hazards and to prepare for emergency response and recovery.

The earthquake loss estimates provided in this report was based on a region that includes 8 county(ies) from the following state(s):

Connecticut

Note:
Appendix A contains a complete listing of the counties contained in the region.

The geographical size of the region is 4,989.48 square miles and contains 878 census tracts. There are over 1,418 thousand households in the region which has a total population of 3,605,944 peopleF. The distribution of population by Total Region and County is provided in Appendix B.

There are an estimated 1,150 thousand buildings in the region with a total building replacement value (excluding contents) of 706,231 (millions of dollars). Approximately 87.00 % of the buildings (and 64.00% of the building value) are associated with residential housing.

The replacement value of the transportation and utility lifeline systems is estimated to be 104,555 and 35,869 (millions of dollars) , respectively.

Building and Lifeline Inventory

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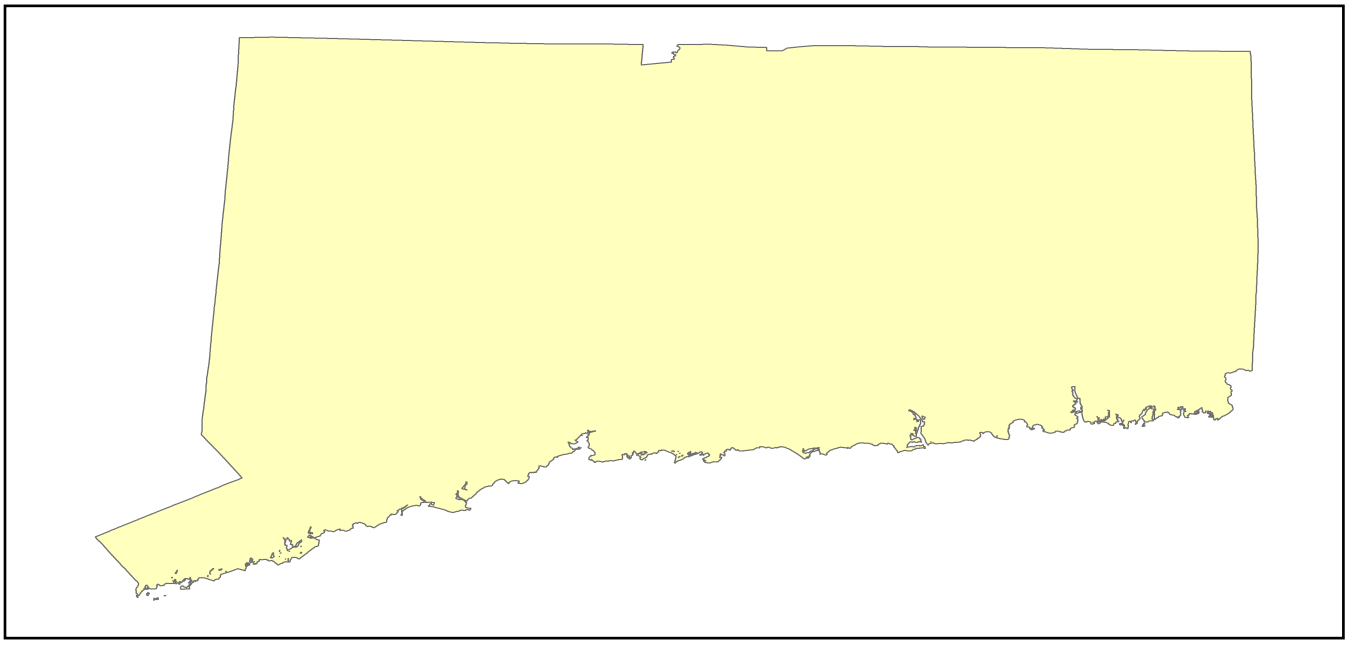
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	Facilities	0	0.0000
	Segments	0	0.0000
	Tunnels	0	0.0000
		Subtotal	**0.0000**
Bus	Facilities	5	10.3109
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		Subtotal	**1270.5903**
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	Facilities	89	14012.7118
	Pipelines	0	0.0000
		Subtotal	**14522.3190**
Natural Gas	Distribution Lines	NA	339.7381
	Facilities	5	402.3145
	Pipelines	508	4102.1934
		Subtotal	**4844.2460**
Oil Systems	Facilities	1	0.1150
	Pipelines	0	0.0000
		Subtotal	**0.1150**
Electrical Power	Facilities	84	15218.7350
		Subtotal	**15218.7350**
Communication	Facilities	113	12.9950
		Subtotal	**12.9950**
		Total	**35,869.00**

Earthquake Scenario

Hazus uses the following set of information to define the earthquake parameters used for the earthquake loss estimate provided in this report.



Scenario Name	East_Haddam_6.4
Type of Earthquake	Arbitrary
Fault Name	NA
Historical Epicenter ID #	NA
Probabilistic Return Period	NA
Longitude of Epicenter	-72.40
Latitude of Epicenter	41.50
Earthquake Magnitude	6.40
Depth (km)	10.00
Rupture Length (Km)	NA
Rupture Orientation (degrees)	NA
Attenuation Function	Central & East US (CEUS 2008)

Direct Earthquake Damage

Building Damage

Hazus estimates that about 142,986 buildings will be at least moderately damaged. This is over 12.00 % of the buildings in the region. There are an estimated 15,990 buildings that will be damaged beyond repair. The definition of the 'damage states' is provided in Volume 1: Chapter 5 of the Hazus technical manual. Table 3 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4 below summarizes the expected damage by general building type.

Damage Categories by General Occupancy Type

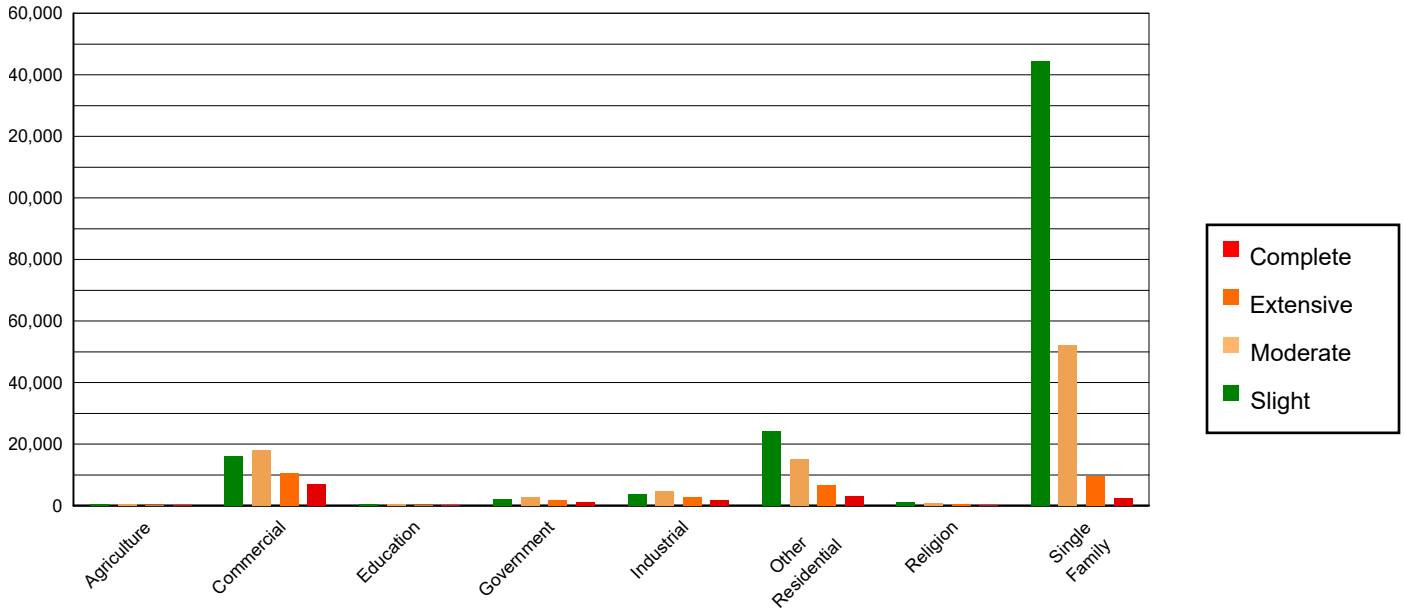


Table 3: Expected Building Damage by Occupancy

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Agriculture	1645.10	0.20	547.74	0.28	518.20	0.55	269.98	0.84	176.97	1.11
Commercial	49118.64	6.03	16075.53	8.34	18039.22	19.06	10628.79	32.87	7032.83	43.98
Education	1449.55	0.18	459.55	0.24	533.01	0.56	310.86	0.96	189.03	1.18
Government	6517.41	0.80	2174.21	1.13	2789.19	2.95	1773.22	5.48	1141.98	7.14
Industrial	11966.70	1.47	3714.61	1.93	4557.09	4.81	2833.39	8.76	1803.21	11.28
Other Residential	99923.31	12.26	24313.61	12.61	15149.80	16.00	6632.48	20.51	3143.80	19.66
Religion	4055.72	0.50	1075.82	0.56	852.99	0.90	411.64	1.27	221.83	1.39
Single Family	640045.58	78.56	144498.72	74.92	52223.33	55.17	9472.09	29.30	2281.27	14.27
Total	**814,722**		**192,860**		**94,663**		**32,332**		**15,991**	

Table 4: Expected Building Damage by Building Type (All Design Levels)

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Wood	706301.99	86.69	158186.63	82.02	54890.76	57.99	8685.14	26.86	1403.38	8.78
Steel	31327.85	3.85	10090.75	5.23	15159.64	16.01	10657.75	32.96	7384.33	46.18
Concrete	6838.01	0.84	2151.55	1.12	3232.84	3.42	2117.97	6.55	1307.02	8.17
Precast	2355.54	0.29	585.21	0.30	911.70	0.96	676.46	2.09	380.88	2.38
RM	14924.24	1.83	2773.36	1.44	3800.74	4.02	2344.48	7.25	957.71	5.99
URM	51620.67	6.34	18192.42	9.43	15185.72	16.04	6444.26	19.93	3582.99	22.41
MH	1353.71	0.17	879.88	0.46	1481.44	1.56	1406.39	4.35	974.58	6.09
Total	**814,722**		**192,860**		**94,663**		**32,332**		**15,991**	

*Note:

RM Reinforced Masonry
URM Unreinforced Masonry
MH Manufactured Housing

Essential Facility Damage

Before the earthquake, the region had 10,483 hospital beds available for use. On the day of the earthquake, the model estimates that only 5,342 hospital beds (51.00%) are available for use by patients already in the hospital and those injured by the earthquake. After one week, 70.00% of the beds will be back in service. By 30 days, 89.00% will be operational.

Table 5: Expected Damage to Essential Facilities

Classification	Total	# Facilities		
		At Least Moderate Damage > 50%	Complete Damage > 50%	With Functionality > 50% on day 1
Hospitals	54	7	0	29
Schools	1,350	158	21	822
EOCs	174	35	9	110
PoliceStations	198	39	9	119
FireStations	569	80	20	361

Transportation Lifeline Damage

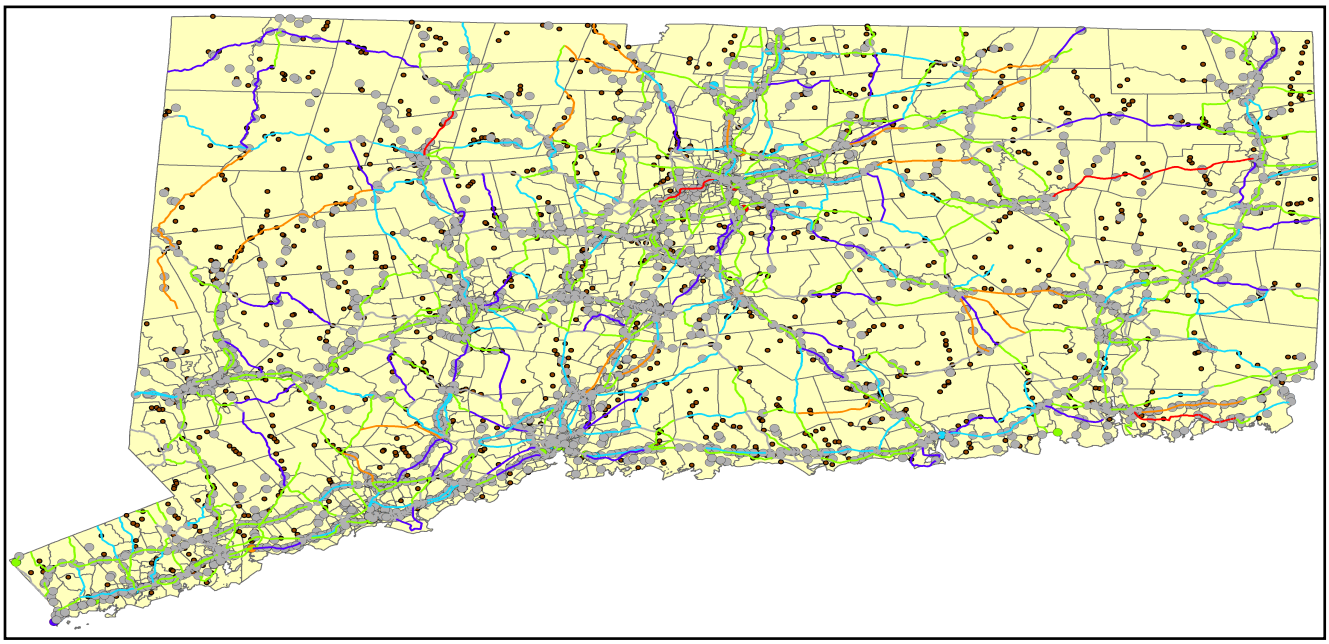


Table 6: Expected Damage to the Transportation Systems

System	Component		Number of Locations			
		Locations/ Segments	With at Least Mod. Damage	With Complete Damage	With Functionality > 50 % After Day 1	With Functionality > 50 % After Day 7
Highway	Segments	2,070	0	0	2,070	2,070
	Bridges	4,361	288	39	4,094	4,245
	Tunnels	7	0	0	7	7
Railways	Segments	427	0	0	427	427
	Bridges	463	1	0	462	463
	Tunnels	0	0	0	0	0
	Facilities	20	0	0	20	20
Light Rail	Segments	0	0	0	0	0
	Bridges	0	0	0	0	0
	Tunnels	0	0	0	0	0
	Facilities	0	0	0	0	0
Bus	Facilities	5	0	0	5	5
Ferry	Facilities	10	2	0	8	8
Port	Facilities	283	9	0	276	280
Airport	Facilities	12	0	0	12	12
	Runways	26	0	0	26	26

Table 6 provides damage estimates for the transportation system.

Note: Roadway segments, railroad tracks and light rail tracks are assumed to be damaged by ground failure only. If ground failure maps are not provided, damage estimates to these components will not be computed.

Tables 7-9 provide information on the damage to the utility lifeline systems. Table 7 provides damage to the utility system facilities. Table 8 provides estimates on the number of leaks and breaks by the pipelines of the utility systems. For electric power and potable water, Hazus performs a simplified system performance analysis. Table 9 provides a summary of the system performance information.

Table 7 : Expected Utility System Facility Damage

System	# of Locations				
	Total #	With at Least Moderate Damage	With Complete Damage	with Functionality > 50 %	
				After Day 1	After Day 7
Potable Water	11	0	0	11	11
Waste Water	89	8	0	56	86
Natural Gas	5	0	0	4	5
Oil Systems	1	1	0	0	1
Electrical Power	84	40	0	48	82
Communication	113	12	0	113	113

Table 8 : Expected Utility System Pipeline Damage (Site Specific)

System	Total Pipelines Length (miles)	Number of Leaks	Number of Breaks
Potable Water	26,388	7109	1777
Waste Water	15,833	3571	893
Natural Gas	405	32	8
Oil	0	0	0

Table 9: Expected Potable Water and Electric Power System Performance

	Total # of Households	Number of Households without Service				
		At Day 1	At Day 3	At Day 7	At Day 30	At Day 90
Potable Water	1,418,069	158,525	120,777	71,633	0	0
Electric Power		148,698	106,849	59,448	10,425	191

Induced Earthquake Damage

Fire Following Earthquake

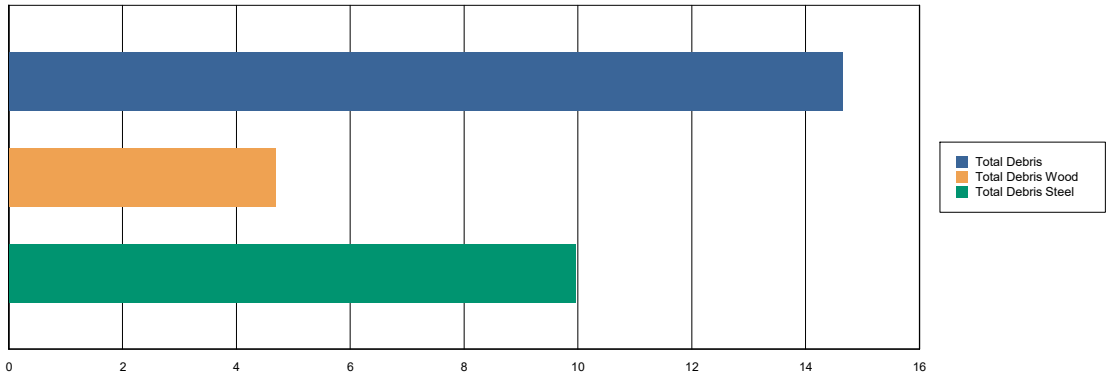
Fires often occur after an earthquake. Because of the number of fires and the lack of water to fight the fires, they can often burn out of control. Hazus uses a Monte Carlo simulation model to estimate the number of ignitions and the amount of burnt area. For this scenario, the model estimates that there will be 8 ignitions that will burn about 0.06 sq. mi 0.00 % of the region's total area.) The model also estimates that the fires will displace about 613 people and burn about 64 (millions of dollars) of building value.

Debris Generation

Hazus estimates the amount of debris that will be generated by the earthquake. The model breaks the debris into two general categories: a) Brick/Wood and b) Reinforced Concrete/Steel. This distinction is made because of the different types of material handling equipment required to handle the debris.

The model estimates that a total of 14,644,000 tons of debris will be generated. Of the total amount, Brick/Wood comprises 32.00% of the total, with the remainder being Reinforced Concrete/Steel. If the debris tonnage is converted to an estimated number of truckloads, it will require 585,760 truckloads (@25 tons/truck) to remove the debris generated by the earthquake.

Earthquake Debris (millions of tons)



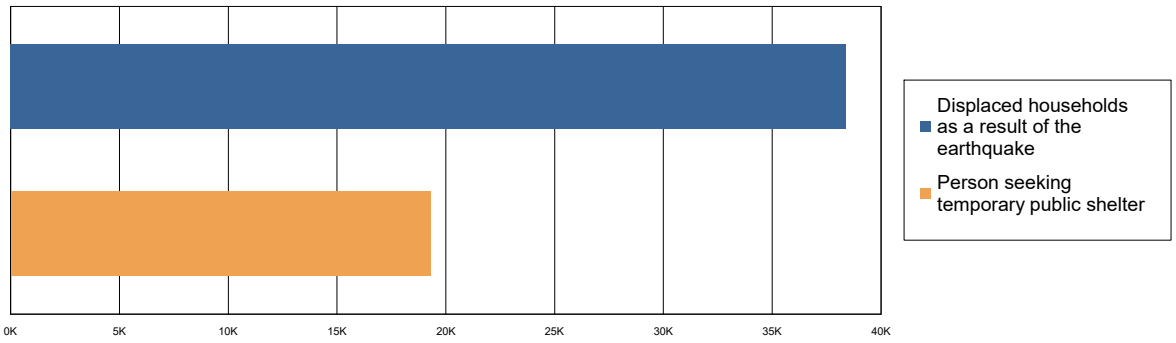
Brick/ Wood	Reinforced Concrete/Steel	Total Debris	Truck Load
4.69	9.96	14.64	585,760 (@25 tons/truck)

Social Impact

Shelter Requirement

Hazus estimates the number of households that are expected to be displaced from their homes due to the earthquake and the number of displaced people that will require accommodations in temporary public shelters. The model estimates 38,390 households to be displaced due to the earthquake. Of these, 19,290 people (out of a total population of 3,605,944) will seek temporary shelter in public shelters.

Displaced Households/ Persons Seeking Short Term Public Shelter



Displaced households as a result of the earthquake	Persons seeking temporary public shelter
38,390	19,290

Casualties

Hazus estimates the number of people that will be injured and killed by the earthquake. The casualties are broken down into four (4) severity levels that describe the extent of the injuries. The levels are described as follows;

- Severity Level 1: Injuries will require medical attention but hospitalization is not needed.
- Severity Level 2: Injuries will require hospitalization but are not considered life-threatening
- Severity Level 3: Injuries will require hospitalization and can become life threatening if not promptly treated.
- Severity Level 4: Victims are killed by the earthquake.

The casualty estimates are provided for three (3) times of day: 2:00 AM, 2:00 PM and 5:00 PM. These times represent the periods of the day that different sectors of the community are at their peak occupancy loads. The 2:00 AM estimate considers that the residential occupancy load is maximum, the 2:00 PM estimate considers that the educational, commercial and industrial sector loads are maximum and 5:00 PM represents peak commute time.

Table 10 provides a summary of the casualties estimated for this earthquake

Table 10: Casualty Estimates

		Level 1	Level 2	Level 3	Level 4
2 AM	Commercial	215.39	57.86	8.42	16.51
	Commuting	0.49	0.72	1.14	0.22
	Educational	0.00	0.00	0.00	0.00
	Hotels	3.50	0.99	0.16	0.32
	Industrial	182.44	49.32	7.21	14.13
	Other-Residential	3261.43	840.91	126.37	248.61
	Single Family	1605.70	300.38	34.03	66.12
	Total	**5,269**	**1,250**	**177**	**346**
2 PM	Commercial	13571.11	3655.96	535.47	1042.35
	Commuting	4.44	6.46	10.25	2.02
	Educational	4796.37	1329.44	208.72	406.12
	Hotels	0.67	0.19	0.03	0.06
	Industrial	1347.43	364.25	53.56	103.92
	Other-Residential	1058.94	275.31	42.37	80.27
	Single Family	488.70	95.12	11.51	21.16
	Total	**21,268**	**5,727**	**862**	**1,656**
5 PM	Commercial	9151.17	2472.10	366.22	701.84
	Commuting	93.11	135.37	214.98	42.31
	Educational	635.71	171.78	26.92	51.90
	Hotels	1.05	0.30	0.05	0.10
	Industrial	842.14	227.66	33.48	64.95
	Other-Residential	1280.03	331.59	50.84	96.27
	Single Family	632.87	123.00	14.87	27.33
	Total	**12,636**	**3,462**	**707**	**985**

Economic Loss

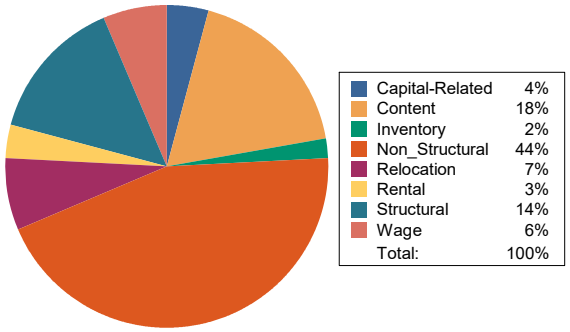
The total economic loss estimated for the earthquake is 72,398.01 (millions of dollars), which includes building and lifeline related losses based on the region's available inventory. The following three sections provide more detailed information about these losses.

Building-Related Losses

The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the earthquake. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the earthquake.

The total building-related losses were 67,503.13 (millions of dollars); 21 % of the estimated losses were related to the business interruption of the region. By far, the largest loss was sustained by the residential occupancies which made up over 27 % of the total loss. Table 11 below provides a summary of the losses associated with the building damage.

Earthquake Losses by Loss Type ($ millions)



Earthquake Losses by Occupancy Type ($ millions)

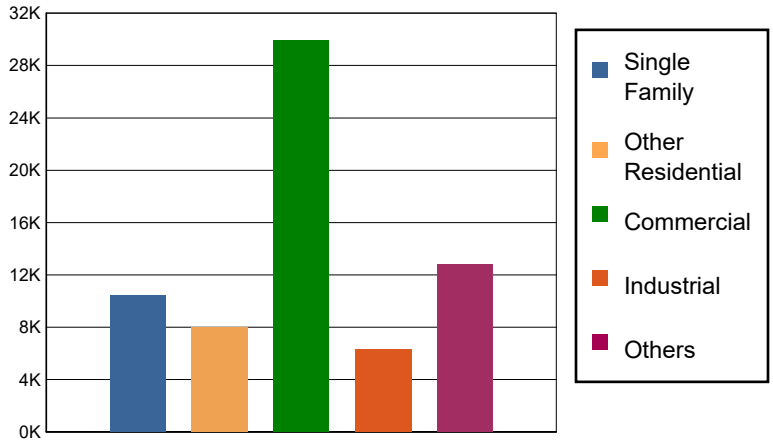


Table 11: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Single Family	Other Residential	Commercial	Industrial	Others	Total
Income Losses							
	Wage	0.0000	482.8144	3063.8024	123.0093	598.3785	4,268.0046
	Capital-Related	0.0000	205.4552	2461.4585	74.0565	111.0233	2,851.9935
	Rental	168.4038	612.1376	1231.7091	49.1145	275.1741	2,336.5391
	Relocation	605.8166	328.3901	1969.0353	225.7800	1720.3665	4,849.3885
	Subtotal	**774.2204**	**1628.7973**	**8726.0053**	**471.9603**	**2704.9424**	**14305.9257**
Capital Stock Losses							
	Structural	1326.0329	1014.2654	4628.2171	969.3882	1784.7795	9,722.6831
	Non_Structural	6187.3387	4363.8308	10702.6120	2860.6317	5813.9200	29,928.3332
	Content	2139.3561	991.1142	4822.7636	1750.3211	2458.2606	12,161.8156
	Inventory	0.0000	0.0000	1054.9570	282.7362	46.6813	1,384.3745
	Subtotal	**9652.7277**	**6369.2104**	**21208.5497**	**5863.0772**	**10103.6414**	**53197.2064**
	Total	**10426.95**	**7998.01**	**29934.56**	**6335.04**	**12808.58**	**67503.13**

Transportation and Utility Lifeline Losses

For the transportation and utility lifeline systems, Hazus computes the direct repair cost for each component only. There are no losses computed by Hazus for business interruption due to lifeline outages. Tables 12 & 13 provide a detailed breakdown in the expected lifeline losses.

Table 12: Transportation System Economic Losses

(Millions of dollars)

System	Component	Inventory Value	Economic Loss	Loss Ratio (%)
Highway	Segments	27492.4546	0.0000	0.00
	Bridges	19517.4512	780.2188	4.00
	Tunnels	56.0245	0.3768	0.67
	Subtotal	**47065.9303**	**780.5956**	
Railways	Segments	53524.7609	0.0000	0.00
	Bridges	2412.2300	27.4107	1.14
	Tunnels	0.0000	0.0000	0.00
	Facilities	53.2600	7.7901	14.63
	Subtotal	**55990.2509**	**35.2008**	
Light Rail	Segments	0.0000	0.0000	0.00
	Bridges	0.0000	0.0000	0.00
	Tunnels	0.0000	0.0000	0.00
	Facilities	0.0000	0.0000	0.00
	Subtotal	**0.0000**	**0.0000**	
Bus	Facilities	10.3109	1.0752	10.43
	Subtotal	**10.3109**	**1.0752**	
Ferry	Facilities	13.3100	3.3276	25.00
	Subtotal	**13.3100**	**3.3276**	
Port	Facilities	987.7501	134.0216	13.57
	Subtotal	**987.7501**	**134.0216**	
Airport	Facilities	318.5866	34.2943	10.76
	Runways	169.3324	0.0000	0.00
	Subtotal	**487.9190**	**34.2943**	
	Total	**104,555.47**	**988.52**	

Table 13: Utility System Economic Losses

(Millions of dollars)

System	Component	Inventory Value	Economic Loss	Loss Ratio (%)
Potable Water	Pipelines	0.0000	0.0000	0.00
	Facilities	421.2450	26.2734	6.24
	Distribution Lines	849.3453	31.9912	3.77
	Subtotal	**1270.5903**	**58.2646**	
Waste Water	Pipelines	0.0000	0.0000	0.00
	Facilities	14012.7118	1071.1467	7.64
	Distribution Lines	509.6072	16.0700	3.15
	Subtotal	**14522.3190**	**1087.2167**	
Natural Gas	Pipelines	4102.1934	0.0000	0.00
	Facilities	402.3145	21.8038	5.42
	Distribution Lines	339.7381	5.5055	1.62
	Subtotal	**4844.2460**	**27.3093**	
Oil Systems	Pipelines	0.0000	0.0000	0.00
	Facilities	0.1150	0.0250	21.74
	Subtotal	**0.1150**	**0.0250**	
Electrical Power	Facilities	15218.7350	2731.9214	17.95
	Subtotal	**15218.7350**	**2731.9214**	
Communication	Facilities	12.9950	1.6246	12.50
	Subtotal	**12.9950**	**1.6246**	
	Total	**35,869.00**	**3,906.36**	

Appendix A: County Listing for the Region

Fairfield,CT

Hartford,CT

Litchfield,CT

Middlesex,CT

New Haven,CT

New London,CT

Tolland,CT

Windham,CT

Appendix B: Regional Population and Building Value Data

State	County Name	Population	Building Value (millions of dollars)		
			Residential	Non-Residential	Total
Connecticut					
	Fairfield	957,419	138,202	64,140	202,343
	Hartford	899,498	103,349	67,437	170,787
	Litchfield	185,186	28,643	14,484	43,128
	Middlesex	164,245	22,031	10,973	33,004
	New Haven	864,835	92,892	61,159	154,052
	New London	268,555	32,865	18,760	51,625
	Tolland	149,788	19,496	9,789	29,285
	Windham	116,418	12,974	9,028	22,003
Total Region		**3,605,944**	**450,452**	**255,770**	**706,227**

Hazus: Earthquake Global Risk Report

Region Name: CT_EQ_Haddam_57

Earthquake Scenario: Haddam_5.7

Print Date: April 28, 2023

Disclaimer:
Totals only reflect data for those census tracts/blocks included in the user's study region.

The estimates of social and economic impacts contained in this report were produced using Hazus loss estimation methodology software which is based on current scientific and engineering knowledge. There are uncertainties inherent in any loss estimation technique. Therefore, there may be significant differences between the modeled results contained in this report and the actual social and economic losses following a specific earthquake. These results can be improved by using enhanced inventory, geotechnical, and observed ground motion data.

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General Description of the Region

Hazus-MH is a regional earthquake loss estimation model that was developed by the Federal Emergency Management Agency (FEMA) and the National Institute of Building Sciences. The primary purpose of Hazus is to provide a methodology and software application to develop multi-hazard losses at a regional scale. These loss estimates would be used primarily by local, state and regional officials to plan and stimulate efforts to reduce risks from multi-hazards and to prepare for emergency response and recovery.

The earthquake loss estimates provided in this report was based on a region that includes 8 county(ies) from the following state(s):

Connecticut

Note:
Appendix A contains a complete listing of the counties contained in the region.

The geographical size of the region is 4,989.48 square miles and contains 878 census tracts. There are over 1,418 thousand households in the region which has a total population of 3,605,944 peopleF. The distribution of population by Total Region and County is provided in Appendix B.

There are an estimated 1,150 thousand buildings in the region with a total building replacement value (excluding contents) of 706,231 (millions of dollars). Approximately 87.00 % of the buildings (and 64.00% of the building value) are associated with residential housing.

The replacement value of the transportation and utility lifeline systems is estimated to be 104,555 and 35,869 (millions of dollars) , respectively.

Building and Lifeline Inventory

Building Inventory

Hazus estimates that there are 1,150 thousand buildings in the region which have an aggregate total replacement value of 706,231 (millions of dollars) . Appendix B provides a general distribution of the building value by Total Region and County.

In terms of building construction types found in the region, wood frame construction makes up 81% of the building inventory. The remaining percentage is distributed between the other general building types.

Critical Facility Inventory

Hazus breaks critical facilities into two (2) groups: essential facilities and high potential loss facilities (HPL). Essential facilities include hospitals, medical clinics, schools, fire stations, police stations and emergency operations facilities. High potential loss facilities include dams, levees, military installations, nuclear power plants and hazardous material sites.

For essential facilities, there are 54 hospitals in the region with a total bed capacity of 10,483 beds. There are 1,350 schools, 569 fire stations, 198 police stations and 174 emergency operation facilities. With respect to high potential loss facilities (HPL), there are no dams identified within the inventory. The inventory also includes no hazardous material sites, no military installations and no nuclear power plants.

Transportation and Utility Lifeline Inventory

Within Hazus, the lifeline inventory is divided between transportation and utility lifeline systems. There are seven (7) transportation systems that include highways, railways, light rail, bus, ports, ferry and airports. There are six (6) utility systems that include potable water, wastewater, natural gas, crude & refined oil, electric power and communications. The lifeline inventory data are provided in Tables 1 and 2.

The total value of the lifeline inventory is over 140,424.00 (millions of dollars). This inventory includes over 2,753.29 miles of highways, 4,361 bridges, 42,625.43 miles of pipes.

Table 1: Transportation System Lifeline Inventory

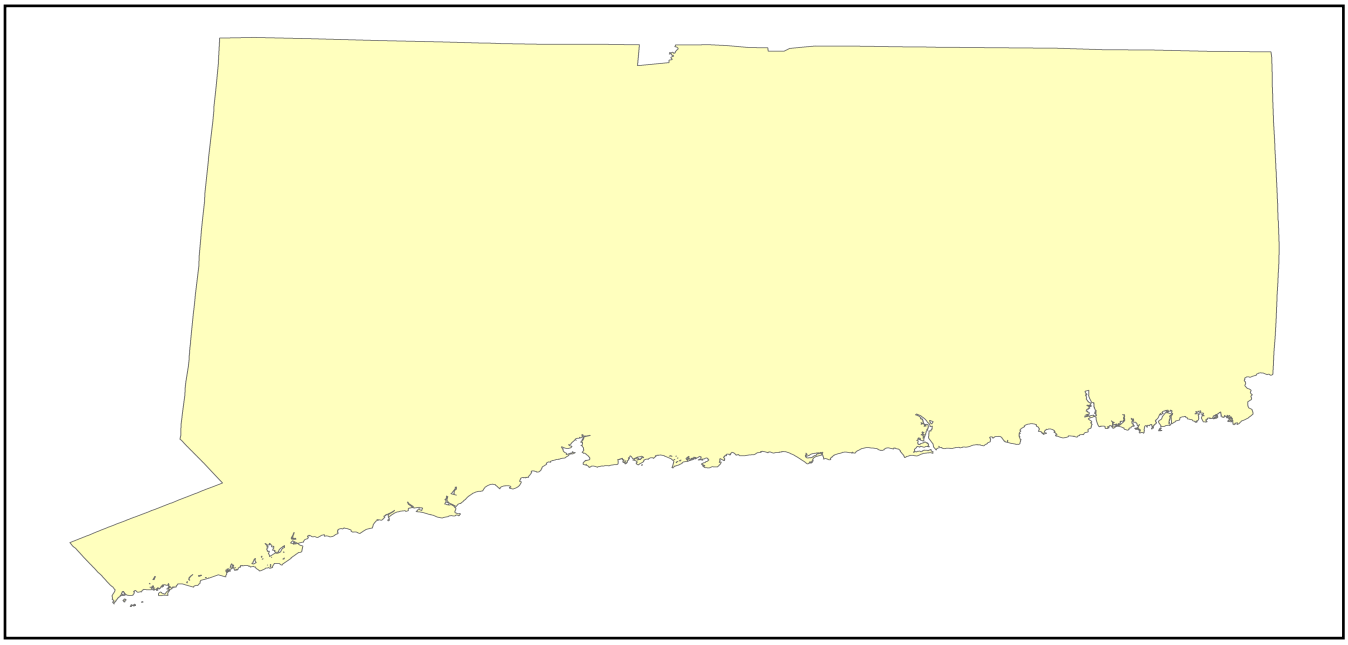
System	Component	# Locations/ # Segments	Replacement value (millions of dollars)
Highway	Bridges	4,361	19517.4512
	Segments	2,070	27492.4546
	Tunnels	7	56.0245
		Subtotal	**47065.9303**
Railways	Bridges	463	2412.2300
	Facilities	20	53.2600
	Segments	427	53524.7609
	Tunnels	0	0.0000
		Subtotal	**55990.2509**
Light Rail	Bridges	0	0.0000
	Facilities	0	0.0000
	Segments	0	0.0000
	Tunnels	0	0.0000
		Subtotal	**0.0000**
Bus	Facilities	5	10.3109
		Subtotal	**10.3109**
Ferry	Facilities	10	13.3100
		Subtotal	**13.3100**
Port	Facilities	283	987.7501
		Subtotal	**987.7501**
Airport	Facilities	12	318.5866
	Runways	26	169.3324
		Subtotal	**487.9190**
		Total	**104,555.50**

Table 2: Utility System Lifeline Inventory

System	Component	# Locations / Segments	Replacement value (millions of dollars)
Potable Water	Distribution Lines	NA	849.3453
	Facilities	11	421.2450
	Pipelines	0	0.0000
		Subtotal	**1270.5903**
Waste Water	Distribution Lines	NA	509.6072
	Facilities	89	14012.7118
	Pipelines	0	0.0000
		Subtotal	**14522.3190**
Natural Gas	Distribution Lines	NA	339.7381
	Facilities	5	402.3145
	Pipelines	508	4102.1934
		Subtotal	**4844.2460**
Oil Systems	Facilities	1	0.1150
	Pipelines	0	0.0000
		Subtotal	**0.1150**
Electrical Power	Facilities	84	15218.7350
		Subtotal	**15218.7350**
Communication	Facilities	113	12.9950
		Subtotal	**12.9950**
		Total	**35,869.00**

Earthquake Scenario

Hazus uses the following set of information to define the earthquake parameters used for the earthquake loss estimate provided in this report.



Scenario Name	Haddam_5.7
Type of Earthquake	Arbitrary
Fault Name	NA
Historical Epicenter ID #	NA
Probabilistic Return Period	NA
Longitude of Epicenter	-72.50
Latitude of Epicenter	41.50
Earthquake Magnitude	5.70
Depth (km)	10.00
Rupture Length (Km)	NA
Rupture Orientation (degrees)	NA
Attenuation Function	Central & East US (CEUS 2008)

Direct Earthquake Damage

Building Damage

Hazus estimates that about 58,112 buildings will be at least moderately damaged. This is over 5.00 % of the buildings in the region. There are an estimated 3,720 buildings that will be damaged beyond repair. The definition of the 'damage states' is provided in Volume 1: Chapter 5 of the Hazus technical manual. Table 3 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4 below summarizes the expected damage by general building type.

Damage Categories by General Occupancy Type

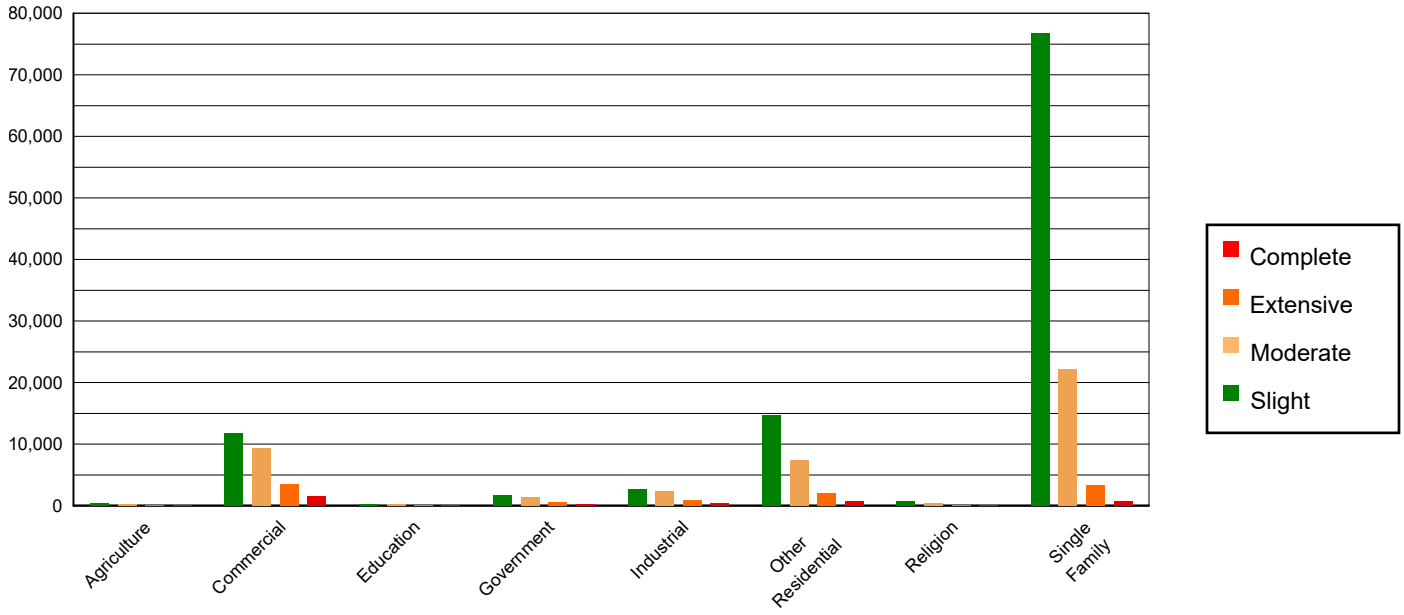


Table 3: Expected Building Damage by Occupancy

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Agriculture	2404.18	0.24	370.68	0.34	249.92	0.57	93.34	0.86	39.88	1.07
Commercial	74660.61	7.59	11842.94	10.85	9287.69	21.30	3553.38	32.92	1550.39	41.67
Education	2199.65	0.22	335.79	0.31	264.72	0.61	96.92	0.90	44.93	1.21
Government	10625.53	1.08	1647.87	1.51	1377.25	3.16	516.10	4.78	229.25	6.16
Industrial	18413.37	1.87	2752.07	2.52	2355.92	5.40	940.49	8.71	413.15	11.10
Other Residential	124229.80	12.63	14701.47	13.47	7457.93	17.11	2078.70	19.26	695.10	18.68
Religion	5276.62	0.54	698.98	0.64	433.89	1.00	146.14	1.35	62.37	1.68
Single Family	745518.90	75.82	76777.42	70.36	22168.45	50.85	3370.35	31.22	685.88	18.43
Total	**983,329**		**109,127**		**43,596**		**10,795**		**3,721**	

Table 4: Expected Building Damage by Building Type (All Design Levels)

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Wood	821914.16	83.58	82651.14	75.74	21949.57	50.35	2677.96	24.81	275.08	7.39
Steel	53679.97	5.46	8236.98	7.55	7957.47	18.25	3233.39	29.95	1512.51	40.65
Concrete	11470.07	1.17	1712.95	1.57	1626.57	3.73	580.00	5.37	257.80	6.93
Precast	3554.96	0.36	474.82	0.44	531.63	1.22	260.30	2.41	88.08	2.37
RM	20144.32	2.05	1867.35	1.71	1800.35	4.13	765.87	7.09	222.64	5.98
URM	69011.59	7.02	13147.18	12.05	8716.21	19.99	2926.91	27.11	1224.18	32.90
MH	3553.59	0.36	1036.79	0.95	1013.98	2.33	351.00	3.25	140.64	3.78
Total	**983,329**		**109,127**		**43,596**		**10,795**		**3,721**	

*Note:

RM Reinforced Masonry
URM Unreinforced Masonry
MH Manufactured Housing

Essential Facility Damage

Before the earthquake, the region had 10,483 hospital beds available for use. On the day of the earthquake, the model estimates that only 7,383 hospital beds (70.00%) are available for use by patients already in the hospital and those injured by the earthquake. After one week, 84.00% of the beds will be back in service. By 30 days, 95.00% will be operational.

Table 5: Expected Damage to Essential Facilities

Classification	Total	# Facilities		
		At Least Moderate Damage > 50%	Complete Damage > 50%	With Functionality > 50% on day 1
Hospitals	54	2	0	52
Schools	1,350	45	7	1,255
EOCs	174	13	3	151
PoliceStations	198	11	2	176
FireStations	569	30	7	512

Transportation Lifeline Damage

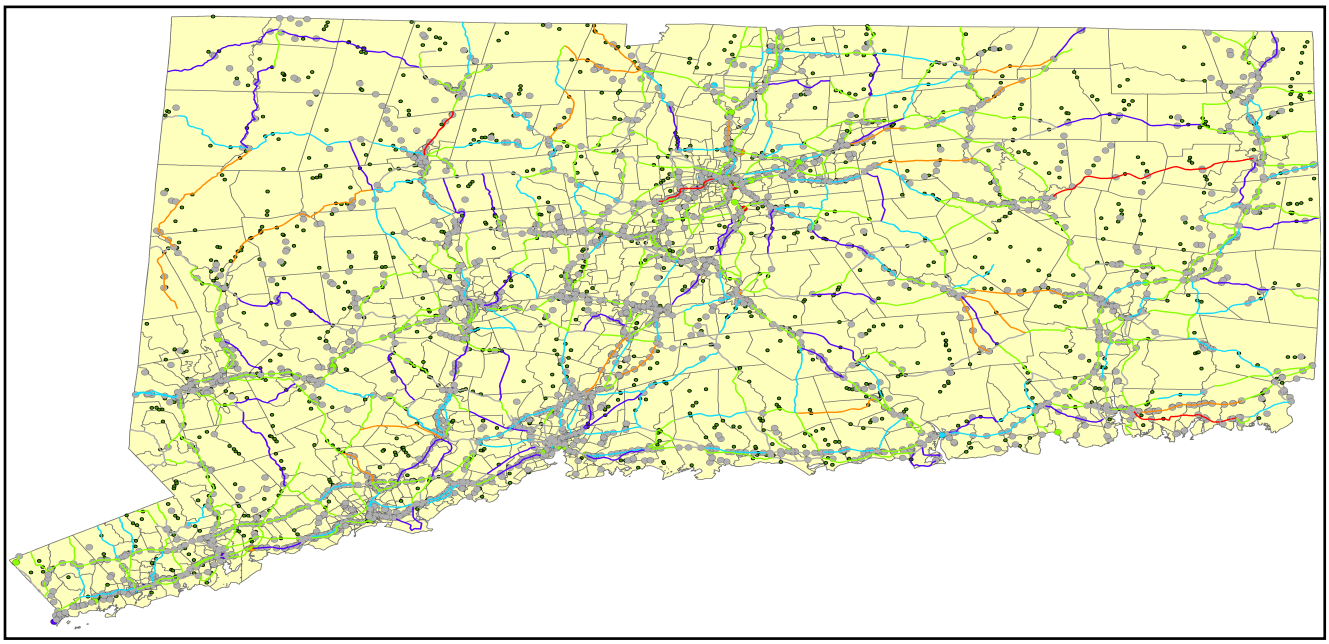


Table 6: Expected Damage to the Transportation Systems

System	Component		Number of Locations			
		Locations/ Segments	With at Least Mod. Damage	With Complete Damage	With Functionality > 50 %	
					After Day 1	After Day 7
Highway	Segments	2,070	0	0	2,070	2,070
	Bridges	4,361	48	5	4,315	4,328
	Tunnels	7	0	0	7	7
Railways	Segments	427	0	0	427	427
	Bridges	463	0	0	463	463
	Tunnels	0	0	0	0	0
	Facilities	20	0	0	20	20
Light Rail	Segments	0	0	0	0	0
	Bridges	0	0	0	0	0
	Tunnels	0	0	0	0	0
	Facilities	0	0	0	0	0
Bus	Facilities	5	0	0	5	5
Ferry	Facilities	10	2	0	8	10
Port	Facilities	283	7	0	279	283
Airport	Facilities	12	0	0	12	12
	Runways	26	0	0	26	26

Table 6 provides damage estimates for the transportation system.

Note: Roadway segments, railroad tracks and light rail tracks are assumed to be damaged by ground failure only. If ground failure maps are not provided, damage estimates to these components will not be computed.

Tables 7-9 provide information on the damage to the utility lifeline systems. Table 7 provides damage to the utility system facilities. Table 8 provides estimates on the number of leaks and breaks by the pipelines of the utility systems. For electric power and potable water, Hazus performs a simplified system performance analysis. Table 9 provides a summary of the system performance information.

Table 7 : Expected Utility System Facility Damage

System	# of Locations				
	Total #	With at Least Moderate Damage	With Complete Damage	with Functionality > 50 %	
				After Day 1	After Day 7
Potable Water	11	0	0	11	11
Waste Water	89	6	0	81	87
Natural Gas	5	0	0	5	5
Oil Systems	1	1	0	0	1
Electrical Power	84	9	0	77	82
Communication	113	3	0	112	113

Table 8 : Expected Utility System Pipeline Damage (Site Specific)

System	Total Pipelines Length (miles)	Number of Leaks	Number of Breaks
Potable Water	26,388	2032	508
Waste Water	15,833	1021	255
Natural Gas	405	9	2
Oil	0	0	0

Table 9: Expected Potable Water and Electric Power System Performance

	Total # of Households	Number of Households without Service				
		At Day 1	At Day 3	At Day 7	At Day 30	At Day 90
Potable Water	1,418,069	23,470	14,591	1,062	0	0
Electric Power		60,387	45,749	26,281	4,298	75

Induced Earthquake Damage

Fire Following Earthquake

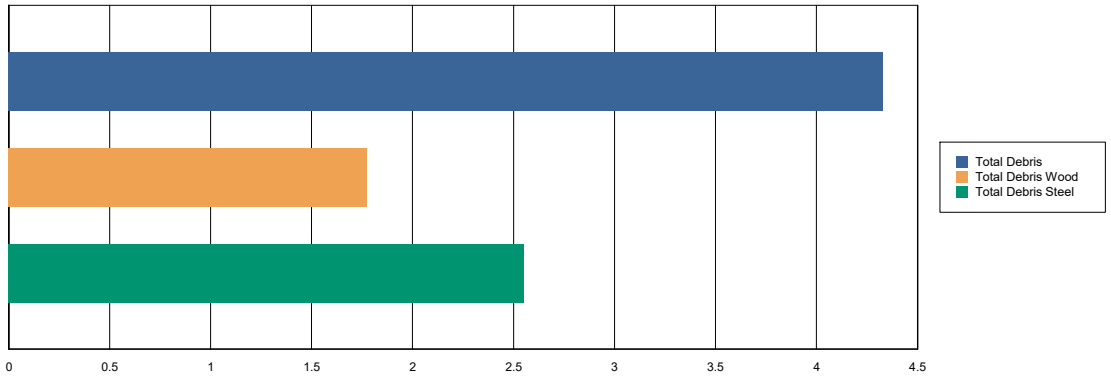
Fires often occur after an earthquake. Because of the number of fires and the lack of water to fight the fires, they can often burn out of control. Hazus uses a Monte Carlo simulation model to estimate the number of ignitions and the amount of burnt area. For this scenario, the model estimates that there will be 6 ignitions that will burn about 0.04 sq. mi 0.00 % of the region's total area.) The model also estimates that the fires will displace about 449 people and burn about 35 (millions of dollars) of building value.

Debris Generation

Hazus estimates the amount of debris that will be generated by the earthquake. The model breaks the debris into two general categories: a) Brick/Wood and b) Reinforced Concrete/Steel. This distinction is made because of the different types of material handling equipment required to handle the debris.

The model estimates that a total of 4,328,000 tons of debris will be generated. Of the total amount, Brick/Wood comprises 41.00% of the total, with the remainder being Reinforced Concrete/Steel. If the debris tonnage is converted to an estimated number of truckloads, it will require 173,120 truckloads (@25 tons/truck) to remove the debris generated by the earthquake.

Earthquake Debris (millions of tons)



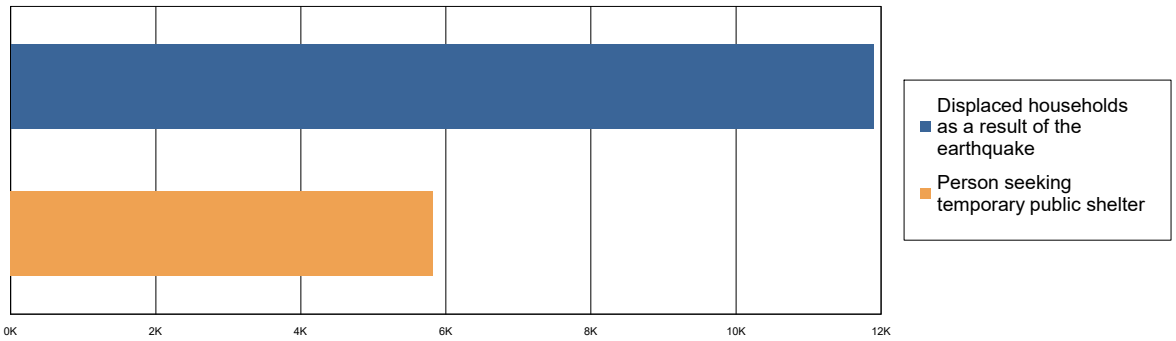
Brick/ Wood	Reinforced Concrete/Steel	Total Debris	Truck Load
1.77	2.55	4.33	173,120 (@25 tons/truck)

Social Impact

Shelter Requirement

Hazus estimates the number of households that are expected to be displaced from their homes due to the earthquake and the number of displaced people that will require accommodations in temporary public shelters. The model estimates 11,895 households to be displaced due to the earthquake. Of these, 5,829 people (out of a total population of 3,605,944) will seek temporary shelter in public shelters.

Displaced Households/ Persons Seeking Short Term Public Shelter



Displaced households as a result of the earthquake	Persons seeking temporary public shelter
11,895	5,829

Casualties

Hazus estimates the number of people that will be injured and killed by the earthquake. The casualties are broken down into four (4) severity levels that describe the extent of the injuries. The levels are described as follows;

- Severity Level 1: Injuries will require medical attention but hospitalization is not needed.
- Severity Level 2: Injuries will require hospitalization but are not considered life-threatening
- Severity Level 3: Injuries will require hospitalization and can become life threatening if not promptly treated.
- Severity Level 4: Victims are killed by the earthquake.

The casualty estimates are provided for three (3) times of day: 2:00 AM, 2:00 PM and 5:00 PM. These times represent the periods of the day that different sectors of the community are at their peak occupancy loads. The 2:00 AM estimate considers that the residential occupancy load is maximum, the 2:00 PM estimate considers that the educational, commercial and industrial sector loads are maximum and 5:00 PM represents peak commute time.

Table 10 provides a summary of the casualties estimated for this earthquake

Table 10: Casualty Estimates

		Level 1	Level 2	Level 3	Level 4
2 AM	Commercial	52.29	12.39	1.68	3.30
	Commuting	0.11	0.15	0.24	0.05
	Educational	0.00	0.00	0.00	0.00
	Hotels	0.64	0.14	0.02	0.04
	Industrial	48.08	11.75	1.63	3.18
	Other-Residential	975.94	221.78	31.16	61.18
	Single Family	621.81	105.32	11.68	22.76
	Total	**1,699**	**352**	**46**	**91**
2 PM	Commercial	3374.15	809.33	111.58	216.70
	Commuting	0.96	1.35	2.20	0.43
	Educational	1285.85	328.75	49.43	96.03
	Hotels	0.12	0.03	0.00	0.01
	Industrial	354.98	86.83	12.10	23.45
	Other-Residential	312.03	72.03	10.39	19.62
	Single Family	186.05	32.88	3.88	7.18
	Total	**5,514**	**1,331**	**190**	**363**
5 PM	Commercial	2332.39	566.12	79.43	151.72
	Commuting	20.32	28.35	46.35	9.05
	Educational	160.37	40.48	6.11	11.76
	Hotels	0.19	0.04	0.01	0.01
	Industrial	221.87	54.27	7.56	14.66
	Other-Residential	385.07	88.67	12.77	24.09
	Single Family	243.63	43.08	5.09	9.41
	Total	**3,364**	**821**	**157**	**221**

Economic Loss

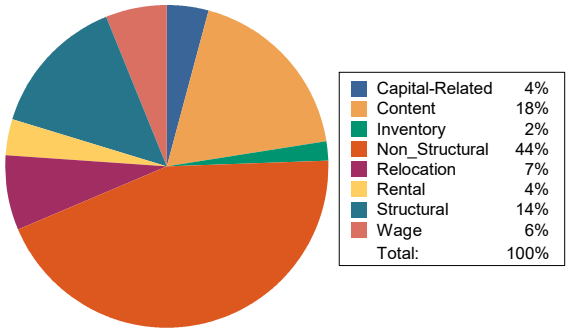
The total economic loss estimated for the earthquake is 24,149.14 (millions of dollars), which includes building and lifeline related losses based on the region's available inventory. The following three sections provide more detailed information about these losses.

Building-Related Losses

The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the earthquake. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the earthquake.

The total building-related losses were 21,243.21 (millions of dollars); 21 % of the estimated losses were related to the business interruption of the region. By far, the largest loss was sustained by the residential occupancies which made up over 33 % of the total loss. Table 11 below provides a summary of the losses associated with the building damage.

Earthquake Losses by Loss Type ($ millions)



Earthquake Losses by Occupancy Type ($ millions)

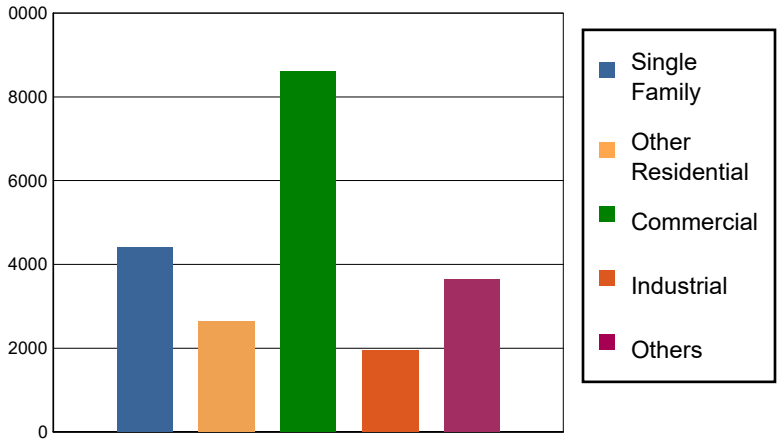


Table 11: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Single Family	Other Residential	Commercial	Industrial	Others	Total
Income Losses							
	Wage	0.0000	146.4194	935.8157	38.6380	171.3215	1,292.1946
	Capital-Related	0.0000	62.3149	744.9796	23.3047	31.4158	862.0150
	Rental	66.6497	203.2892	407.6509	16.6135	79.3055	773.5088
	Relocation	237.7790	117.9145	646.9712	81.5047	496.3562	1,580.5256
	Subtotal	**304.4287**	**529.9380**	**2735.4174**	**160.0609**	**778.3990**	**4508.2440**
Capital Stock Losses							
	Structural	538.4844	327.0576	1320.7259	301.4476	519.2760	3,006.9915
	Non_Structural	2603.0861	1438.4460	2907.5890	862.4975	1611.3629	9,422.9815
	Content	946.3622	349.4821	1358.1176	543.1073	727.6726	3,924.7418
	Inventory	0.0000	0.0000	277.2153	87.5071	15.5261	380.2485
	Subtotal	**4087.9327**	**2114.9857**	**5863.6478**	**1794.5595**	**2873.8376**	**16734.9633**
	Total	**4392.36**	**2644.92**	**8599.07**	**1954.62**	**3652.24**	**21243.21**

Transportation and Utility Lifeline Losses

For the transportation and utility lifeline systems, Hazus computes the direct repair cost for each component only. There are no losses computed by Hazus for business interruption due to lifeline outages. Tables 12 & 13 provide a detailed breakdown in the expected lifeline losses.

Table 12: Transportation System Economic Losses

(Millions of dollars)

System	Component	Inventory Value	Economic Loss	Loss Ratio (%)
Highway	Segments	27492.4546	0.0000	0.00
	Bridges	19517.4512	197.9101	1.01
	Tunnels	56.0245	0.0561	0.10
	Subtotal	**47065.9303**	**197.9662**	
Railways	Segments	53524.7609	0.0000	0.00
	Bridges	2412.2300	2.7015	0.11
	Tunnels	0.0000	0.0000	0.00
	Facilities	53.2600	4.1103	7.72
	Subtotal	**55990.2509**	**6.8118**	
Light Rail	Segments	0.0000	0.0000	0.00
	Bridges	0.0000	0.0000	0.00
	Tunnels	0.0000	0.0000	0.00
	Facilities	0.0000	0.0000	0.00
	Subtotal	**0.0000**	**0.0000**	
Bus	Facilities	10.3109	0.5229	5.07
	Subtotal	**10.3109**	**0.5229**	
Ferry	Facilities	13.3100	2.1201	15.93
	Subtotal	**13.3100**	**2.1201**	
Port	Facilities	987.7501	67.5357	6.84
	Subtotal	**987.7501**	**67.5357**	
Airport	Facilities	318.5866	17.4004	5.46
	Runways	169.3324	0.0000	0.00
	Subtotal	**487.9190**	**17.4004**	
	Total	**104,555.47**	**292.36**	

Table 13: Utility System Economic Losses

(Millions of dollars)

System	Component	Inventory Value	Economic Loss	Loss Ratio (%)
Potable Water	Pipelines	0.0000	0.0000	0.00
	Facilities	421.2450	12.6218	3.00
	Distribution Lines	849.3453	9.1449	1.08
	Subtotal	**1270.5903**	**21.7667**	
Waste Water	Pipelines	0.0000	0.0000	0.00
	Facilities	14012.7118	554.1177	3.95
	Distribution Lines	509.6072	4.5937	0.90
	Subtotal	**14522.3190**	**558.7114**	
Natural Gas	Pipelines	4102.1934	0.0000	0.00
	Facilities	402.3145	11.9622	2.97
	Distribution Lines	339.7381	1.5738	0.46
	Subtotal	**4844.2460**	**13.5360**	
Oil Systems	Pipelines	0.0000	0.0000	0.00
	Facilities	0.1150	0.0304	26.43
	Subtotal	**0.1150**	**0.0304**	
Electrical Power	Facilities	15218.7350	2018.7494	13.26
	Subtotal	**15218.7350**	**2018.7494**	
Communication	Facilities	12.9950	0.7777	5.98
	Subtotal	**12.9950**	**0.7777**	
	Total	**35,869.00**	**2,613.57**	

Appendix A: County Listing for the Region

Fairfield,CT

Hartford,CT

Litchfield,CT

Middlesex,CT

New Haven,CT

New London,CT

Tolland,CT

Windham,CT

Appendix B: Regional Population and Building Value Data

State	County Name	Population	Building Value (millions of dollars)		
			Residential	Non-Residential	Total
Connecticut					
	Fairfield	957,419	138,202	64,140	202,343
	Hartford	899,498	103,349	67,437	170,787
	Litchfield	185,186	28,643	14,484	43,128
	Middlesex	164,245	22,031	10,973	33,004
	New Haven	864,835	92,892	61,159	154,052
	New London	268,555	32,865	18,760	51,625
	Tolland	149,788	19,496	9,789	29,285
	Windham	116,418	12,974	9,028	22,003
Total Region		**3,605,944**	**450,452**	**255,770**	**706,227**

Hazus: Earthquake Global Risk Report

Region Name: CT_EQ_Portland_57

Earthquake Scenario: Portland_5.7

Print Date: April 28, 2023

Disclaimer:
Totals only reflect data for those census tracts/blocks included in the user's study region.

The estimates of social and economic impacts contained in this report were produced using Hazus loss estimation methodology software which is based on current scientific and engineering knowledge. There are uncertainties inherent in any loss estimation technique. Therefore, there may be significant differences between the modeled results contained in this report and the actual social and economic losses following a specific earthquake. These results can be improved by using enhanced inventory, geotechnical, and observed ground motion data.

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General Description of the Region

Hazus-MH is a regional earthquake loss estimation model that was developed by the Federal Emergency Management Agency (FEMA) and the National Institute of Building Sciences. The primary purpose of Hazus is to provide a methodology and software application to develop multi-hazard losses at a regional scale. These loss estimates would be used primarily by local, state and regional officials to plan and stimulate efforts to reduce risks from multi-hazards and to prepare for emergency response and recovery.

The earthquake loss estimates provided in this report was based on a region that includes 8 county(ies) from the following state(s):

Connecticut

Note:
Appendix A contains a complete listing of the counties contained in the region.

The geographical size of the region is 4,989.48 square miles and contains 878 census tracts. There are over 1,418 thousand households in the region which has a total population of 3,605,944 peopleF. The distribution of population by Total Region and County is provided in Appendix B.

There are an estimated 1,150 thousand buildings in the region with a total building replacement value (excluding contents) of 706,231 (millions of dollars). Approximately 87.00 % of the buildings (and 64.00% of the building value) are associated with residential housing.

The replacement value of the transportation and utility lifeline systems is estimated to be 104,555 and 35,869 (millions of dollars) , respectively.

Building and Lifeline Inventory

Building Inventory

Hazus estimates that there are 1,150 thousand buildings in the region which have an aggregate total replacement value of 706,231 (millions of dollars) . Appendix B provides a general distribution of the building value by Total Region and County.

In terms of building construction types found in the region, wood frame construction makes up 81% of the building inventory. The remaining percentage is distributed between the other general building types.

Critical Facility Inventory

Hazus breaks critical facilities into two (2) groups: essential facilities and high potential loss facilities (HPL). Essential facilities include hospitals, medical clinics, schools, fire stations, police stations and emergency operations facilities. High potential loss facilities include dams, levees, military installations, nuclear power plants and hazardous material sites.

For essential facilities, there are 54 hospitals in the region with a total bed capacity of 10,483 beds. There are 1,350 schools, 569 fire stations, 198 police stations and 174 emergency operation facilities. With respect to high potential loss facilities (HPL), there are no dams identified within the inventory. The inventory also includes no hazardous material sites, no military installations and no nuclear power plants.

Transportation and Utility Lifeline Inventory

Within Hazus, the lifeline inventory is divided between transportation and utility lifeline systems. There are seven (7) transportation systems that include highways, railways, light rail, bus, ports, ferry and airports. There are six (6) utility systems that include potable water, wastewater, natural gas, crude & refined oil, electric power and communications. The lifeline inventory data are provided in Tables 1 and 2.

The total value of the lifeline inventory is over 140,424.00 (millions of dollars). This inventory includes over 2,753.29 miles of highways, 4,361 bridges, 42,625.43 miles of pipes.

Table 1: Transportation System Lifeline Inventory

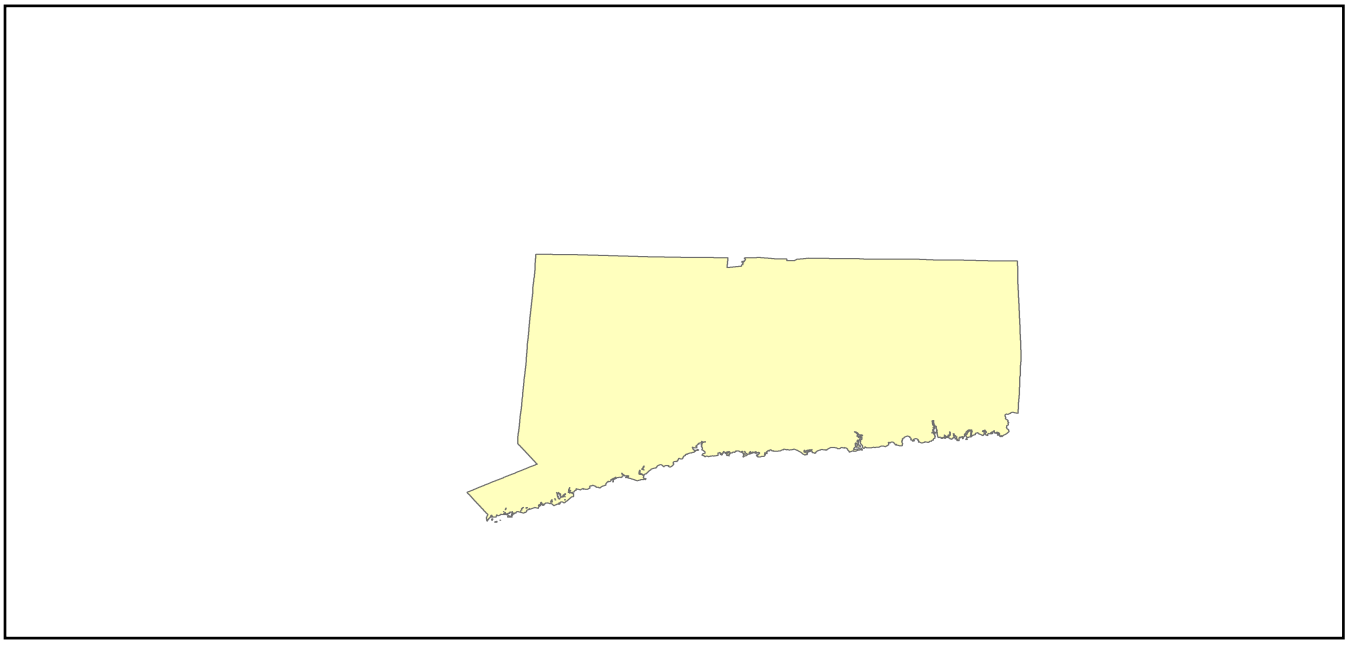
System	Component	# Locations/ # Segments	Replacement value (millions of dollars)
Highway	Bridges	4,361	19517.4512
	Segments	2,070	27492.4546
	Tunnels	7	56.0245
		Subtotal	**47065.9303**
Railways	Bridges	463	2412.2300
	Facilities	20	53.2600
	Segments	427	53524.7609
	Tunnels	0	0.0000
		Subtotal	**55990.2509**
Light Rail	Bridges	0	0.0000
	Facilities	0	0.0000
	Segments	0	0.0000
	Tunnels	0	0.0000
		Subtotal	**0.0000**
Bus	Facilities	5	10.3109
		Subtotal	**10.3109**
Ferry	Facilities	10	13.3100
		Subtotal	**13.3100**
Port	Facilities	283	987.7501
		Subtotal	**987.7501**
Airport	Facilities	12	318.5866
	Runways	26	169.3324
		Subtotal	**487.9190**
		Total	**104,555.50**

Table 2: Utility System Lifeline Inventory

System	Component	# Locations / Segments	Replacement value (millions of dollars)
Potable Water	Distribution Lines	NA	849.3453
	Facilities	11	421.2450
	Pipelines	0	0.0000
		Subtotal	**1270.5903**
Waste Water	Distribution Lines	NA	509.6072
	Facilities	89	14012.7118
	Pipelines	0	0.0000
		Subtotal	**14522.3190**
Natural Gas	Distribution Lines	NA	339.7381
	Facilities	5	402.3145
	Pipelines	508	4102.1934
		Subtotal	**4844.2460**
Oil Systems	Facilities	1	0.1150
	Pipelines	0	0.0000
		Subtotal	**0.1150**
Electrical Power	Facilities	84	15218.7350
		Subtotal	**15218.7350**
Communication	Facilities	113	12.9950
		Subtotal	**12.9950**
		Total	**35,869.00**

Earthquake Scenario

Hazus uses the following set of information to define the earthquake parameters used for the earthquake loss estimate provided in this report.



Scenario Name	Portland_5.7
Type of Earthquake	Arbitrary
Fault Name	NA
Historical Epicenter ID #	NA
Probabilistic Return Period	NA
Longitude of Epicenter	-72.60
Latitude of Epicenter	41.60
Earthquake Magnitude	5.70
Depth (km)	10.00
Rupture Length (Km)	NA
Rupture Orientation (degrees)	NA
Attenuation Function	Central & East US (CEUS 2008)

Direct Earthquake Damage

Building Damage

Hazus estimates that about 88,348 buildings will be at least moderately damaged. This is over 8.00 % of the buildings in the region. There are an estimated 8,986 buildings that will be damaged beyond repair. The definition of the 'damage states' is provided in Volume 1: Chapter 5 of the Hazus technical manual. Table 3 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4 below summarizes the expected damage by general building type.

Damage Categories by General Occupancy Type

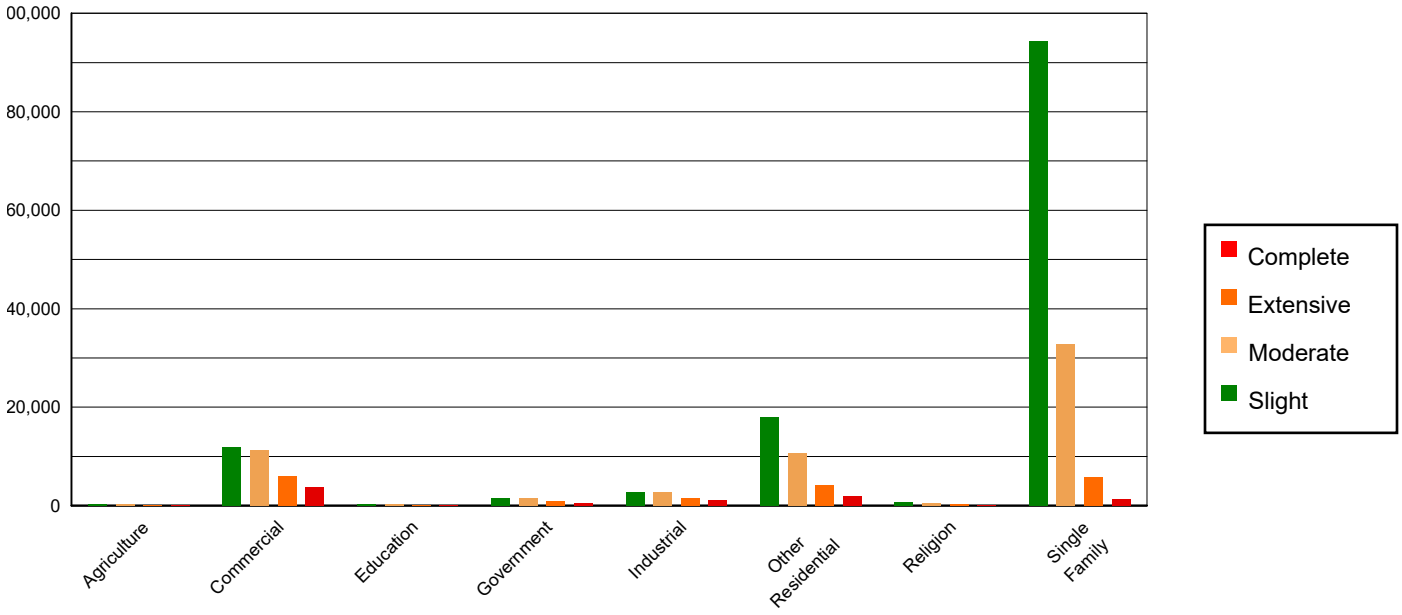


Table 3: Expected Building Damage by Occupancy

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Agriculture	2214.23	0.24	382.27	0.29	313.13	0.52	152.31	0.81	96.05	1.07
Commercial	68126.01	7.31	11869.47	9.13	11253.76	18.61	5930.25	31.38	3715.51	41.34
Education	1972.89	0.21	336.36	0.26	333.23	0.55	182.05	0.96	117.47	1.31
Government	9590.31	1.03	1634.46	1.26	1658.53	2.74	918.02	4.86	594.69	6.62
Industrial	16707.65	1.79	2736.96	2.10	2794.59	4.62	1582.85	8.38	1052.94	11.72
Other Residential	114576.11	12.29	17949.76	13.80	10642.62	17.60	4103.41	21.71	1891.11	21.04
Religion	4852.51	0.52	777.20	0.60	569.08	0.94	268.07	1.42	151.14	1.68
Single Family	714145.11	76.61	94348.63	72.56	32896.89	54.41	5762.44	30.49	1367.93	15.22
Total	**932,185**		**130,035**		**60,462**		**18,899**		**8,987**	

Table 4: Expected Building Damage by Building Type (All Design Levels)

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Wood	785422.14	84.26	103332.38	79.46	34714.91	57.42	5297.12	28.03	701.36	7.80
Steel	48458.91	5.20	7872.84	6.05	9143.33	15.12	5469.11	28.94	3676.13	40.91
Concrete	10163.29	1.09	1621.14	1.25	1967.69	3.25	1172.49	6.20	722.76	8.04
Precast	3219.80	0.35	460.53	0.35	597.23	0.99	399.56	2.11	232.67	2.59
RM	17996.79	1.93	1961.33	1.51	2480.50	4.10	1641.35	8.68	720.56	8.02
URM	63325.70	6.79	13773.02	10.59	10574.43	17.49	4561.19	24.13	2791.73	31.06
MH	3598.18	0.39	1013.88	0.78	983.74	1.63	358.56	1.90	141.63	1.58
Total	**932,185**		**130,035**		**60,462**		**18,899**		**8,987**	

*Note:

RM Reinforced Masonry
URM Unreinforced Masonry
MH Manufactured Housing

Essential Facility Damage

Before the earthquake, the region had 10,483 hospital beds available for use. On the day of the earthquake, the model estimates that only 6,342 hospital beds (61.00%) are available for use by patients already in the hospital and those injured by the earthquake. After one week, 75.00% of the beds will be back in service. By 30 days, 89.00% will be operational.

Table 5: Expected Damage to Essential Facilities

Classification	Total	# Facilities		
		At Least Moderate Damage > 50%	Complete Damage > 50%	With Functionality > 50% on day 1
Hospitals	54	8	2	37
Schools	1,350	129	21	1,045
EOCs	174	14	5	148
PoliceStations	198	15	5	163
FireStations	569	54	14	466

Transportation Lifeline Damage

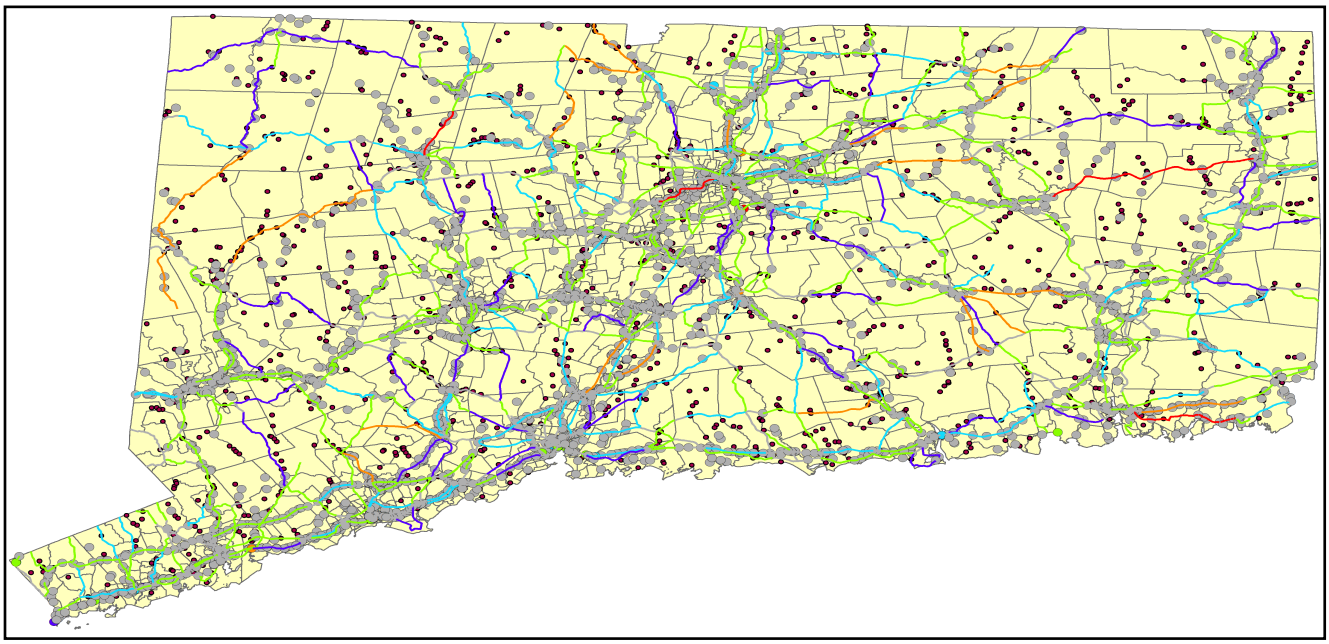


Table 6: Expected Damage to the Transportation Systems

System	Component		Number of Locations			
		Locations/ Segments	With at Least Mod. Damage	With Complete Damage	With Functionality > 50 %	
					After Day 1	After Day 7
Highway	Segments	2,070	0	0	2,070	2,070
	Bridges	4,361	87	11	4,280	4,307
	Tunnels	7	0	0	7	7
Railways	Segments	427	0	0	427	427
	Bridges	463	0	0	463	463
	Tunnels	0	0	0	0	0
	Facilities	20	1	0	20	20
Light Rail	Segments	0	0	0	0	0
	Bridges	0	0	0	0	0
	Tunnels	0	0	0	0	0
	Facilities	0	0	0	0	0
Bus	Facilities	5	0	0	5	5
Ferry	Facilities	10	2	0	8	10
Port	Facilities	283	7	0	277	283
Airport	Facilities	12	0	0	12	12
	Runways	26	0	0	26	26

Table 6 provides damage estimates for the transportation system.

Note: Roadway segments, railroad tracks and light rail tracks are assumed to be damaged by ground failure only. If ground failure maps are not provided, damage estimates to these components will not be computed.

Tables 7-9 provide information on the damage to the utility lifeline systems. Table 7 provides damage to the utility system facilities. Table 8 provides estimates on the number of leaks and breaks by the pipelines of the utility systems. For electric power and potable water, Hazus performs a simplified system performance analysis. Table 9 provides a summary of the system performance information.

Table 7 : Expected Utility System Facility Damage

System	# of Locations				
	Total #	With at Least Moderate Damage	With Complete Damage	with Functionality > 50 %	
				After Day 1	After Day 7
Potable Water	11	1	0	10	11
Waste Water	89	7	0	71	84
Natural Gas	5	1	0	4	5
Oil Systems	1	1	0	0	0
Electrical Power	84	16	1	72	79
Communication	113	9	0	109	113

Table 8 : Expected Utility System Pipeline Damage (Site Specific)

System	Total Pipelines Length (miles)	Number of Leaks	Number of Breaks
Potable Water	26,388	2635	659
Waste Water	15,833	1324	331
Natural Gas	405	17	4
Oil	0	0	0

Table 9: Expected Potable Water and Electric Power System Performance

	Total # of Households	Number of Households without Service				
		At Day 1	At Day 3	At Day 7	At Day 30	At Day 90
Potable Water	1,418,069	48,055	27,985	2,738	0	0
Electric Power		182,285	136,788	78,499	13,440	227

Induced Earthquake Damage

Fire Following Earthquake

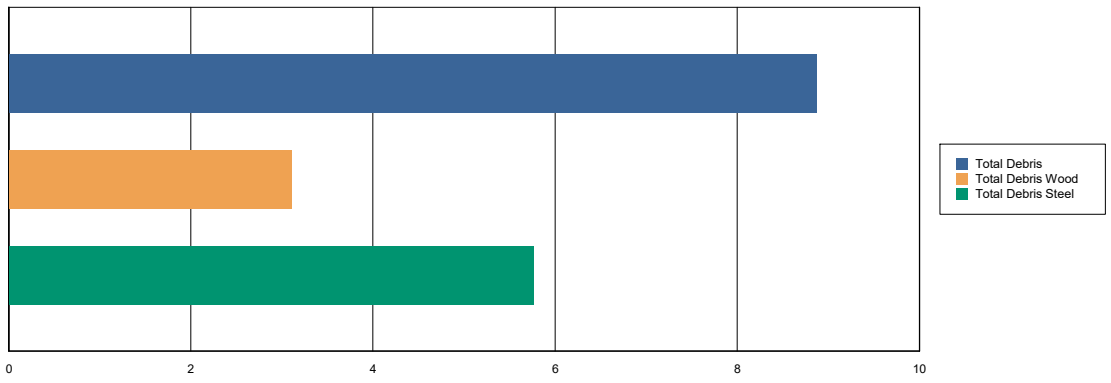
Fires often occur after an earthquake. Because of the number of fires and the lack of water to fight the fires, they can often burn out of control. Hazus uses a Monte Carlo simulation model to estimate the number of ignitions and the amount of burnt area. For this scenario, the model estimates that there will be 7 ignitions that will burn about 0.06 sq. mi 0.00 % of the region's total area.) The model also estimates that the fires will displace about 642 people and burn about 53 (millions of dollars) of building value.

Debris Generation

Hazus estimates the amount of debris that will be generated by the earthquake. The model breaks the debris into two general categories: a) Brick/Wood and b) Reinforced Concrete/Steel. This distinction is made because of the different types of material handling equipment required to handle the debris.

The model estimates that a total of 8,871,000 tons of debris will be generated. Of the total amount, Brick/Wood comprises 35.00% of the total, with the remainder being Reinforced Concrete/Steel. If the debris tonnage is converted to an estimated number of truckloads, it will require 354,840 truckloads (@25 tons/truck) to remove the debris generated by the earthquake.

Earthquake Debris (millions of tons)



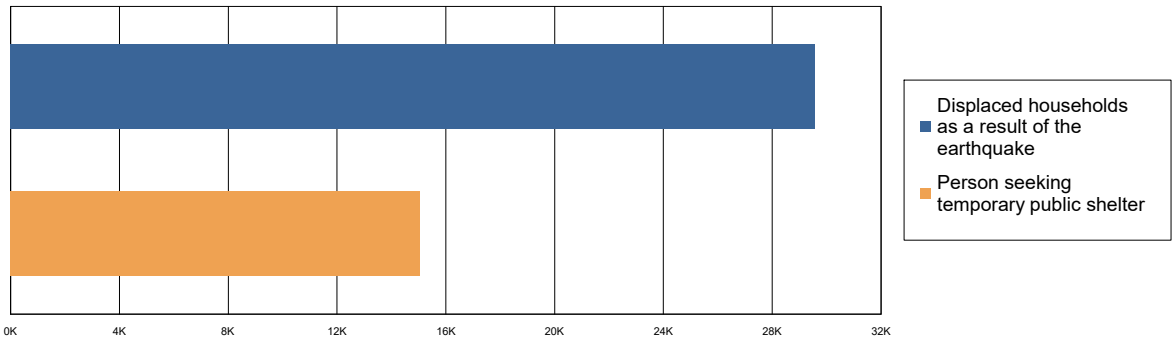
Brick/ Wood	Reinforced Concrete/Steel	Total Debris	Truck Load
3.10	5.77	8.87	354,840 (@25 tons/truck)

Social Impact

Shelter Requirement

Hazus estimates the number of households that are expected to be displaced from their homes due to the earthquake and the number of displaced people that will require accommodations in temporary public shelters. The model estimates 29,573 households to be displaced due to the earthquake. Of these, 15,048 people (out of a total population of 3,605,944) will seek temporary shelter in public shelters.

Displaced Households/ Persons Seeking Short Term Public Shelter



Displaced households as a result of the earthquake	Persons seeking temporary public shelter
29,573	15,048

Casualties

Hazus estimates the number of people that will be injured and killed by the earthquake. The casualties are broken down into four (4) severity levels that describe the extent of the injuries. The levels are described as follows;

- Severity Level 1: Injuries will require medical attention but hospitalization is not needed.
- Severity Level 2: Injuries will require hospitalization but are not considered life-threatening
- Severity Level 3: Injuries will require hospitalization and can become life threatening if not promptly treated.
- Severity Level 4: Victims are killed by the earthquake.

The casualty estimates are provided for three (3) times of day: 2:00 AM, 2:00 PM and 5:00 PM. These times represent the periods of the day that different sectors of the community are at their peak occupancy loads. The 2:00 AM estimate considers that the residential occupancy load is maximum, the 2:00 PM estimate considers that the educational, commercial and industrial sector loads are maximum and 5:00 PM represents peak commute time.

Table 10 provides a summary of the casualties estimated for this earthquake

Table 10: Casualty Estimates

		Level 1	Level 2	Level 3	Level 4
2 AM	Commercial	140.22	37.89	5.57	10.95
	Commuting	0.23	0.33	0.53	0.10
	Educational	0.00	0.00	0.00	0.00
	Hotels	1.92	0.53	0.08	0.17
	Industrial	133.04	36.48	5.41	10.62
	Other-Residential	2635.70	702.88	108.71	214.44
	Single Family	1088.88	208.33	24.58	47.94
	Total	**4,000**	**986**	**145**	**284**
2 PM	Commercial	8641.83	2337.79	345.63	673.78
	Commuting	2.09	2.94	4.78	0.93
	Educational	2986.66	832.69	131.43	255.65
	Hotels	0.37	0.10	0.02	0.03
	Industrial	983.45	269.84	40.27	78.20
	Other-Residential	822.98	221.39	34.98	66.29
	Single Family	322.04	63.91	8.00	14.81
	Total	**13,759**	**3,729**	**565**	**1,090**
5 PM	Commercial	5787.23	1569.30	234.45	450.06
	Commuting	43.65	61.28	99.74	19.50
	Educational	427.03	119.80	19.21	37.05
	Hotels	0.57	0.16	0.03	0.05
	Industrial	614.66	168.65	25.17	48.88
	Other-Residential	1042.70	280.59	44.32	84.00
	Single Family	429.53	85.47	10.71	19.82
	Total	**8,345**	**2,285**	**434**	**659**

Economic Loss

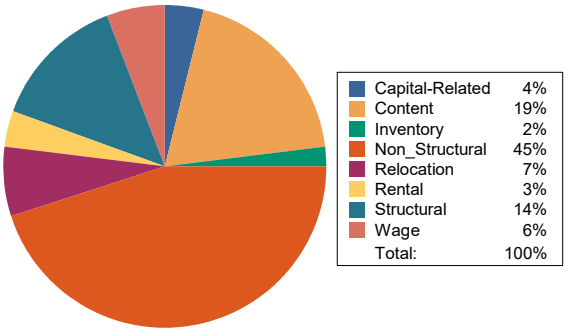
The total economic loss estimated for the earthquake is 45,748.17 (millions of dollars), which includes building and lifeline related losses based on the region's available inventory. The following three sections provide more detailed information about these losses.

Building-Related Losses

The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the earthquake. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the earthquake.

The total building-related losses were 42,039.44 (millions of dollars); 20 % of the estimated losses were related to the business interruption of the region. By far, the largest loss was sustained by the residential occupancies which made up over 30 % of the total loss. Table 11 below provides a summary of the losses associated with the building damage.

Earthquake Losses by Loss Type ($ millions)



Earthquake Losses by Occupancy Type ($ millions)

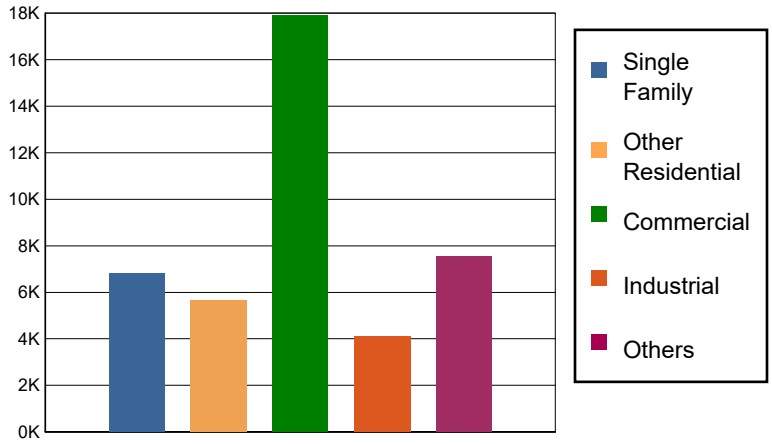


Table 11: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Single Family	Other Residential	Commercial	Industrial	Others	Total
Income Losses							
	Wage	0.0000	253.3939	1839.4146	75.9628	316.1278	2,484.8991
	Capital-Related	0.0000	107.8315	1450.1824	45.7054	64.2232	1,667.9425
	Rental	105.6394	417.3315	743.7643	28.8600	160.9324	1,456.5276
	Relocation	379.7555	237.7499	1200.8771	136.7003	989.5470	2,944.6298
	Subtotal	**485.3949**	**1016.3068**	**5234.2384**	**287.2285**	**1530.8304**	**8553.9990**
Capital Stock Losses							
	Structural	832.5493	669.3288	2613.5193	595.5023	1025.5850	5,736.4847
	Non_Structural	4030.8850	3184.4957	6431.3555	1874.1256	3425.4782	18,946.3400
	Content	1487.2789	767.5169	3004.5311	1181.4226	1530.1244	7,970.8739
	Inventory	0.0000	0.0000	614.0462	189.3614	28.3347	831.7423
	Subtotal	**6350.7132**	**4621.3414**	**12663.4521**	**3840.4119**	**6009.5223**	**33485.4409**
	Total	**6836.11**	**5637.65**	**17897.69**	**4127.64**	**7540.35**	**42039.44**

Transportation and Utility Lifeline Losses

For the transportation and utility lifeline systems, Hazus computes the direct repair cost for each component only. There are no losses computed by Hazus for business interruption due to lifeline outages. Tables 12 & 13 provide a detailed breakdown in the expected lifeline losses.

Table 12: Transportation System Economic Losses

(Millions of dollars)

System	Component	Inventory Value	Economic Loss	Loss Ratio (%)
Highway	Segments	27492.4546	0.0000	0.00
	Bridges	19517.4512	394.2242	2.02
	Tunnels	56.0245	0.6300	1.12
	Subtotal	**47065.9303**	**394.8542**	
Railways	Segments	53524.7609	0.0000	0.00
	Bridges	2412.2300	8.1014	0.34
	Tunnels	0.0000	0.0000	0.00
	Facilities	53.2600	5.5154	10.36
	Subtotal	**55990.2509**	**13.6168**	
Light Rail	Segments	0.0000	0.0000	0.00
	Bridges	0.0000	0.0000	0.00
	Tunnels	0.0000	0.0000	0.00
	Facilities	0.0000	0.0000	0.00
	Subtotal	**0.0000**	**0.0000**	
Bus	Facilities	10.3109	0.6100	5.92
	Subtotal	**10.3109**	**0.6100**	
Ferry	Facilities	13.3100	2.0749	15.59
	Subtotal	**13.3100**	**2.0749**	
Port	Facilities	987.7501	54.9359	5.56
	Subtotal	**987.7501**	**54.9359**	
Airport	Facilities	318.5866	31.4665	9.88
	Runways	169.3324	0.0000	0.00
	Subtotal	**487.9190**	**31.4665**	
	Total	**104,555.47**	**497.56**	

Table 13: Utility System Economic Losses

(Millions of dollars)

System	Component	Inventory Value	Economic Loss	Loss Ratio (%)
Potable Water	Pipelines	0.0000	0.0000	0.00
	Facilities	421.2450	18.0800	4.29
	Distribution Lines	849.3453	11.8571	1.40
	Subtotal	**1270.5903**	**29.9371**	
Waste Water	Pipelines	0.0000	0.0000	0.00
	Facilities	14012.7118	791.6844	5.65
	Distribution Lines	509.6072	5.9561	1.17
	Subtotal	**14522.3190**	**797.6405**	
Natural Gas	Pipelines	4102.1934	0.0000	0.00
	Facilities	402.3145	39.6898	9.87
	Distribution Lines	339.7381	2.0405	0.60
	Subtotal	**4844.2460**	**41.7303**	
Oil Systems	Pipelines	0.0000	0.0000	0.00
	Facilities	0.1150	0.0581	50.52
	Subtotal	**0.1150**	**0.0581**	
Electrical Power	Facilities	15218.7350	2340.5562	15.38
	Subtotal	**15218.7350**	**2340.5562**	
Communication	Facilities	12.9950	1.2482	9.61
	Subtotal	**12.9950**	**1.2482**	
	Total	**35,869.00**	**3,211.17**	

Appendix A: County Listing for the Region

Fairfield,CT

Hartford,CT

Litchfield,CT

Middlesex,CT

New Haven,CT

New London,CT

Tolland,CT

Windham,CT

Appendix B: Regional Population and Building Value Data

State	County Name	Population	Building Value (millions of dollars)		
			Residential	Non-Residential	Total
Connecticut					
	Fairfield	957,419	138,202	64,140	202,343
	Hartford	899,498	103,349	67,437	170,787
	Litchfield	185,186	28,643	14,484	43,128
	Middlesex	164,245	22,031	10,973	33,004
	New Haven	864,835	92,892	61,159	154,052
	New London	268,555	32,865	18,760	51,625
	Tolland	149,788	19,496	9,789	29,285
	Windham	116,418	12,974	9,028	22,003
Total Region		**3,605,944**	**450,452**	**255,770**	**706,227**

Hazus: Earthquake Global Risk Report

Region Name: CT_EQ_Stamford_57

Earthquake Scenario: Stamford_5.7

Print Date: April 28, 2023

Disclaimer:
Totals only reflect data for those census tracts/blocks included in the user's study region.

The estimates of social and economic impacts contained in this report were produced using Hazus loss estimation methodology software which is based on current scientific and engineering knowledge. There are uncertainties inherent in any loss estimation technique. Therefore, there may be significant differences between the modeled results contained in this report and the actual social and economic losses following a specific earthquake. These results can be improved by using enhanced inventory, geotechnical, and observed ground motion data.

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General Description of the Region

Hazus-MH is a regional earthquake loss estimation model that was developed by the Federal Emergency Management Agency (FEMA) and the National Institute of Building Sciences. The primary purpose of Hazus is to provide a methodology and software application to develop multi-hazard losses at a regional scale. These loss estimates would be used primarily by local, state and regional officials to plan and stimulate efforts to reduce risks from multi-hazards and to prepare for emergency response and recovery.

The earthquake loss estimates provided in this report was based on a region that includes 8 county(ies) from the following state(s):

Connecticut

Note:
Appendix A contains a complete listing of the counties contained in the region.

The geographical size of the region is 4,989.48 square miles and contains 878 census tracts. There are over 1,418 thousand households in the region which has a total population of 3,605,944 peopleF. The distribution of population by Total Region and County is provided in Appendix B.

There are an estimated 1,150 thousand buildings in the region with a total building replacement value (excluding contents) of 706,231 (millions of dollars). Approximately 87.00 % of the buildings (and 64.00% of the building value) are associated with residential housing.

The replacement value of the transportation and utility lifeline systems is estimated to be 104,555 and 35,869 (millions of dollars) , respectively.

Building and Lifeline Inventory

Building Inventory

Hazus estimates that there are 1,150 thousand buildings in the region which have an aggregate total replacement value of 706,231 (millions of dollars) . Appendix B provides a general distribution of the building value by Total Region and County.

In terms of building construction types found in the region, wood frame construction makes up 81% of the building inventory. The remaining percentage is distributed between the other general building types.

Critical Facility Inventory

Hazus breaks critical facilities into two (2) groups: essential facilities and high potential loss facilities (HPL). Essential facilities include hospitals, medical clinics, schools, fire stations, police stations and emergency operations facilities. High potential loss facilities include dams, levees, military installations, nuclear power plants and hazardous material sites.

For essential facilities, there are 54 hospitals in the region with a total bed capacity of 10,483 beds. There are 1,350 schools, 569 fire stations, 198 police stations and 174 emergency operation facilities. With respect to high potential loss facilities (HPL), there are no dams identified within the inventory. The inventory also includes no hazardous material sites, no military installations and no nuclear power plants.

Transportation and Utility Lifeline Inventory

Within Hazus, the lifeline inventory is divided between transportation and utility lifeline systems. There are seven (7) transportation systems that include highways, railways, light rail, bus, ports, ferry and airports. There are six (6) utility systems that include potable water, wastewater, natural gas, crude & refined oil, electric power and communications. The lifeline inventory data are provided in Tables 1 and 2.

The total value of the lifeline inventory is over 140,424.00 (millions of dollars). This inventory includes over 2,753.29 miles of highways, 4,361 bridges, 42,625.43 miles of pipes.

Table 1: Transportation System Lifeline Inventory

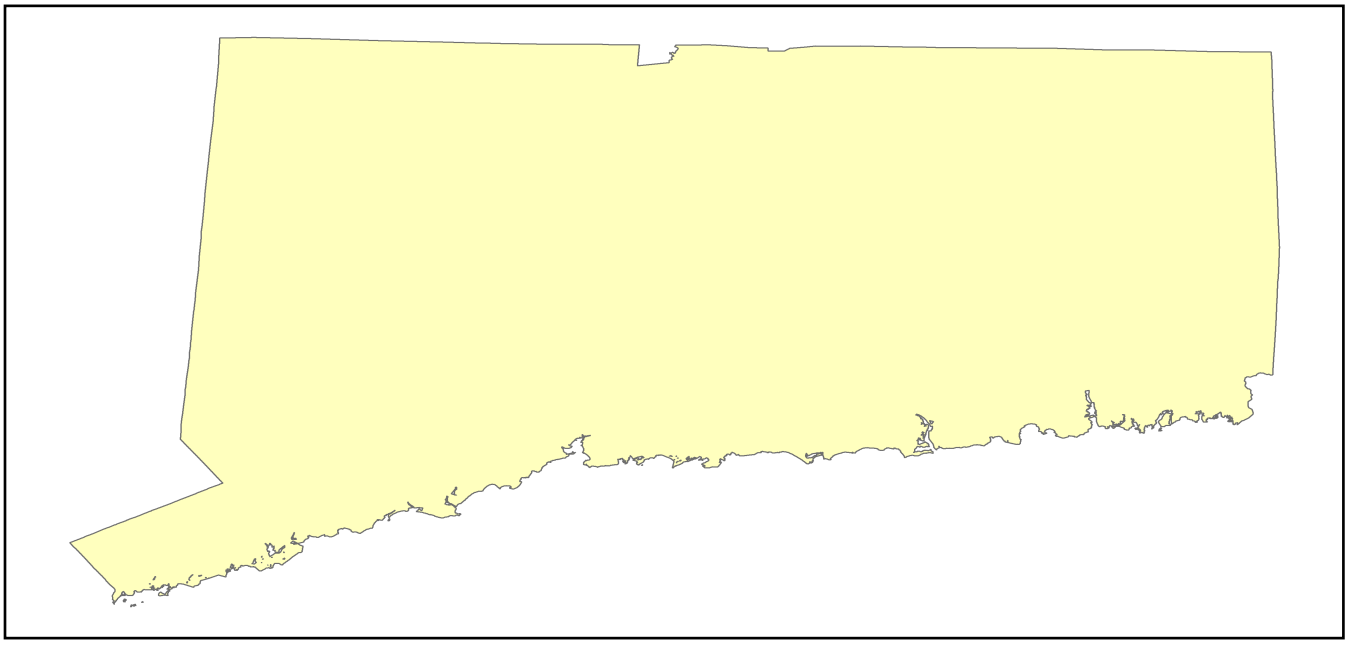
System	Component	# Locations/ # Segments	Replacement value (millions of dollars)
Highway	Bridges	4,361	19517.4512
	Segments	2,070	27492.4546
	Tunnels	7	56.0245
		Subtotal	**47065.9303**
Railways	Bridges	463	2412.2300
	Facilities	20	53.2600
	Segments	427	53524.7609
	Tunnels	0	0.0000
		Subtotal	**55990.2509**
Light Rail	Bridges	0	0.0000
	Facilities	0	0.0000
	Segments	0	0.0000
	Tunnels	0	0.0000
		Subtotal	**0.0000**
Bus	Facilities	5	10.3109
		Subtotal	**10.3109**
Ferry	Facilities	10	13.3100
		Subtotal	**13.3100**
Port	Facilities	283	987.7501
		Subtotal	**987.7501**
Airport	Facilities	12	318.5866
	Runways	26	169.3324
		Subtotal	**487.9190**
		Total	**104,555.50**

Table 2: Utility System Lifeline Inventory

System	Component	# Locations / Segments	Replacement value (millions of dollars)
Potable Water	Distribution Lines	NA	849.3453
	Facilities	11	421.2450
	Pipelines	0	0.0000
		Subtotal	**1270.5903**
Waste Water	Distribution Lines	NA	509.6072
	Facilities	89	14012.7118
	Pipelines	0	0.0000
		Subtotal	**14522.3190**
Natural Gas	Distribution Lines	NA	339.7381
	Facilities	5	402.3145
	Pipelines	508	4102.1934
		Subtotal	**4844.2460**
Oil Systems	Facilities	1	0.1150
	Pipelines	0	0.0000
		Subtotal	**0.1150**
Electrical Power	Facilities	84	15218.7350
		Subtotal	**15218.7350**
Communication	Facilities	113	12.9950
		Subtotal	**12.9950**
		Total	**35,869.00**

Earthquake Scenario

Hazus uses the following set of information to define the earthquake parameters used for the earthquake loss estimate provided in this report.



Scenario Name	Stamford_5.7
Type of Earthquake	Arbitrary
Fault Name	NA
Historical Epicenter ID #	NA
Probabilistic Return Period	NA
Longitude of Epicenter	-73.56
Latitude of Epicenter	41.11
Earthquake Magnitude	5.70
Depth (km)	10.00
Rupture Length (Km)	NA
Rupture Orientation (degrees)	NA
Attenuation Function	Central & East US (CEUS 2008)

Direct Earthquake Damage

Building Damage

Hazus estimates that about 65,888 buildings will be at least moderately damaged. This is over 6.00 % of the buildings in the region. There are an estimated 10,609 buildings that will be damaged beyond repair. The definition of the 'damage states' is provided in Volume 1: Chapter 5 of the Hazus technical manual. Table 3 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4 below summarizes the expected damage by general building type.

Damage Categories by General Occupancy Type

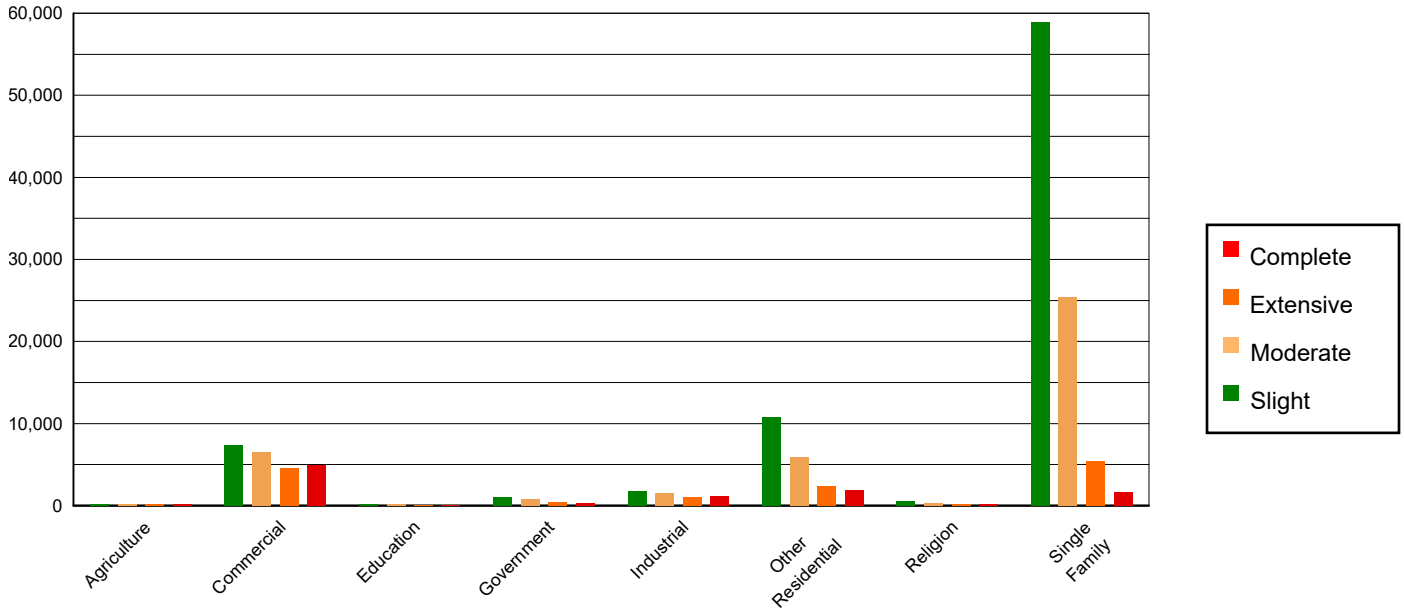


Table 3: Expected Building Damage by Occupancy

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Agriculture	2384.97	0.24	242.81	0.30	221.62	0.54	155.11	1.08	153.50	1.45
Commercial	77483.65	7.72	7376.37	9.12	6485.16	15.85	4594.12	32.01	4955.70	46.71
Education	2292.18	0.23	207.27	0.26	180.96	0.44	127.23	0.89	134.36	1.27
Government	11791.73	1.17	1034.38	1.28	809.88	1.98	417.20	2.91	342.81	3.23
Industrial	19204.50	1.91	1803.31	2.23	1562.17	3.82	1087.52	7.58	1217.51	11.48
Other Residential	128260.75	12.78	10737.61	13.28	5890.95	14.39	2330.50	16.24	1943.19	18.32
Religion	5404.06	0.54	508.06	0.63	342.18	0.84	180.64	1.26	183.06	1.73
Single Family	757003.01	75.41	58944.69	72.90	25432.87	62.14	5461.17	38.05	1679.27	15.83
Total	**1,003,825**		**80,854**		**40,926**		**14,353**		**10,609**	

Table 4: Expected Building Damage by Building Type (All Design Levels)

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Wood	831948.98	82.88	63758.98	78.86	27089.16	66.19	5628.52	39.21	1042.27	9.82
Steel	57826.26	5.76	4882.09	6.04	4527.21	11.06	3408.84	23.75	3975.91	37.48
Concrete	12226.33	1.22	1001.73	1.24	929.94	2.27	681.81	4.75	807.58	7.61
Precast	3677.09	0.37	321.95	0.40	353.01	0.86	252.76	1.76	304.98	2.87
RM	20341.67	2.03	1207.37	1.49	1289.42	3.15	1019.62	7.10	942.44	8.88
URM	72435.84	7.22	9195.48	11.37	6511.70	15.91	3347.78	23.32	3535.27	33.32
MH	5368.68	0.53	486.88	0.60	225.35	0.55	14.16	0.10	0.94	0.01
Total	**1,003,825**		**80,854**		**40,926**		**14,353**		**10,609**	

*Note:

RM Reinforced Masonry
URM Unreinforced Masonry
MH Manufactured Housing

Essential Facility Damage

Before the earthquake, the region had 10,483 hospital beds available for use. On the day of the earthquake, the model estimates that only 8,076 hospital beds (77.00%) are available for use by patients already in the hospital and those injured by the earthquake. After one week, 86.00% of the beds will be back in service. By 30 days, 92.00% will be operational.

Table 5: Expected Damage to Essential Facilities

Classification	Total	# Facilities		
		At Least Moderate Damage > 50%	Complete Damage > 50%	With Functionality > 50% on day 1
Hospitals	54	5	3	49
Schools	1,350	106	66	1,209
EOCs	174	5	3	165
PoliceStations	198	8	4	187
FireStations	569	32	16	525

Transportation Lifeline Damage

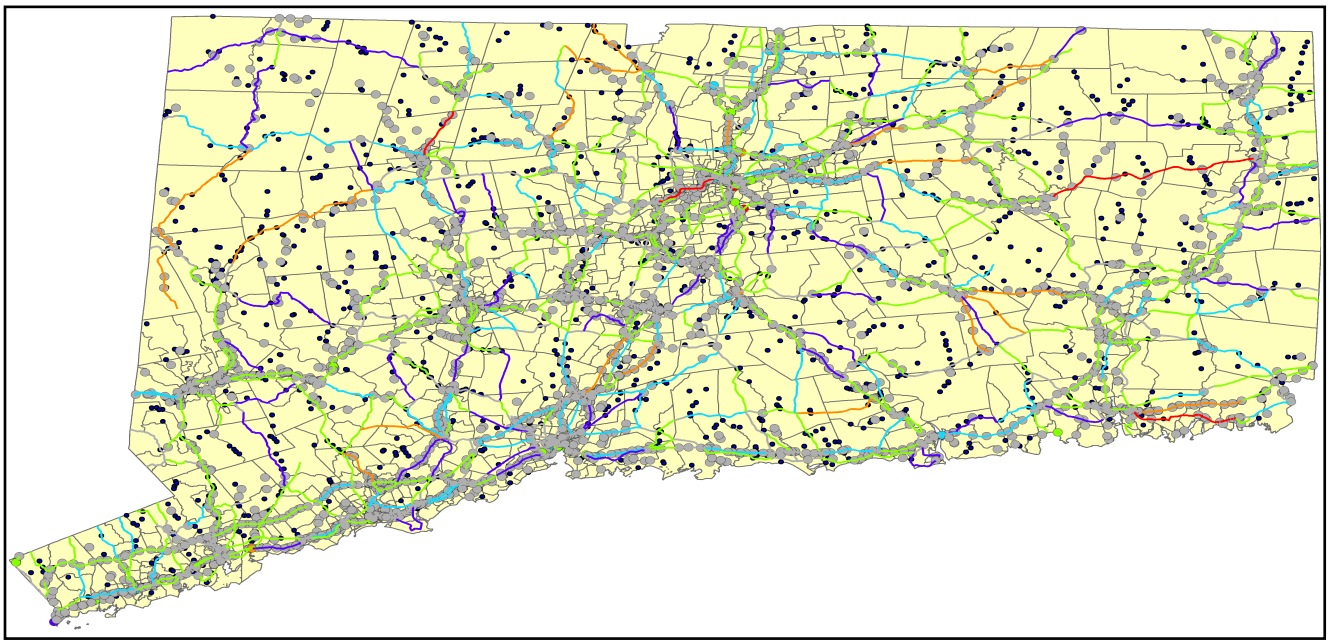


Table 6: Expected Damage to the Transportation Systems

System	Component		Number of Locations			
		Locations/ Segments	With at Least Mod. Damage	With Complete Damage	With Functionality > 50 % After Day 1	With Functionality > 50 % After Day 7
Highway	Segments	2,070	0	0	2,070	2,070
	Bridges	4,361	27	2	4,335	4,345
	Tunnels	7	0	0	7	7
Railways	Segments	427	0	0	427	427
	Bridges	463	0	0	463	463
	Tunnels	0	0	0	0	0
	Facilities	20	2	0	18	20
Light Rail	Segments	0	0	0	0	0
	Bridges	0	0	0	0	0
	Tunnels	0	0	0	0	0
	Facilities	0	0	0	0	0
Bus	Facilities	5	0	0	5	5
Ferry	Facilities	10	2	0	10	10
Port	Facilities	283	76	0	247	283
Airport	Facilities	12	0	0	12	12
	Runways	26	0	0	26	26

Table 6 provides damage estimates for the transportation system.

Note: Roadway segments, railroad tracks and light rail tracks are assumed to be damaged by ground failure only. If ground failure maps are not provided, damage estimates to these components will not be computed.

Tables 7-9 provide information on the damage to the utility lifeline systems. Table 7 provides damage to the utility system facilities. Table 8 provides estimates on the number of leaks and breaks by the pipelines of the utility systems. For electric power and potable water, Hazus performs a simplified system performance analysis. Table 9 provides a summary of the system performance information.

Table 7 : Expected Utility System Facility Damage

System	# of Locations				
	Total #	With at Least Moderate Damage	With Complete Damage	with Functionality > 50 %	
				After Day 1	After Day 7
Potable Water	11	0	0	11	11
Waste Water	89	5	0	80	87
Natural Gas	5	0	0	5	5
Oil Systems	1	0	0	1	1
Electrical Power	84	5	1	80	81
Communication	113	8	0	106	113

Table 8 : Expected Utility System Pipeline Damage (Site Specific)

System	Total Pipelines Length (miles)	Number of Leaks	Number of Breaks
Potable Water	26,388	1865	466
Waste Water	15,833	937	234
Natural Gas	405	6	2
Oil	0	0	0

Table 9: Expected Potable Water and Electric Power System Performance

	Total # of Households	Number of Households without Service				
		At Day 1	At Day 3	At Day 7	At Day 30	At Day 90
Potable Water	1,418,069	59,744	46,371	22,066	0	0
Electric Power		131,000	115,392	80,213	21,480	144

Induced Earthquake Damage

Fire Following Earthquake

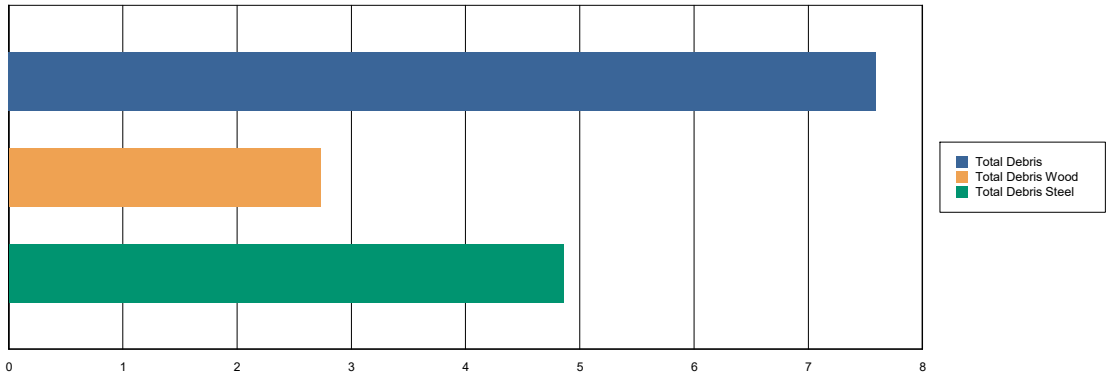
Fires often occur after an earthquake. Because of the number of fires and the lack of water to fight the fires, they can often burn out of control. Hazus uses a Monte Carlo simulation model to estimate the number of ignitions and the amount of burnt area. For this scenario, the model estimates that there will be 7 ignitions that will burn about 0.09 sq. mi 0.00 % of the region's total area.) The model also estimates that the fires will displace about 783 people and burn about 84 (millions of dollars) of building value.

Debris Generation

Hazus estimates the amount of debris that will be generated by the earthquake. The model breaks the debris into two general categories: a) Brick/Wood and b) Reinforced Concrete/Steel. This distinction is made because of the different types of material handling equipment required to handle the debris.

The model estimates that a total of 7,594,000 tons of debris will be generated. Of the total amount, Brick/Wood comprises 36.00% of the total, with the remainder being Reinforced Concrete/Steel. If the debris tonnage is converted to an estimated number of truckloads, it will require 303,760 truckloads (@25 tons/truck) to remove the debris generated by the earthquake.

Earthquake Debris (millions of tons)



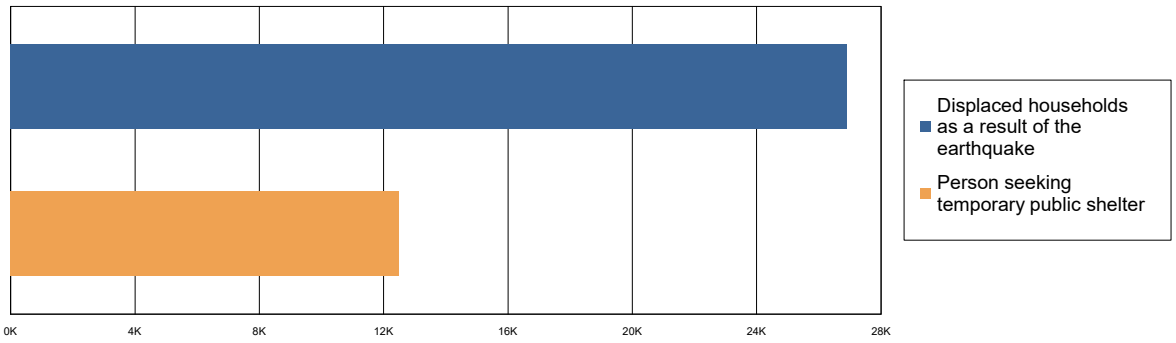
Brick/ Wood	Reinforced Concrete/Steel	Total Debris	Truck Load
2.73	4.86	7.59	303,760 (@25 tons/truck)

Social Impact

Shelter Requirement

Hazus estimates the number of households that are expected to be displaced from their homes due to the earthquake and the number of displaced people that will require accommodations in temporary public shelters. The model estimates 26,906 households to be displaced due to the earthquake. Of these, 12,503 people (out of a total population of 3,605,944) will seek temporary shelter in public shelters.

Displaced Households/ Persons Seeking Short Term Public Shelter



Displaced households as a result of the earthquake	Persons seeking temporary public shelter
26,906	12,503

Casualties

Hazus estimates the number of people that will be injured and killed by the earthquake. The casualties are broken down into four (4) severity levels that describe the extent of the injuries. The levels are described as follows;

- Severity Level 1: Injuries will require medical attention but hospitalization is not needed.
- Severity Level 2: Injuries will require hospitalization but are not considered life-threatening
- Severity Level 3: Injuries will require hospitalization and can become life threatening if not promptly treated.
- Severity Level 4: Victims are killed by the earthquake.

The casualty estimates are provided for three (3) times of day: 2:00 AM, 2:00 PM and 5:00 PM. These times represent the periods of the day that different sectors of the community are at their peak occupancy loads. The 2:00 AM estimate considers that the residential occupancy load is maximum, the 2:00 PM estimate considers that the educational, commercial and industrial sector loads are maximum and 5:00 PM represents peak commute time.

Table 10 provides a summary of the casualties estimated for this earthquake

Table 10: Casualty Estimates

		Level 1	Level 2	Level 3	Level 4
2 AM	Commercial	178.88	52.87	8.20	16.14
	Commuting	0.16	0.28	0.40	0.08
	Educational	0.00	0.00	0.00	0.00
	Hotels	3.96	1.25	0.21	0.42
	Industrial	101.72	29.92	4.63	9.10
	Other-Residential	2787.47	821.25	133.01	262.85
	Single Family	1108.14	241.61	30.47	59.48
	Total	**4,180**	**1,147**	**177**	**348**
2 PM	Commercial	10520.97	3105.75	483.18	945.20
	Commuting	1.47	2.55	3.59	0.73
	Educational	2684.28	803.36	130.85	255.12
	Hotels	0.76	0.24	0.04	0.08
	Industrial	753.17	221.63	34.48	67.07
	Other-Residential	905.41	269.56	44.62	84.62
	Single Family	348.18	78.70	10.52	19.46
	Total	**15,214**	**4,482**	**707**	**1,372**
5 PM	Commercial	6631.20	1956.26	306.59	591.86
	Commuting	30.63	52.15	74.35	15.09
	Educational	204.84	60.10	9.85	18.99
	Hotels	1.19	0.38	0.06	0.13
	Industrial	470.73	138.52	21.55	41.92
	Other-Residential	1109.27	330.20	54.65	103.65
	Single Family	440.48	99.49	13.29	24.59
	Total	**8,888**	**2,637**	**480**	**796**

Economic Loss

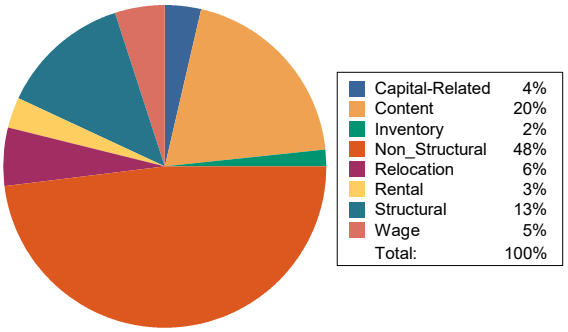
The total economic loss estimated for the earthquake is 40,840.64 (millions of dollars), which includes building and lifeline related losses based on the region's available inventory. The following three sections provide more detailed information about these losses.

Building-Related Losses

The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the earthquake. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the earthquake.

The total building-related losses were 39,475.40 (millions of dollars); 18 % of the estimated losses were related to the business interruption of the region. By far, the largest loss was sustained by the residential occupancies which made up over 36 % of the total loss. Table 11 below provides a summary of the losses associated with the building damage.

Earthquake Losses by Loss Type ($ millions)



Earthquake Losses by Occupancy Type ($ millions)

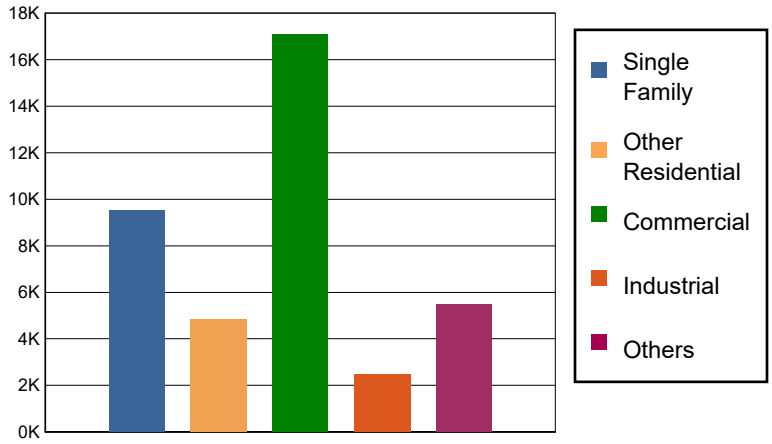


Table 11: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Single Family	Other Residential	Commercial	Industrial	Others	Total
Income Losses							
	Wage	0.0000	292.3867	1479.4063	39.1895	195.3166	2,006.2991
	Capital-Related	0.0000	124.4014	1247.4781	23.3295	40.1217	1,435.3307
	Rental	131.0955	361.2224	629.7076	15.1442	82.9516	1,220.1213
	Relocation	472.5444	184.1410	992.3427	71.5650	589.9650	2,310.5581
	Subtotal	**603.6399**	**962.1515**	**4348.9347**	**149.2282**	**908.3549**	**6972.3092**
Capital Stock Losses							
	Structural	1193.7686	511.1307	2332.8237	331.3283	766.2044	5,135.2557
	Non_Structural	5671.8868	2719.9566	6703.6322	1165.9350	2619.9003	18,881.3109
	Content	2079.3332	647.0949	3194.9963	711.3880	1174.3133	7,807.1257
	Inventory	0.0000	0.0000	534.5540	117.6576	27.1897	679.4013
	Subtotal	**8944.9886**	**3878.1822**	**12766.0062**	**2326.3089**	**4587.6077**	**32503.0936**
	Total	**9548.63**	**4840.33**	**17114.94**	**2475.54**	**5495.96**	**39475.40**

Transportation and Utility Lifeline Losses

For the transportation and utility lifeline systems, Hazus computes the direct repair cost for each component only. There are no losses computed by Hazus for business interruption due to lifeline outages. Tables 12 & 13 provide a detailed breakdown in the expected lifeline losses.

Table 12: Transportation System Economic Losses
(Millions of dollars)

System	Component	Inventory Value	Economic Loss	Loss Ratio (%)
Highway	Segments	27492.4546	0.0000	0.00
	Bridges	19517.4512	156.6507	0.80
	Tunnels	56.0245	0.0001	0.00
	Subtotal	**47065.9303**	**156.6508**	
Railways	Segments	53524.7609	0.0000	0.00
	Bridges	2412.2300	14.9134	0.62
	Tunnels	0.0000	0.0000	0.00
	Facilities	53.2600	3.8021	7.14
	Subtotal	**55990.2509**	**18.7155**	
Light Rail	Segments	0.0000	0.0000	0.00
	Bridges	0.0000	0.0000	0.00
	Tunnels	0.0000	0.0000	0.00
	Facilities	0.0000	0.0000	0.00
	Subtotal	**0.0000**	**0.0000**	
Bus	Facilities	10.3109	0.3766	3.65
	Subtotal	**10.3109**	**0.3766**	
Ferry	Facilities	13.3100	1.7338	13.03
	Subtotal	**13.3100**	**1.7338**	
Port	Facilities	987.7501	151.5904	15.35
	Subtotal	**987.7501**	**151.5904**	
Airport	Facilities	318.5866	4.9233	1.55
	Runways	169.3324	0.0000	0.00
	Subtotal	**487.9190**	**4.9233**	
	Total	**104,555.47**	**333.99**	

Table 13: Utility System Economic Losses

(Millions of dollars)

System	Component	Inventory Value	Economic Loss	Loss Ratio (%)
Potable Water	Pipelines	0.0000	0.0000	0.00
	Facilities	421.2450	8.1065	1.92
	Distribution Lines	849.3453	8.3945	0.99
	Subtotal	**1270.5903**	**16.5010**	
Waste Water	Pipelines	0.0000	0.0000	0.00
	Facilities	14012.7118	409.0980	2.92
	Distribution Lines	509.6072	4.2168	0.83
	Subtotal	**14522.3190**	**413.3148**	
Natural Gas	Pipelines	4102.1934	0.0000	0.00
	Facilities	402.3145	4.6574	1.16
	Distribution Lines	339.7381	1.4446	0.43
	Subtotal	**4844.2460**	**6.1020**	
Oil Systems	Pipelines	0.0000	0.0000	0.00
	Facilities	0.1150	0.0001	0.09
	Subtotal	**0.1150**	**0.0001**	
Electrical Power	Facilities	15218.7350	594.6146	3.91
	Subtotal	**15218.7350**	**594.6146**	
Communication	Facilities	12.9950	0.7149	5.50
	Subtotal	**12.9950**	**0.7149**	
	Total	**35,869.00**	**1,031.25**	

Appendix A: County Listing for the Region

Fairfield,CT

Hartford,CT

Litchfield,CT

Middlesex,CT

New Haven,CT

New London,CT

Tolland,CT

Windham,CT

Appendix B: Regional Population and Building Value Data

State	County Name	Population	Building Value (millions of dollars)		
			Residential	Non-Residential	Total
Connecticut					
	Fairfield	957,419	138,202	64,140	202,343
	Hartford	899,498	103,349	67,437	170,787
	Litchfield	185,186	28,643	14,484	43,128
	Middlesex	164,245	22,031	10,973	33,004
	New Haven	864,835	92,892	61,159	154,052
	New London	268,555	32,865	18,760	51,625
	Tolland	149,788	19,496	9,789	29,285
	Windham	116,418	12,974	9,028	22,003
Total Region		**3,605,944**	**450,452**	**255,770**	**706,227**

Hazus: Hurricane Global Risk Report

Region Name:	CT_HUR_Prob
Hurricane Scenario:	Probabilistic 10-year Return Period
Print Date:	Tuesday, April 11, 2023

Disclaimer:
Totals only reflect data for those census tracts/blocks included in the user's study region.

The estimates of social and economic impacts contained in this report were produced using Hazus loss estimation methodology software which is based on current scientific and engineering knowledge. There are uncertainties inherent in any loss estimation technique. Therefore, there may be significant differences between the modeled results contained in this report and the actual social and economic losses following a specific Hurricane. These results can be improved by using enhanced inventory data.

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General Description of the Region

Hazus is a regional multi-hazard loss estimation model that was developed by the Federal Emergency Management Agency and the National Institute of Building Sciences. The primary purpose of Hazus is to provide a methodology and software application to develop multi-hazard losses at a regional scale. These loss estimates would be used primarily by local, state and regional officials to plan and stimulate efforts to reduce risks from multi-hazards and to prepare for emergency response and recovery.

The hurricane loss estimates provided in this report are based on a region that includes 8 county(ies) from the following state(s):

- Connecticut

Note:
Appendix A contains a complete listing of the counties contained in the region.

The geographical size of the region is 4,990.78 square miles and contains 878 census tracts. There are over 1,418 thousand households in the region and a total population of 3,605,944 people. The distribution of population by State and County is provided in Appendix B.

There are an estimated 1,150 thousand buildings in the region with a total building replacement value (excluding contents) of 706,231 million dollars. Approximately 87% of the buildings (and 64% of the building value) are associated with residential housing.

Building Inventory

General Building Stock

Hazus estimates that there are 1,150,568 buildings in the region which have an aggregate total replacement valu million. Table 1 presents the relative distribution of the value with respect to the general occupancies. Appendix general distribution of the building value by State and County.

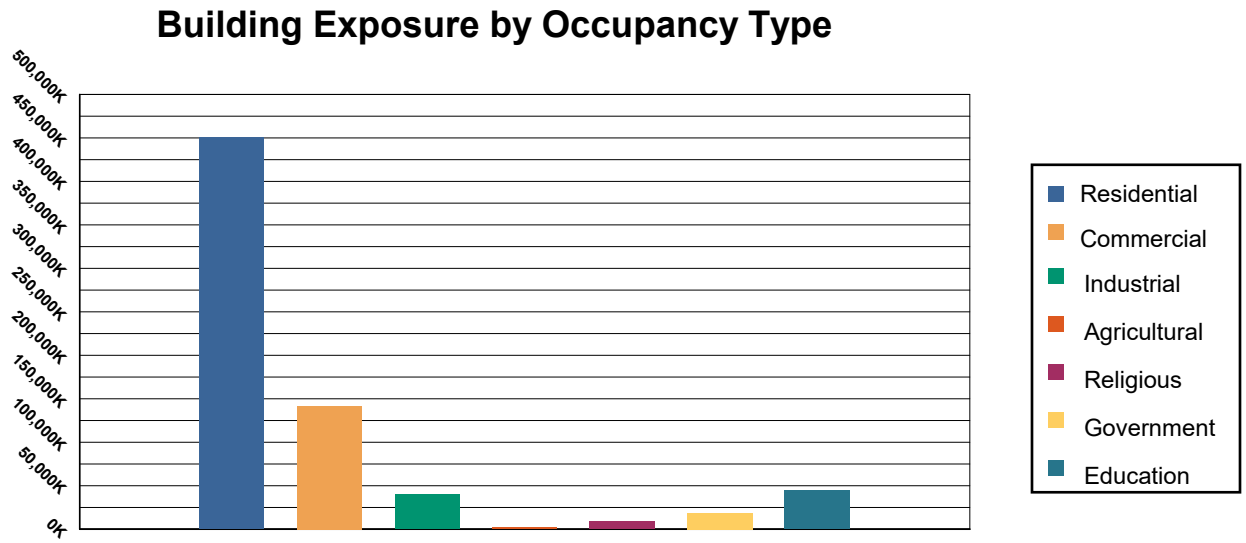


Table 1: Building Exposure by Occupancy Type

Occupancy	Exposure ($1000)	Percent of Tot
Residential	450,456,119	63.78%
Commercial	141,793,008	20.08%
Industrial	39,797,513	5.64%
Agricultural	1,666,239	0.24%
Religious	9,365,213	1.33%
Government	18,574,965	2.63%
Education	44,577,977	6.31%
Total	**706,231,034**	**100.00%**

Essential Facility Inventory

For essential facilities, there are 54 hospitals in the region with a total bed capacity of 10,483 beds. There are 1,350 schools, 569 fire stations, 198 police stations and 174 emergency operation facilities.

Hurricane Scenario

Hazus used the following set of information to define the hurricane parameters for the hurricane loss estimate provided in this report.

Scenario Name:	Probabilistic
Type:	Probabilistic

Building Damage

General Building Stock Damage

Hazus estimates that about 29 buildings will be at least moderately damaged. This is over 0% of the total number of buildings in the region. There are an estimated 0 buildings that will be completely destroyed. The definition of the 'damage states' is provided in the Hazus Hurricane technical manual. Table 2 below summarizes the expected damage by general occupancy for the buildings in the region. Table 3 summarizes the expected damage by general building type.

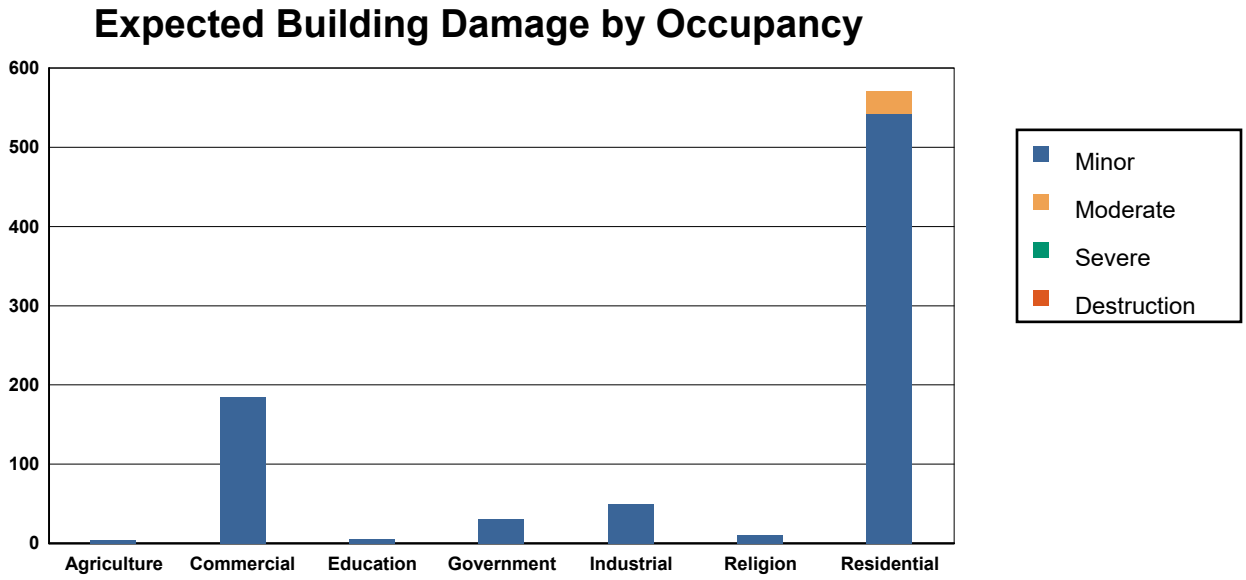


Table 2: Expected Building Damage by Occupancy : 10 - year Event

	None		Minor		Moderate		Severe		Destruction	
Occupancy	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Agriculture	3,154.00	99.87	4.00	0.13	0.00	0.00	0.00	0.00	0.00	0.00
Commercial	100,710.47	99.82	184.45	0.18	0.08	0.00	0.00	0.00	0.00	0.00
Education	2,936.22	99.80	5.78	0.20	0.00	0.00	0.00	0.00	0.00	0.00
Government	14,365.12	99.79	30.88	0.21	0.00	0.00	0.00	0.00	0.00	0.00
Industrial	24,825.69	99.80	49.31	0.20	0.00	0.00	0.00	0.00	0.00	0.00
Religion	6,607.29	99.84	10.70	0.16	0.01	0.00	0.00	0.00	0.00	0.00
Residential	997,112.75	99.94	542.37	0.05	28.85	0.00	0.05	0.00	0.00	0.00
Total	**1,149,711.54**		**827.48**		**28.93**		**0.05**		**0.00**	

Table 3: Expected Building Damage by Building Type : 10 - year Event

Building Type	None		Minor		Moderate		Severe		Destruction	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Concrete	20,498	99.75	51	0.25	0	0.00	0	0.00	0	0.00
Masonry	119,365	99.72	329	0.28	7	0.01	1	0.00	0	0.00
MH	6,044	100.00	0	0.00	0	0.00	0	0.00	0	0.00
Steel	74,259	99.80	152	0.20	0	0.00	0	0.00	0	0.00
Wood	929,305	99.98	153	0.02	20	0.00	0	0.00	0	0.00

Essential Facility Damage

Before the hurricane, the region had 10,483 hospital beds available for use. On the day of the hurricane, the model estimates that 10,483 hospital beds (100%) are available for use by patients already in the hospital and those injured by the hurricane. After one week, 100% of the beds will be in service. By 30 days, 100% will be operational.

Thematic Map of Essential Facilities

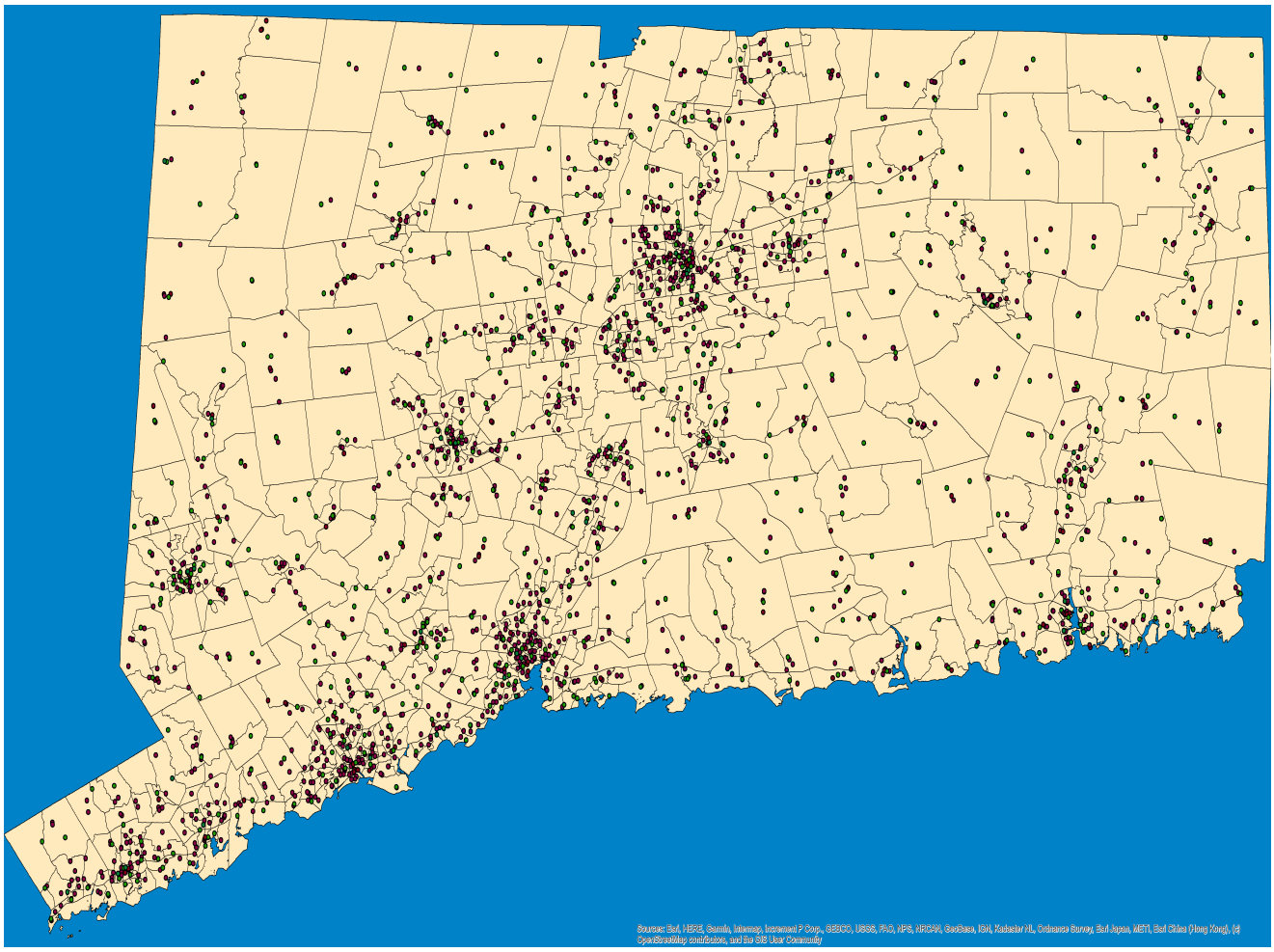
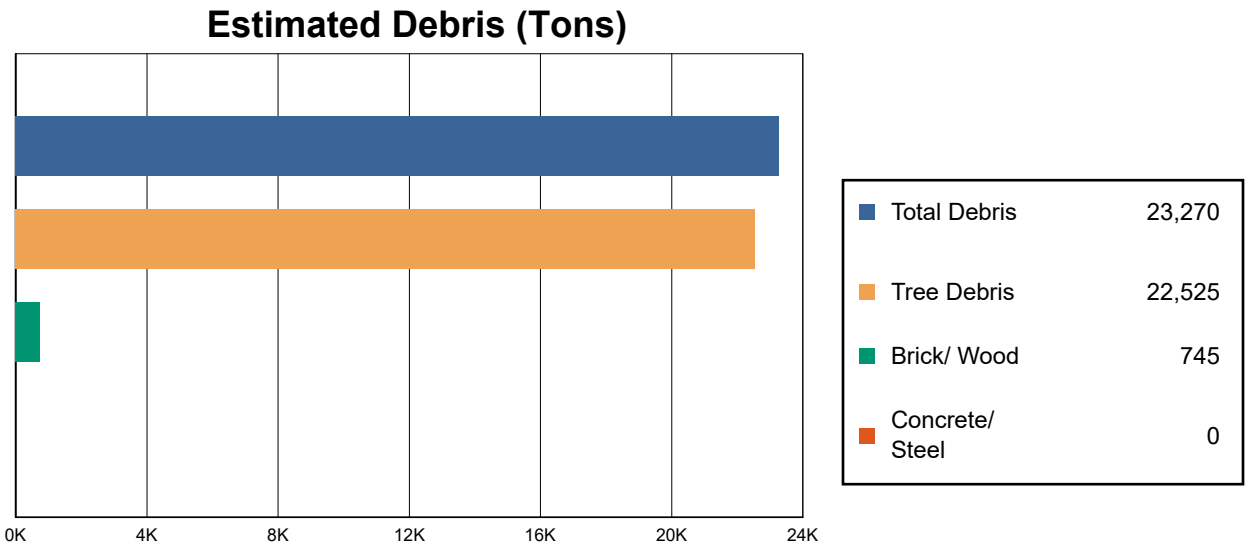


Table 4: Expected Damage to Essential Facilities

Classification	Total	# Facilities		
		Probability of at Least Moderate Damage > 50%	Probability of Complete Damage > 50%	Expected Loss of Use < 1 day
EOCs	174	0	0	174
Fire Stations	569	0	0	569
Hospitals	54	0	0	54
Police Stations	198	0	0	198
Schools	1,350	0	0	1,350

Induced Hurricane Damage

Debris Generation

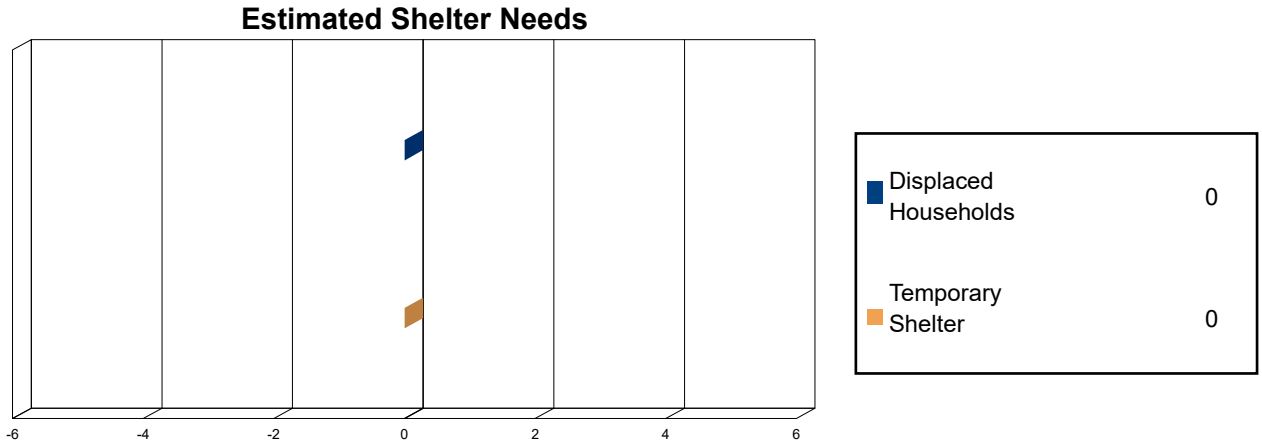


Hazus estimates the amount of debris that will be generated by the hurricane. The model breaks the debris into four general categories: a) Brick/Wood, b) Reinforced Concrete/Steel, c) Eligible Tree Debris, and d) Other Tree Debris. This distinction is made because of the different types of material handling equipment required to handle the debris.

The model estimates that a total of 23,270 tons of debris will be generated. Of the total amount, 17,597 tons (76%) is Other Tree Debris. Of the remaining 5,673 tons, Brick/Wood comprises 13% of the total, Reinforced Concrete/Steel comprises of 0% of the total, with the remainder being Eligible Tree Debris. If the building debris tonnage is converted to an estimated number of truckloads, it will require 30 truckloads (@25 tons/truck) to remove the building debris generated by the hurricane. The number of Eligible Tree Debris truckloads will depend on how the 4,928 tons of Eligible Tree Debris are collected and processed. The volume of tree debris generally ranges from about 4 cubic yards per ton for chipped or compacted tree debris to about 10 cubic yards per ton for bulkier, uncompacted debris.

Social Impact

Shelter Requirement



Hazus estimates the number of households that are expected to be displaced from their homes due to the hurricane and the number of displaced people that will require accommodations in temporary public shelters. The model estimates 0 households to be displaced due to the hurricane. Of these, 0 people (out of a total population of 3,605,944) will seek temporary shelter in public shelters.

Economic Loss

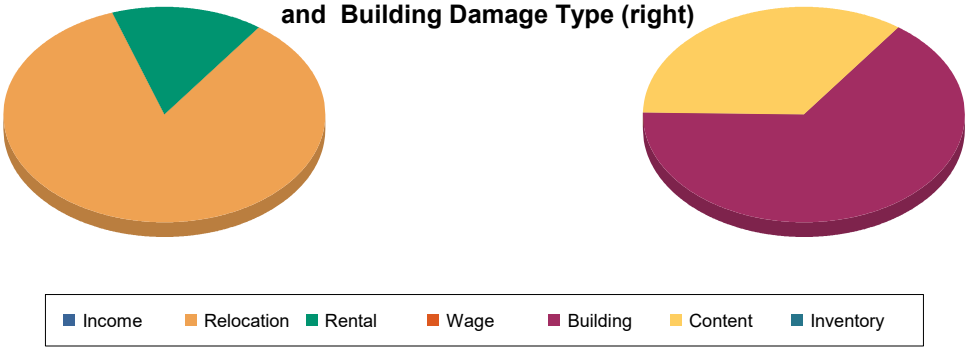
The total economic loss estimated for the hurricane is 28.5 million dollars, which represents 0.00 % of the total replacement value of the region's buildings.

Building-Related Losses

The building related losses are broken into two categories: direct property damage losses and business interruption losses. The direct property damage losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the hurricane. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the hurricane.

The total property damage losses were 28 million dollars. 0% of the estimated losses were related to the business interruption of the region. By far, the largest loss was sustained by the residential occupancies which made up over 99% of the total loss. Table 5 below provides a summary of the losses associated with the building damage.

Loss by Business Interruption Type (left) and Building Damage Type (right)



Loss Type by General Occupancy

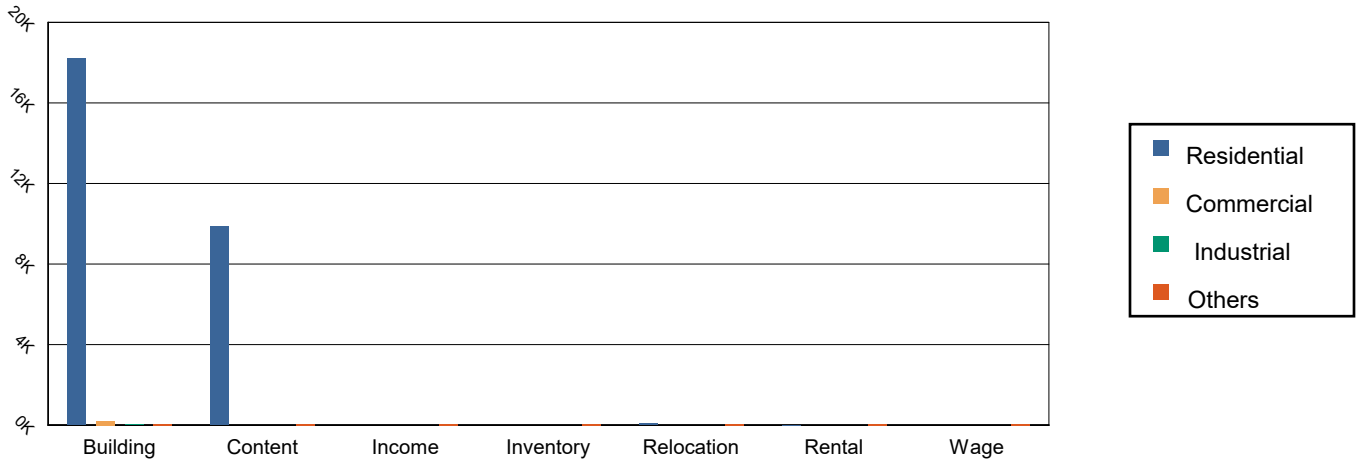


Table 5: Building-Related Economic Loss Estimates

(Thousands of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Property Damage						
	Building	18,216.67	205.44	36.04	60.09	18,518.24
	Content	9,861.38	0.00	0.00	0.00	9,861.38
	Inventory	0.00	0.00	0.00	0.00	0.00
	Subtotal	**28,078.05**	**205.44**	**36.04**	**60.09**	**28,379.62**
Business Interruption Loss						
	Income	0.00	0.00	0.00	0.00	0.00
	Relocation	83.45	0.58	0.00	0.05	84.08
	Rental	15.13	0.00	0.00	0.00	15.13
	Wage	0.00	0.00	0.00	0.00	0.00
	Subtotal	**98.58**	**0.58**	**0.00**	**0.05**	**99.21**

Total

Total	**28,176.63**	**206.03**	**36.04**	**60.14**	**28,478.83**

Appendix A: County Listing for the Region

Connecticut

- Fairfield
- Hartford
- Litchfield
- Middlesex
- New Haven
- New London
- Tolland
- Windham

Appendix B: Regional Population and Building Value Data

		Building Value (thousands of dollars)		
	Population	Residential	Non-Residential	Total
Connecticut				
Fairfield	957,419	138,202,527	64,140,539	202,343,066
Hartford	899,498	103,349,824	67,437,454	170,787,278
Litchfield	185,186	28,643,320	14,484,815	43,128,135
Middlesex	164,245	22,031,593	10,973,115	33,004,708
New Haven	864,835	92,892,604	61,159,705	154,052,309
New London	268,555	32,865,080	18,760,781	51,625,861
Tolland	149,788	19,496,288	9,789,702	29,285,990
Windham	116,418	12,974,883	9,028,804	22,003,687
Total	**3,605,944**	**450,456,119**	**255,774,915**	**706,231,034**
Study Region Total	**3,605,944**	**450,456,119**	**255,774,915**	**706,231,034**

Hazus: Hurricane Global Risk Report

Region Name:	CT_HUR_Prob
Hurricane Scenario:	Probabilistic 20-year Return Period
Print Date:	Tuesday, April 11, 2023

Disclaimer:
Totals only reflect data for those census tracts/blocks included in the user's study region.

The estimates of social and economic impacts contained in this report were produced using Hazus loss estimation methodology software which is based on current scientific and engineering knowledge. There are uncertainties inherent in any loss estimation technique. Therefore, there may be significant differences between the modeled results contained in this report and the actual social and economic losses following a specific Hurricane. These results can be improved by using enhanced inventory data.

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General Description of the Region

Hazus is a regional multi-hazard loss estimation model that was developed by the Federal Emergency Management Agency and the National Institute of Building Sciences. The primary purpose of Hazus is to provide a methodology and software application to develop multi-hazard losses at a regional scale. These loss estimates would be used primarily by local, state and regional officials to plan and stimulate efforts to reduce risks from multi-hazards and to prepare for emergency response and recovery.

The hurricane loss estimates provided in this report are based on a region that includes 8 county(ies) from the following state(s):

- Connecticut

Note:
Appendix A contains a complete listing of the counties contained in the region.

The geographical size of the region is 4,990.78 square miles and contains 878 census tracts. There are over 1,418 thousand households in the region and a total population of 3,605,944 people. The distribution of population by State and County is provided in Appendix B.

There are an estimated 1,150 thousand buildings in the region with a total building replacement value (excluding contents) of 706,231 million dollars. Approximately 87% of the buildings (and 64% of the building value) are associated with residential housing.

Building Inventory

General Building Stock

Hazus estimates that there are 1,150,568 buildings in the region which have an aggregate total replacement valu million. Table 1 presents the relative distribution of the value with respect to the general occupancies. Appendix general distribution of the building value by State and County.

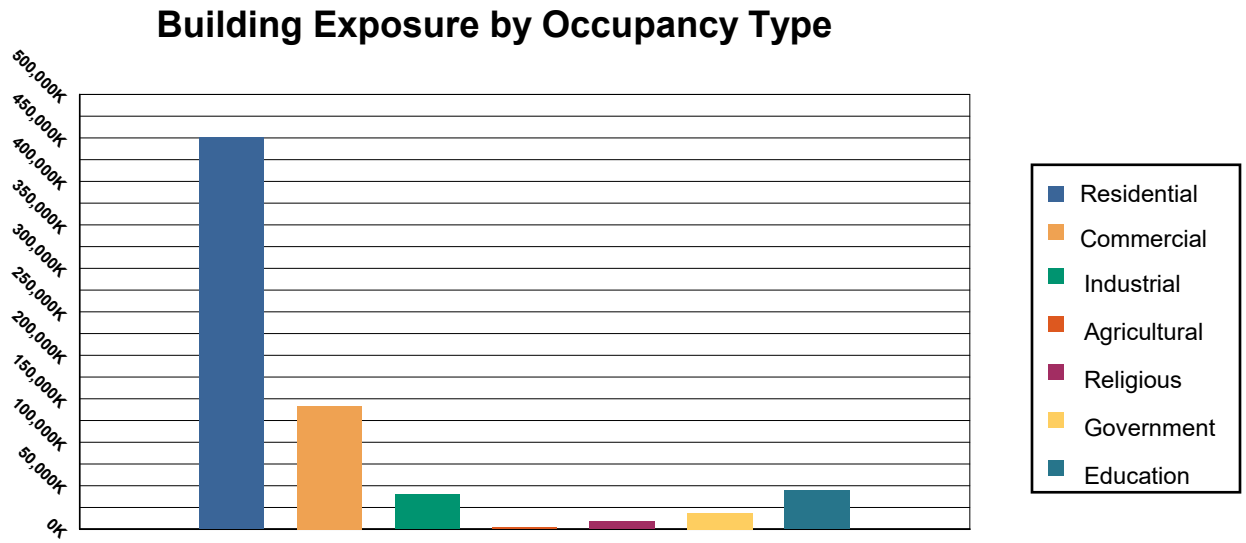


Table 1: Building Exposure by Occupancy Type

Occupancy	Exposure ($1000)	Percent of Tot
Residential	450,456,119	63.78%
Commercial	141,793,008	20.08%
Industrial	39,797,513	5.64%
Agricultural	1,666,239	0.24%
Religious	9,365,213	1.33%
Government	18,574,965	2.63%
Education	44,577,977	6.31%
Total	**706,231,034**	**100.00%**

Essential Facility Inventory

For essential facilities, there are 54 hospitals in the region with a total bed capacity of 10,483 beds. There are 1,350 schools, 569 fire stations, 198 police stations and 174 emergency operation facilities.

Hurricane Scenario

Hazus used the following set of information to define the hurricane parameters for the hurricane loss estimate provided in this report.

Scenario Name:	Probabilistic
Type:	Probabilistic

Building Damage

General Building Stock Damage

Hazus estimates that about 223 buildings will be at least moderately damaged. This is over 0% of the total number of buildings in the region. There are an estimated 0 buildings that will be completely destroyed. The definition of the 'damage states' is provided in the Hazus Hurricane technical manual. Table 2 below summarizes the expected damage by general occupancy for the buildings in the region. Table 3 summarizes the expected damage by general building type.

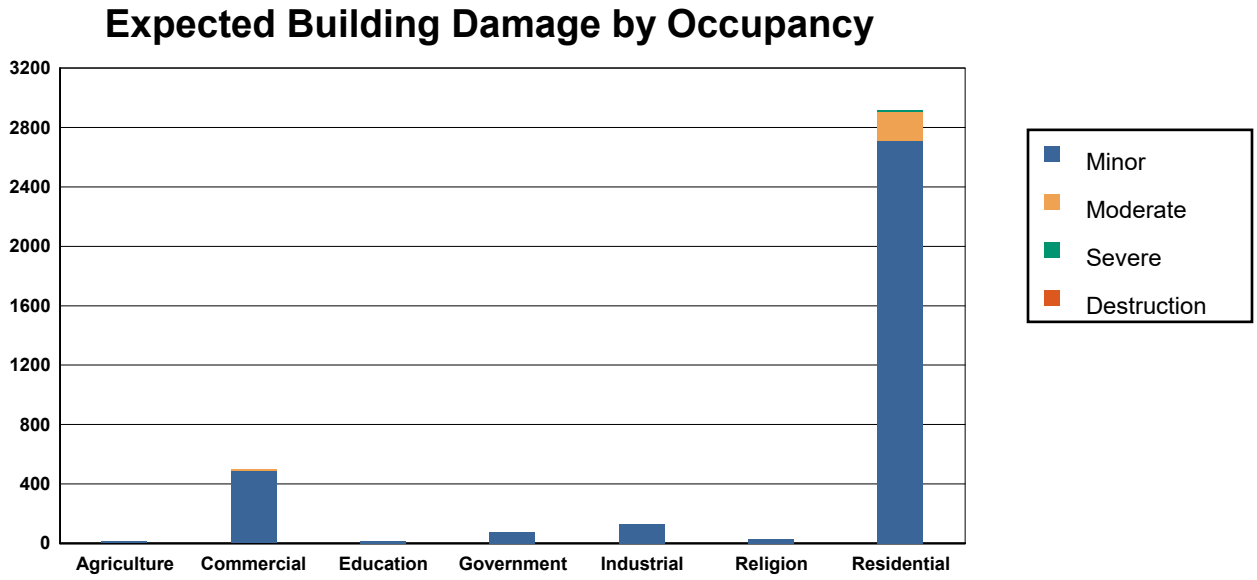


Table 2: Expected Building Damage by Occupancy : 20 - year Event

	None		Minor		Moderate		Severe		Destruction	
Occupancy	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Agriculture	3,145.89	99.62	11.78	0.37	0.30	0.01	0.02	0.00	0.00	0.00
Commercial	100,398.33	99.51	483.46	0.48	13.21	0.01	0.00	0.00	0.00	0.00
Education	2,927.43	99.50	14.57	0.50	0.00	0.00	0.00	0.00	0.00	0.00
Government	14,320.78	99.48	75.22	0.52	0.00	0.00	0.00	0.00	0.00	0.00
Industrial	24,744.50	99.48	129.93	0.52	0.52	0.00	0.05	0.00	0.00	0.00
Religion	6,590.44	99.58	26.93	0.41	0.63	0.01	0.00	0.00	0.00	0.00
Residential	994,766.04	99.71	2,709.99	0.27	195.42	0.02	12.54	0.00	0.00	0.00
Total	**1,146,893.40**		**3,451.88**		**210.09**		**12.61**		**0.00**	

Table 3: Expected Building Damage by Building Type : 20 - year Event

Building Type	None		Minor		Moderate		Severe		Destruction	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Concrete	20,416	99.35	133	0.65	0	0.00	0	0.00	0	0.00
Masonry	118,591	99.07	1,028	0.86	78	0.07	4	0.00	0	0.00
MH	6,044	100.00	0	0.00	0	0.00	0	0.00	0	0.00
Steel	74,020	99.47	384	0.52	7	0.01	0	0.00	0	0.00
Wood	928,030	99.84	1,377	0.15	64	0.01	7	0.00	0	0.00

Essential Facility Damage

Before the hurricane, the region had 10,483 hospital beds available for use. On the day of the hurricane, the model estimates that 10,483 hospital beds (100%) are available for use by patients already in the hospital and those injured by the hurricane. After one week, 100% of the beds will be in service. By 30 days, 100% will be operational.

Thematic Map of Essential Facilities

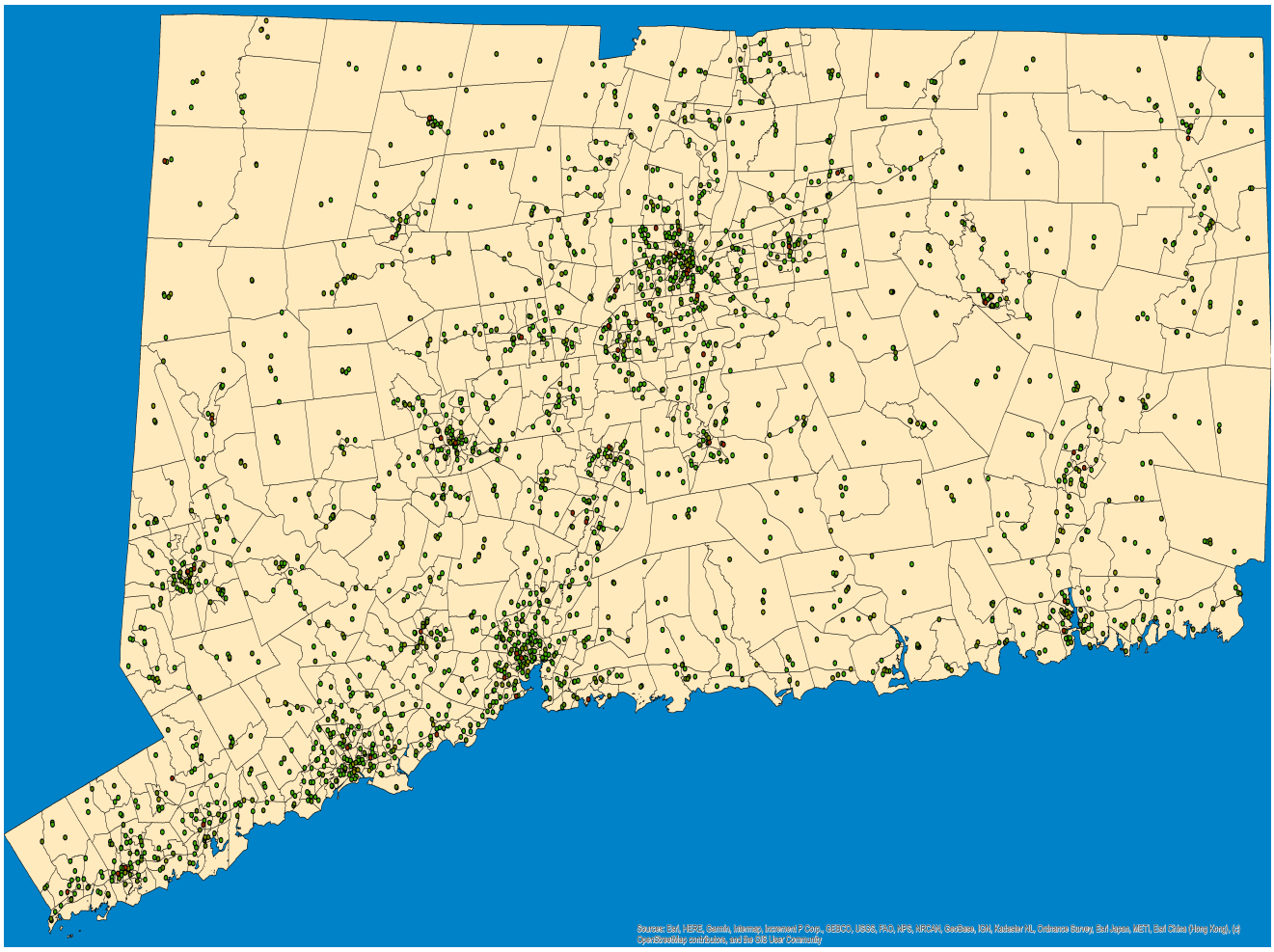
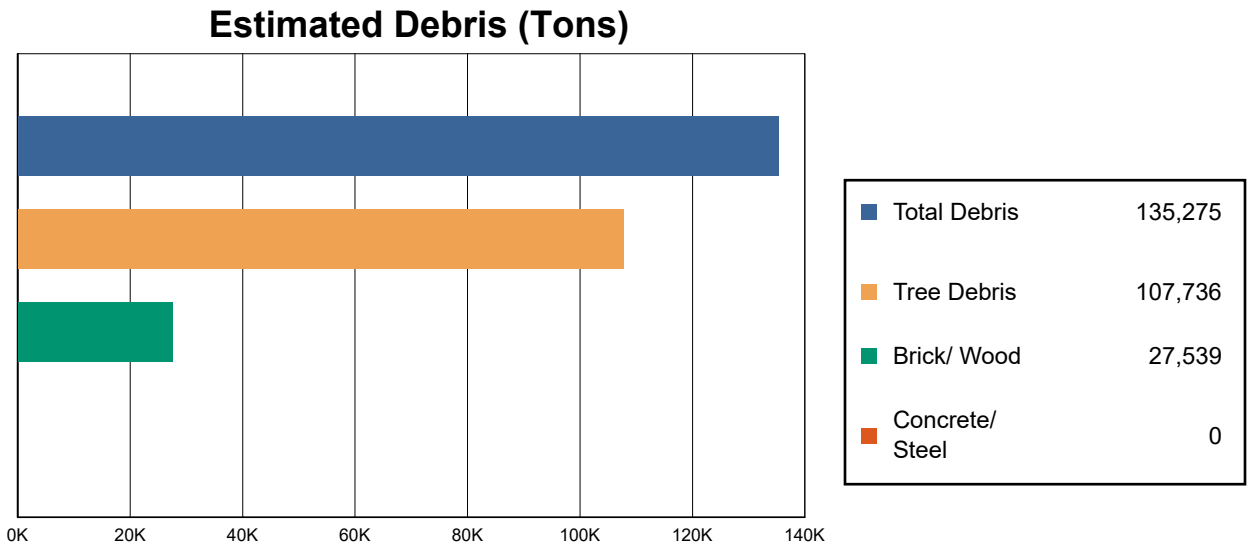


Table 4: Expected Damage to Essential Facilities

		# Facilities		
Classification	Total	Probability of at Least Moderate Damage > 50%	Probability of Complete Damage > 50%	Expected Loss of Use < 1 day
EOCs	174	0	0	174
Fire Stations	569	0	0	569
Hospitals	54	0	0	54
Police Stations	198	0	0	198
Schools	1,350	0	0	1,350

Induced Hurricane Damage

Debris Generation

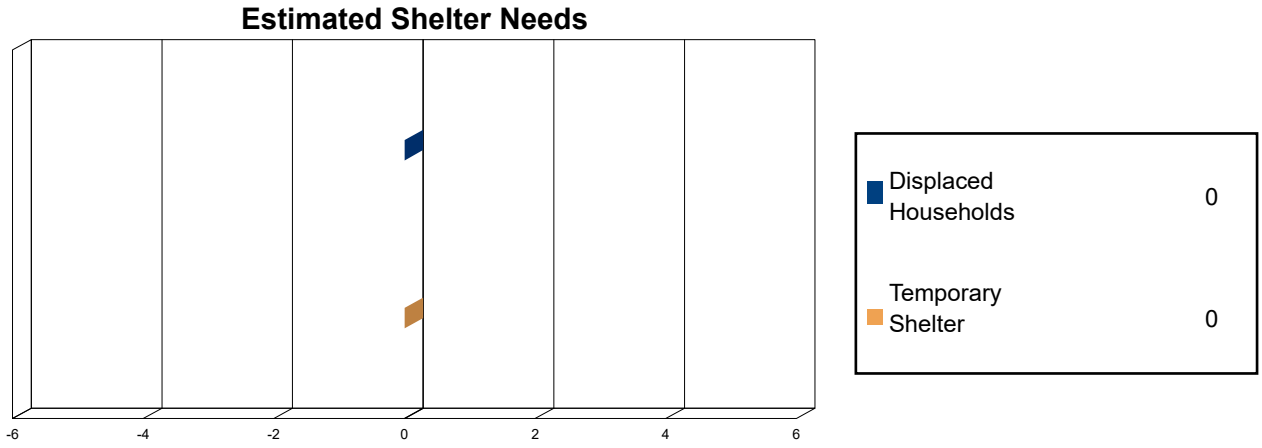


Hazus estimates the amount of debris that will be generated by the hurricane. The model breaks the debris into four general categories: a) Brick/Wood, b) Reinforced Concrete/Steel, c) Eligible Tree Debris, and d) Other Tree Debris. This distinction is made because of the different types of material handling equipment required to handle the debris.

The model estimates that a total of 135,275 tons of debris will be generated. Of the total amount, 79,640 tons (59%) is Other Tree Debris. Of the remaining 55,635 tons, Brick/Wood comprises 49% of the total, Reinforced Concrete/Steel comprises of 0% of the total, with the remainder being Eligible Tree Debris. If the building debris tonnage is converted to an estimated number of truckloads, it will require 1102 truckloads (@25 tons/truck) to remove the building debris generated by the hurricane. The number of Eligible Tree Debris truckloads will depend on how the 28,096 tons of Eligible Tree Debris are collected and processed. The volume of tree debris generally ranges from about 4 cubic yards per ton for chipped or compacted tree debris to about 10 cubic yards per ton for bulkier, uncompacted debris.

Social Impact

Shelter Requirement



Hazus estimates the number of households that are expected to be displaced from their homes due to the hurricane and the number of displaced people that will require accommodations in temporary public shelters. The model estimates 0 households to be displaced due to the hurricane. Of these, 0 people (out of a total population of 3,605,944) will seek temporary shelter in public shelters.

Economic Loss

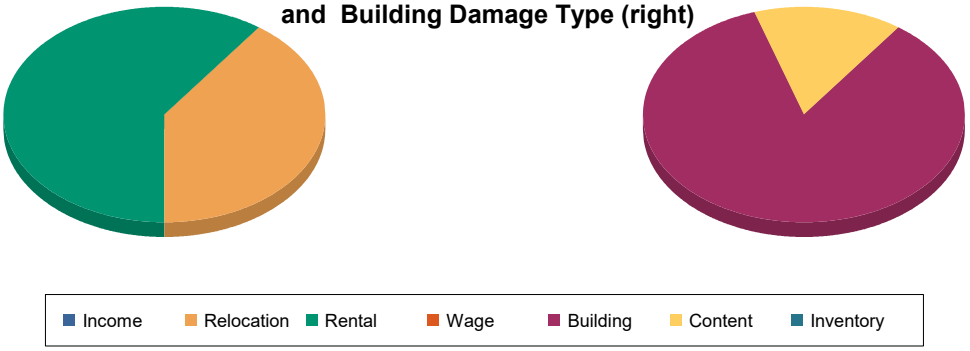
The total economic loss estimated for the hurricane is 460.6 million dollars, which represents 0.07 % of the total replacement value of the region's buildings.

Building-Related Losses

The building related losses are broken into two categories: direct property damage losses and business interruption losses. The direct property damage losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the hurricane. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the hurricane.

The total property damage losses were 461 million dollars. 2% of the estimated losses were related to the business interruption of the region. By far, the largest loss was sustained by the residential occupancies which made up over 93% of the total loss. Table 5 below provides a summary of the losses associated with the building damage.

Loss by Business Interruption Type (left) and Building Damage Type (right)



Loss Type by General Occupancy

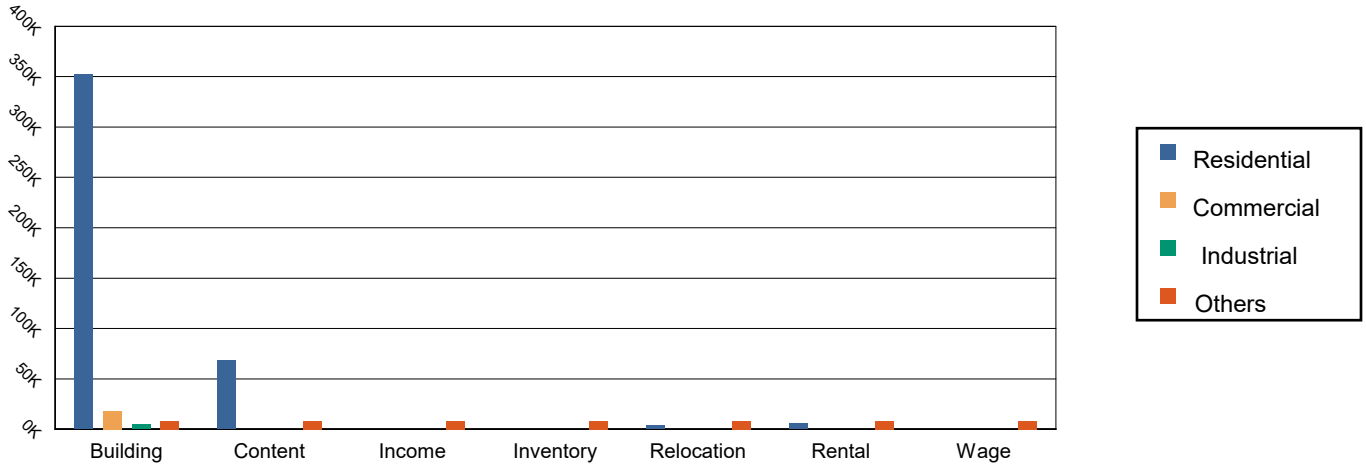


Table 5: Building-Related Economic Loss Estimates

(Thousands of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Property Damage						
	Building	352,365.75	18,034.38	4,481.43	8,332.42	383,213.98
	Content	68,295.96	0.00	0.00	0.00	68,295.96
	Inventory	0.00	0.00	0.00	0.00	0.00
	Subtotal	**420,661.71**	**18,034.38**	**4,481.43**	**8,332.42**	**451,509.94**
Business Interruption Loss						
	Income	0.00	0.00	0.00	0.00	0.00
	Relocation	3,502.65	127.71	2.13	6.05	3,638.54
	Rental	5,433.79	0.00	0.00	0.00	5,433.79
	Wage	0.00	0.00	0.00	0.00	0.00
	Subtotal	**8,936.43**	**127.71**	**2.13**	**6.05**	**9,072.32**

Total

Total	**429,598.14**	**18,162.09**	**4,483.56**	**8,338.47**	**460,582.26**

Appendix A: County Listing for the Region

Connecticut

- Fairfield
- Hartford
- Litchfield
- Middlesex
- New Haven
- New London
- Tolland
- Windham

Appendix B: Regional Population and Building Value Data

		Building Value (thousands of dollars)		
	Population	Residential	Non-Residential	Total
Connecticut				
Fairfield	957,419	138,202,527	64,140,539	202,343,066
Hartford	899,498	103,349,824	67,437,454	170,787,278
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Study Region Total	**3,605,944**	**450,456,119**	**255,774,915**	**706,231,034**

Hazus: Hurricane Global Risk Report

Region Name: CT_HUR_Prob

Hurricane Scenario: Probabilistic 50-year Return Period

Print Date: Tuesday, April 11, 2023

Disclaimer:

Totals only reflect data for those census tracts/blocks included in the user's study region.

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General Description of the Region

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The hurricane loss estimates provided in this report are based on a region that includes 8 county(ies) from the following state(s):

- Connecticut

Note:
Appendix A contains a complete listing of the counties contained in the region.

The geographical size of the region is 4,990.78 square miles and contains 878 census tracts. There are over 1,418 thousand households in the region and a total population of 3,605,944 people. The distribution of population by State and County is provided in Appendix B.

There are an estimated 1,150 thousand buildings in the region with a total building replacement value (excluding contents) of 706,231 million dollars. Approximately 87% of the buildings (and 64% of the building value) are associated with residential housing.

Building Inventory

General Building Stock

Hazus estimates that there are 1,150,568 buildings in the region which have an aggregate total replacement valu million. Table 1 presents the relative distribution of the value with respect to the general occupancies. Appendix general distribution of the building value by State and County.

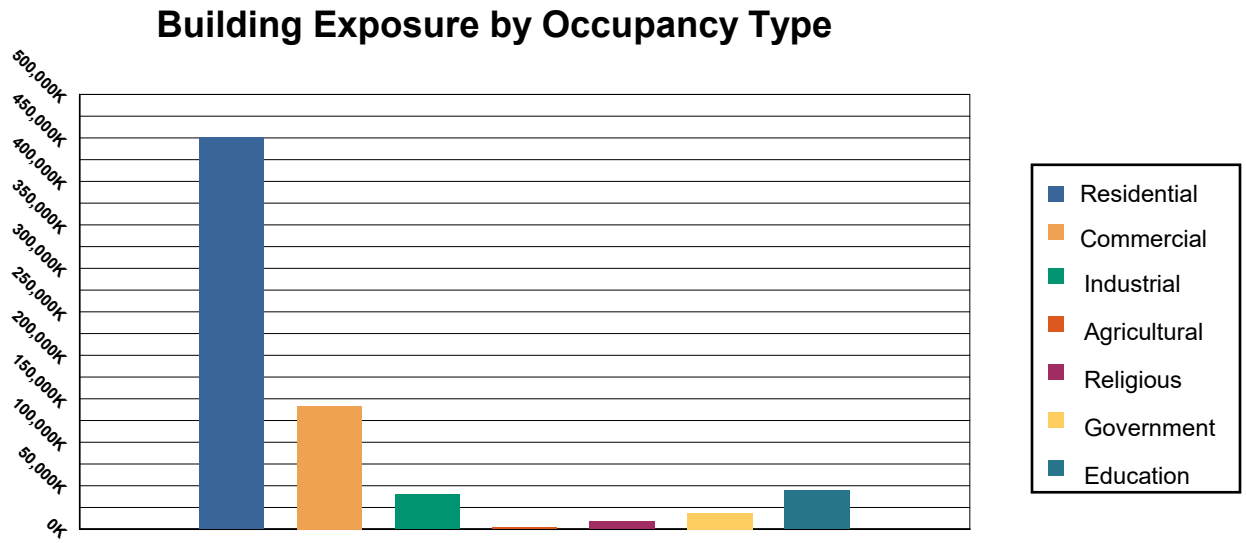


Table 1: Building Exposure by Occupancy Type

Occupancy	Exposure ($1000)	Percent of Tot
Residential	450,456,119	63.78%
Commercial	141,793,008	20.08%
Industrial	39,797,513	5.64%
Agricultural	1,666,239	0.24%
Religious	9,365,213	1.33%
Government	18,574,965	2.63%
Education	44,577,977	6.31%
Total	**706,231,034**	**100.00%**

Essential Facility Inventory

For essential facilities, there are 54 hospitals in the region with a total bed capacity of 10,483 beds. There are 1,350 schools, 569 fire stations, 198 police stations and 174 emergency operation facilities.

Hurricane Scenario

Hazus used the following set of information to define the hurricane parameters for the hurricane loss estimate provided in this report.

Scenario Name:	Probabilistic
Type:	Probabilistic

Building Damage

General Building Stock Damage

Hazus estimates that about 7,674 buildings will be at least moderately damaged. This is over 1% of the total number of buildings in the region. There are an estimated 172 buildings that will be completely destroyed. The definition of the 'damage states' is provided in the Hazus Hurricane technical manual. Table 2 below summarizes the expected damage by general occupancy for the buildings in the region. Table 3 summarizes the expected damage by general building type.

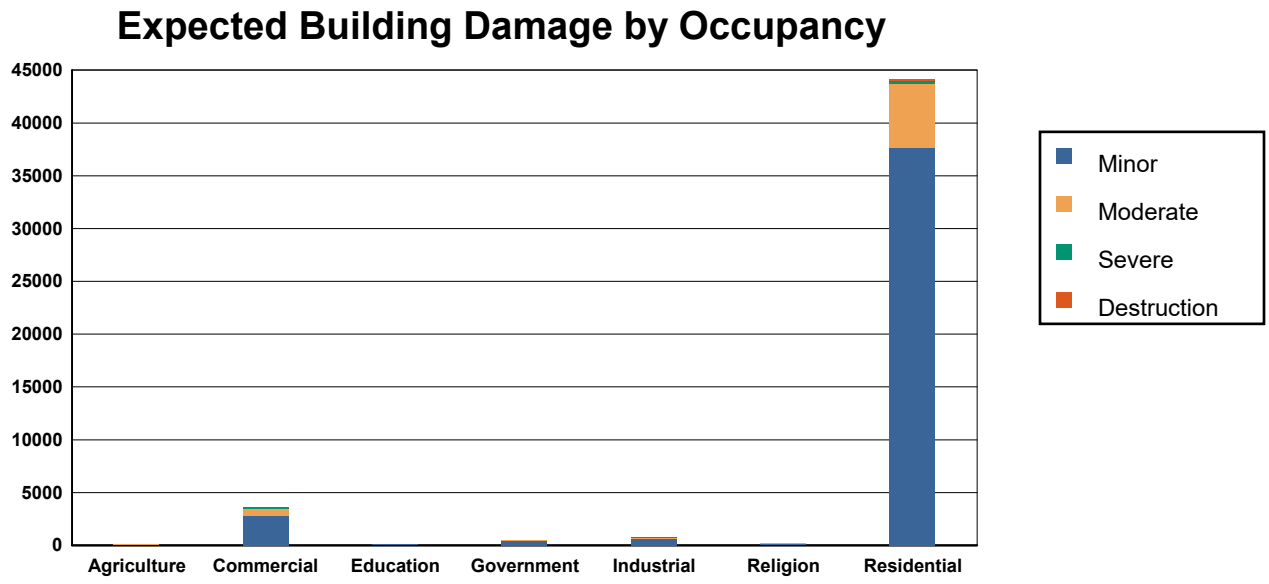


Table 2: Expected Building Damage by Occupancy : 50 - year Event

	None		Minor		Moderate		Severe		Destruction	
Occupancy	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Agriculture	3,039.72	96.25	89.43	2.83	19.26	0.61	8.67	0.27	0.92	0.03
Commercial	97,230.47	96.37	2,766.13	2.74	747.58	0.74	149.96	0.15	0.87	0.00
Education	2,853.35	96.99	75.89	2.58	11.70	0.40	1.06	0.04	0.00	0.00
Government	13,940.54	96.84	391.11	2.72	59.05	0.41	5.29	0.04	0.00	0.00
Industrial	24,149.04	97.08	593.91	2.39	107.10	0.43	23.57	0.09	1.38	0.01
Religion	6,399.39	96.70	188.55	2.85	27.43	0.41	2.63	0.04	0.00	0.00
Residential	953,534.98	95.57	37,641.40	3.77	6,036.72	0.61	302.02	0.03	168.88	0.02
Total	**1,101,147.49**		**41,746.44**		**7,008.83**		**493.21**		**172.05**	

Table 3: Expected Building Damage by Building Type : 50 - year Event

Building Type	None		Minor		Moderate		Severe		Destruction	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Concrete	19,798	96.34	617	3.00	126	0.61	9	0.04	0	0.00
Masonry	113,570	94.88	4,429	3.70	1,606	1.34	90	0.07	7	0.01
MH	5,853	96.84	117	1.94	53	0.88	2	0.03	19	0.31
Steel	71,880	96.60	1,848	2.48	552	0.74	130	0.17	1	0.00
Wood	892,269	96.00	33,342	3.59	3,461	0.37	256	0.03	150	0.02

Essential Facility Damage

Before the hurricane, the region had 10,483 hospital beds available for use. On the day of the hurricane, the model estimates that 10,483 hospital beds (100%) are available for use by patients already in the hospital and those injured by the hurricane. After one week, 100% of the beds will be in service. By 30 days, 100% will be operational.

Thematic Map of Essential Facilities

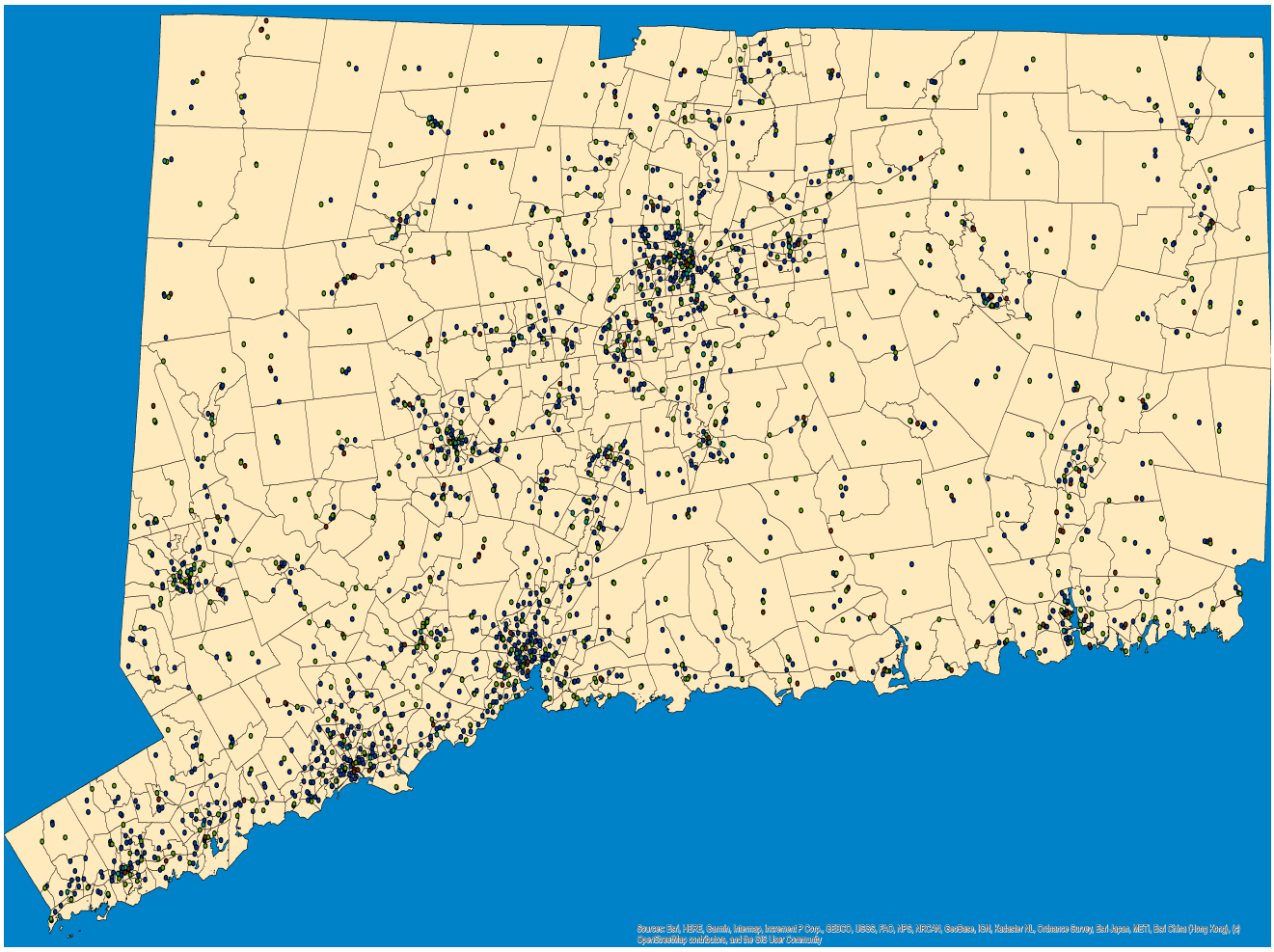
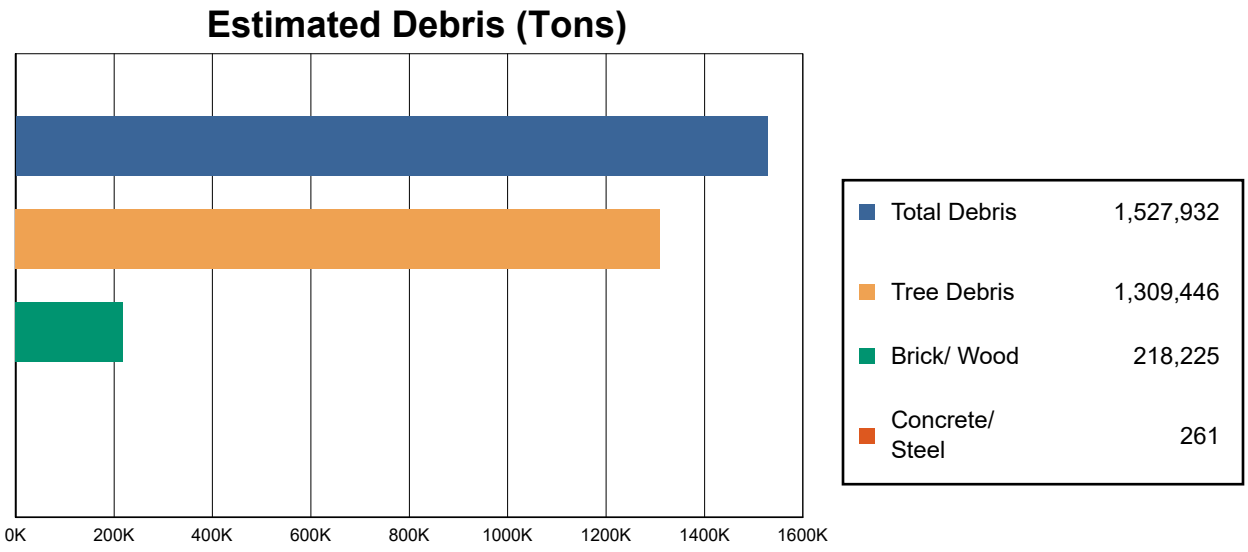


Table 4: Expected Damage to Essential Facilities

		# Facilities		
Classification	Total	Probability of at Least Moderate Damage > 50%	Probability of Complete Damage > 50%	Expected Loss of Use < 1 day
EOCs	174	0	0	174
Fire Stations	569	0	0	569
Hospitals	54	0	0	54
Police Stations	198	0	0	198
Schools	1,350	0	0	1,282

Induced Hurricane Damage

Debris Generation

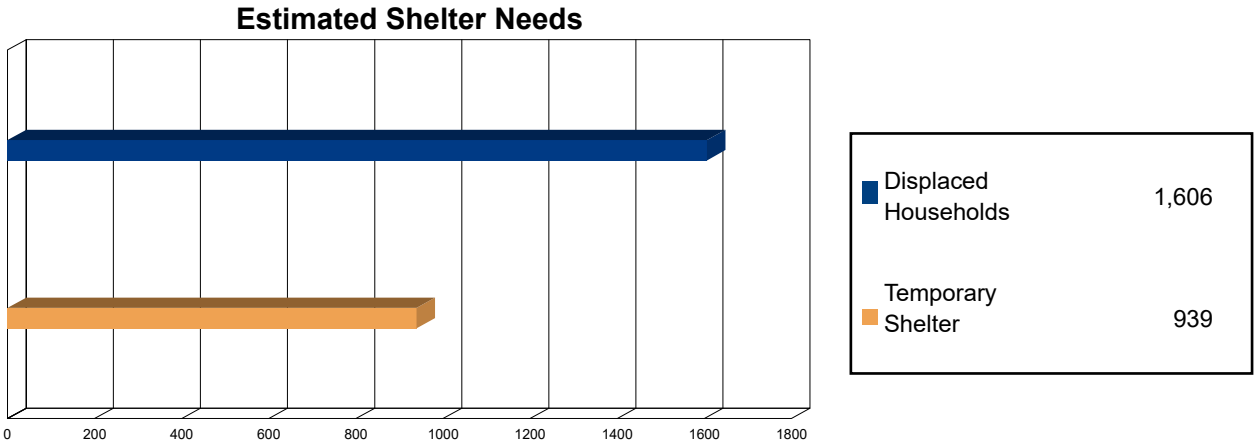


Hazus estimates the amount of debris that will be generated by the hurricane. The model breaks the debris into four general categories: a) Brick/Wood, b) Reinforced Concrete/Steel, c) Eligible Tree Debris, and d) Other Tree Debris. This distinction is made because of the different types of material handling equipment required to handle the debris.

The model estimates that a total of 1,527,932 tons of debris will be generated. Of the total amount, 996,625 tons (65%) is Other Tree Debris. Of the remaining 531,307 tons, Brick/Wood comprises 41% of the total, Reinforced Concrete/Steel comprises of 0% of the total, with the remainder being Eligible Tree Debris. If the building debris tonnage is converted to an estimated number of truckloads, it will require 8739 truckloads (@25 tons/truck) to remove the building debris generated by the hurricane. The number of Eligible Tree Debris truckloads will depend on how the 312,821 tons of Eligible Tree Debris are collected and processed. The volume of tree debris generally ranges from about 4 cubic yards per ton for chipped or compacted tree debris to about 10 cubic yards per ton for bulkier, uncompacted debris.

Social Impact

Shelter Requirement



Hazus estimates the number of households that are expected to be displaced from their homes due to the hurricane and the number of displaced people that will require accommodations in temporary public shelters. The model estimates 1,606 households to be displaced due to the hurricane. Of these, 939 people (out of a total population of 3,605,944) will seek temporary shelter in public shelters.

Economic Loss

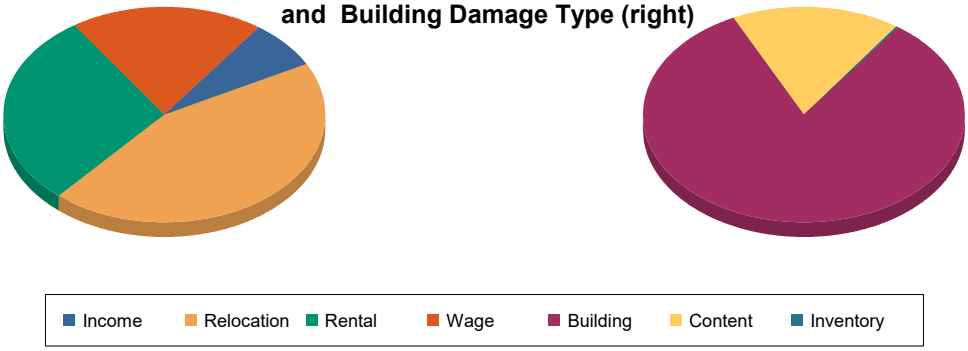
The total economic loss estimated for the hurricane is 2901.2 million dollars, which represents 0.41 % of the total replacement value of the region's buildings.

Building-Related Losses

The building related losses are broken into two categories: direct property damage losses and business interruption losses. The direct property damage losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the hurricane. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the hurricane.

The total property damage losses were 2,901 million dollars. 9% of the estimated losses were related to the business interruption of the region. By far, the largest loss was sustained by the residential occupancies which made up over 84% of the total loss. Table 5 below provides a summary of the losses associated with the building damage.

Loss by Business Interruption Type (left) and Building Damage Type (right)



Loss Type by General Occupancy

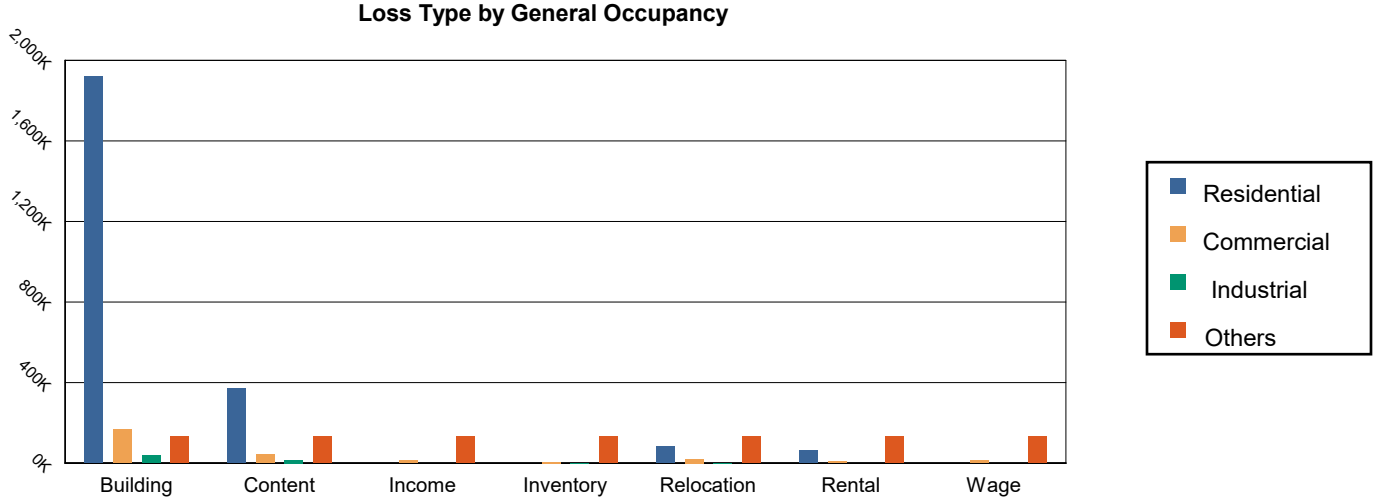


Table 5: Building-Related Economic Loss Estimates

(Thousands of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Property Damage						
	Building	1,920,155.18	167,647.35	37,292.44	65,956.83	2,191,051.81
	Content	369,559.48	42,557.01	16,531.77	14,223.23	442,871.49
	Inventory	0.00	7,414.26	2,078.22	992.07	10,484.56
	Subtotal	**2,289,714.66**	**217,618.62**	**55,902.43**	**81,172.13**	**2,644,407.85**
Business Interruption Loss						
	Income	6.98	13,383.72	299.48	4,780.55	18,470.74
	Relocation	82,257.62	20,744.31	1,731.97	8,749.71	113,483.61
	Rental	63,639.86	9,992.39	249.16	1,016.08	74,897.50
	Wage	16.45	13,399.39	489.55	36,052.14	49,957.53
	Subtotal	**145,920.92**	**57,519.81**	**2,770.17**	**50,598.48**	**256,809.38**

Total

Total	**2,435,635.58**	**275,138.44**	**58,672.61**	**131,770.61**	**2,901,217.23**

Appendix A: County Listing for the Region

Connecticut

- Fairfield
- Hartford
- Litchfield
- Middlesex
- New Haven
- New London
- Tolland
- Windham

Appendix B: Regional Population and Building Value Data

		Building Value (thousands of dollars)		
	Population	Residential	Non-Residential	Total
Connecticut				
Fairfield	957,419	138,202,527	64,140,539	202,343,066
Hartford	899,498	103,349,824	67,437,454	170,787,278
Litchfield	185,186	28,643,320	14,484,815	43,128,135
Middlesex	164,245	22,031,593	10,973,115	33,004,708
New Haven	864,835	92,892,604	61,159,705	154,052,309
New London	268,555	32,865,080	18,760,781	51,625,861
Tolland	149,788	19,496,288	9,789,702	29,285,990
Windham	116,418	12,974,883	9,028,804	22,003,687
Total	**3,605,944**	**450,456,119**	**255,774,915**	**706,231,034**
Study Region Total	**3,605,944**	**450,456,119**	**255,774,915**	**706,231,034**

Hazus: Hurricane Global Risk Report

Region Name: CT_HUR_Prob

Hurricane Scenario: Probabilistic 100-year Return Period

Print Date: Tuesday, April 11, 2023

Disclaimer:
Totals only reflect data for those census tracts/blocks included in the user's study region.

The estimates of social and economic impacts contained in this report were produced using Hazus loss estimation methodology software which is based on current scientific and engineering knowledge. There are uncertainties inherent in any loss estimation technique. Therefore, there may be significant differences between the modeled results contained in this report and the actual social and economic losses following a specific Hurricane. These results can be improved by using enhanced inventory data.

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General Description of the Region

Hazus is a regional multi-hazard loss estimation model that was developed by the Federal Emergency Management Agency and the National Institute of Building Sciences. The primary purpose of Hazus is to provide a methodology and software application to develop multi-hazard losses at a regional scale. These loss estimates would be used primarily by local, state and regional officials to plan and stimulate efforts to reduce risks from multi-hazards and to prepare for emergency response and recovery.

The hurricane loss estimates provided in this report are based on a region that includes 8 county(ies) from the following state(s):

- Connecticut

Note:
Appendix A contains a complete listing of the counties contained in the region.

The geographical size of the region is 4,990.78 square miles and contains 878 census tracts. There are over 1,418 thousand households in the region and a total population of 3,605,944 people. The distribution of population by State and County is provided in Appendix B.

There are an estimated 1,150 thousand buildings in the region with a total building replacement value (excluding contents) of 706,231 million dollars. Approximately 87% of the buildings (and 64% of the building value) are associated with residential housing.

Building Inventory

General Building Stock

Hazus estimates that there are 1,150,568 buildings in the region which have an aggregate total replacement valu million. Table 1 presents the relative distribution of the value with respect to the general occupancies. Appendix general distribution of the building value by State and County.

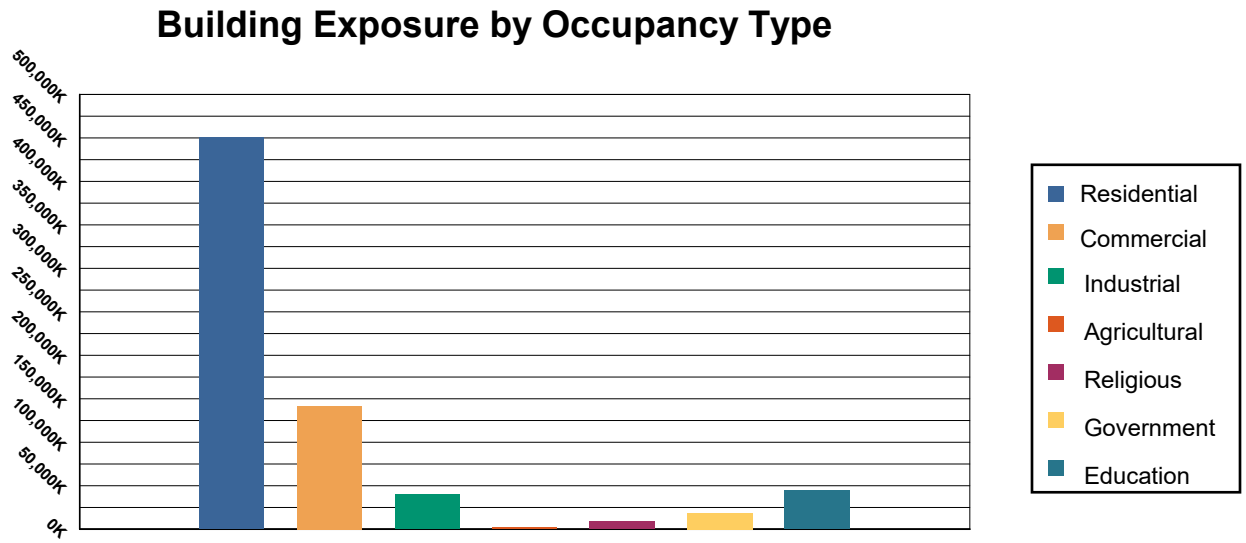


Table 1: Building Exposure by Occupancy Type

Occupancy	Exposure ($1000)	Percent of Tot
Residential	450,456,119	63.78%
Commercial	141,793,008	20.08%
Industrial	39,797,513	5.64%
Agricultural	1,666,239	0.24%
Religious	9,365,213	1.33%
Government	18,574,965	2.63%
Education	44,577,977	6.31%
Total	**706,231,034**	**100.00%**

Essential Facility Inventory

For essential facilities, there are 54 hospitals in the region with a total bed capacity of 10,483 beds. There are 1,350 schools, 569 fire stations, 198 police stations and 174 emergency operation facilities.

Hurricane Scenario

Hazus used the following set of information to define the hurricane parameters for the hurricane loss estimate provided in this report.

Scenario Name:	Probabilistic
Type:	Probabilistic

Building Damage

General Building Stock Damage

Hazus estimates that about 16,975 buildings will be at least moderately damaged. This is over 1% of the total number of buildings in the region. There are an estimated 211 buildings that will be completely destroyed. The definition of the 'damage states' is provided in the Hazus Hurricane technical manual. Table 2 below summarizes the expected damage by general occupancy for the buildings in the region. Table 3 summarizes the expected damage by general building type.

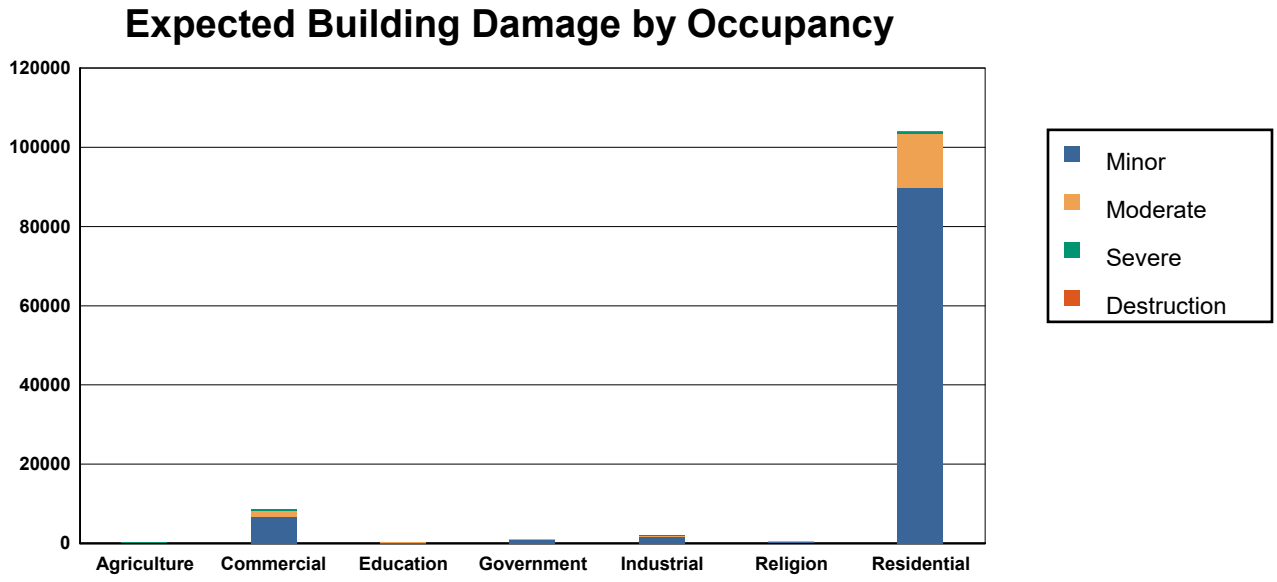


Table 2: Expected Building Damage by Occupancy : 100 - year Event

	None		Minor		Moderate		Severe		Destruction	
Occupancy	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Agriculture	2,872.48	90.96	218.12	6.91	45.62	1.44	20.19	0.64	1.58	0.05
Commercial	92,289.59	91.47	6,678.28	6.62	1,643.99	1.63	282.14	0.28	1.00	0.00
Education	2,727.81	92.72	186.09	6.33	26.85	0.91	1.24	0.04	0.00	0.00
Government	13,336.18	92.64	910.91	6.33	142.09	0.99	6.81	0.05	0.00	0.00
Industrial	22,926.81	92.17	1,569.02	6.31	312.76	1.26	62.93	0.25	3.47	0.01
Religion	6,075.98	91.81	478.24	7.23	60.47	0.91	3.31	0.05	0.00	0.00
Residential	893,572.50	89.56	89,751.05	9.00	13,685.63	1.37	469.84	0.05	204.97	0.02
Total	**1,033,801.36**		**99,791.71**		**15,917.41**		**846.49**		**211.03**	

Table 3: Expected Building Damage by Building Type : 100 - year Event

Building Type	None		Minor		Moderate		Severe		Destruction	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Concrete	18,747	91.23	1,511	7.35	281	1.37	9	0.04	0	0.00
Masonry	105,131	87.83	10,112	8.45	4,254	3.55	193	0.16	11	0.01
MH	5,877	97.23	106	1.76	43	0.72	1	0.02	17	0.27
Steel	68,478	92.03	4,416	5.94	1,259	1.69	255	0.34	2	0.00
Wood	840,255	90.40	81,584	8.78	7,067	0.76	390	0.04	182	0.02

Essential Facility Damage

Before the hurricane, the region had 10,483 hospital beds available for use. On the day of the hurricane, the model estimates that 10,483 hospital beds (100%) are available for use by patients already in the hospital and those injured by the hurricane. After one week, 100% of the beds will be in service. By 30 days, 100% will be operational.

Thematic Map of Essential Facilities

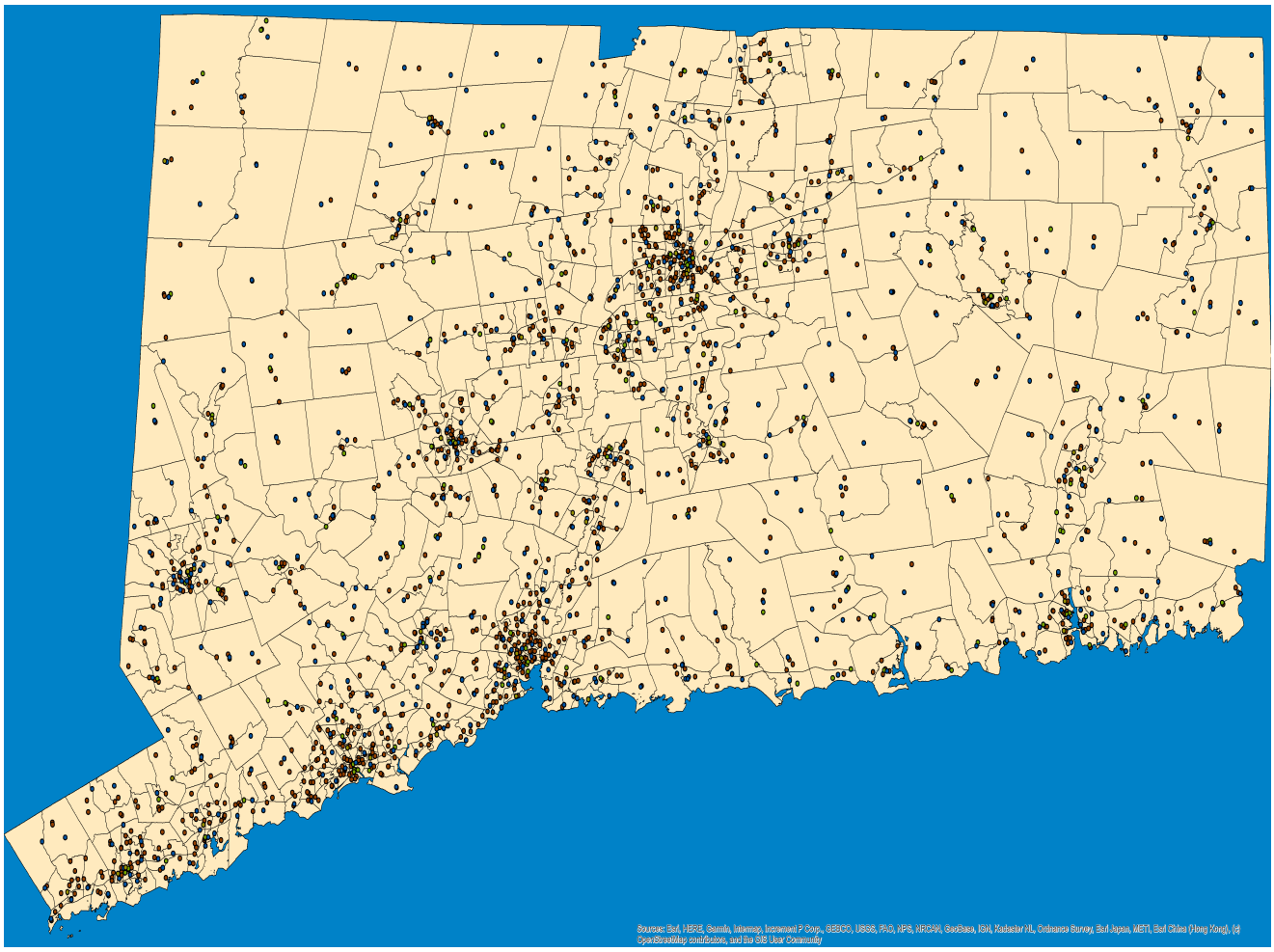
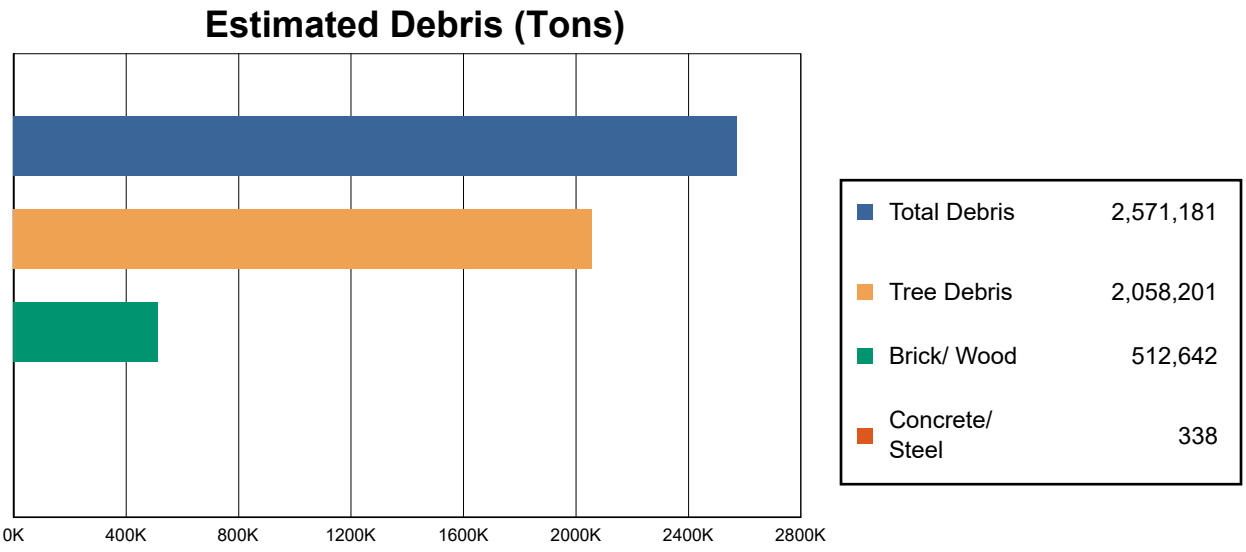


Table 4: Expected Damage to Essential Facilities

		# Facilities		
Classification	Total	Probability of at Least Moderate Damage > 50%	Probability of Complete Damage > 50%	Expected Loss of Use < 1 day
EOCs	174	0	0	174
Fire Stations	569	0	0	569
Hospitals	54	0	0	54
Police Stations	198	0	0	198
Schools	1,350	0	0	1,245

Induced Hurricane Damage

Debris Generation

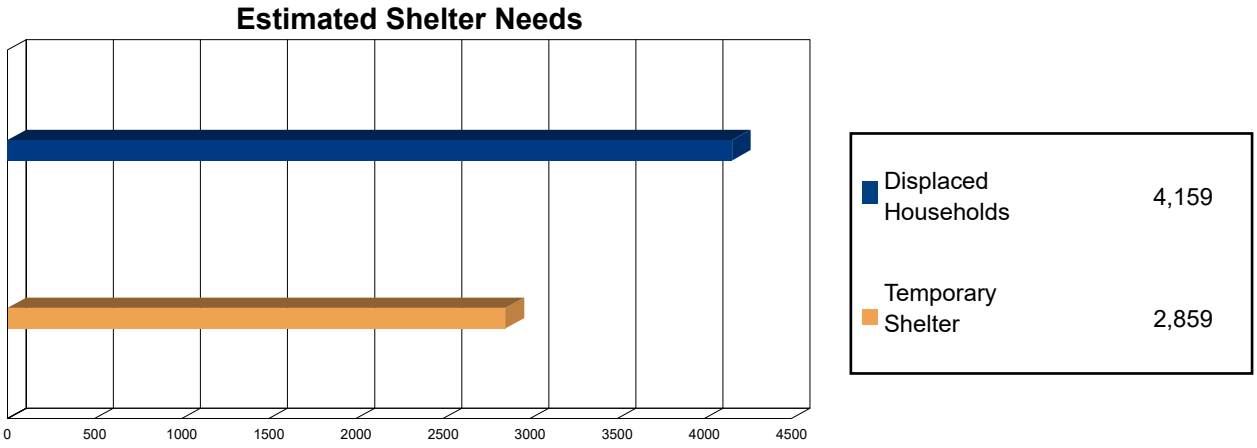


Hazus estimates the amount of debris that will be generated by the hurricane. The model breaks the debris into four general categories: a) Brick/Wood, b) Reinforced Concrete/Steel, c) Eligible Tree Debris, and d) Other Tree Debris. This distinction is made because of the different types of material handling equipment required to handle the debris.

The model estimates that a total of 2,571,181 tons of debris will be generated. Of the total amount, 1,436,045 tons (56%) is Other Tree Debris. Of the remaining 1,135,136 tons, Brick/Wood comprises 45% of the total, Reinforced Concrete/Steel comprises of 0% of the total, with the remainder being Eligible Tree Debris. If the building debris tonnage is converted to an estimated number of truckloads, it will require 20519 truckloads (@25 tons/truck) to remove the building debris generated by the hurricane. The number of Eligible Tree Debris truckloads will depend on how the 622,156 tons of Eligible Tree Debris are collected and processed. The volume of tree debris generally ranges from about 4 cubic yards per ton for chipped or compacted tree debris to about 10 cubic yards per ton for bulkier, uncompacted debris.

Social Impact

Shelter Requirement



Hazus estimates the number of households that are expected to be displaced from their homes due to the hurricane and the number of displaced people that will require accommodations in temporary public shelters. The model estimates 4,159 households to be displaced due to the hurricane. Of these, 2,859 people (out of a total population of 3,605,944) will seek temporary shelter in public shelters.

Economic Loss

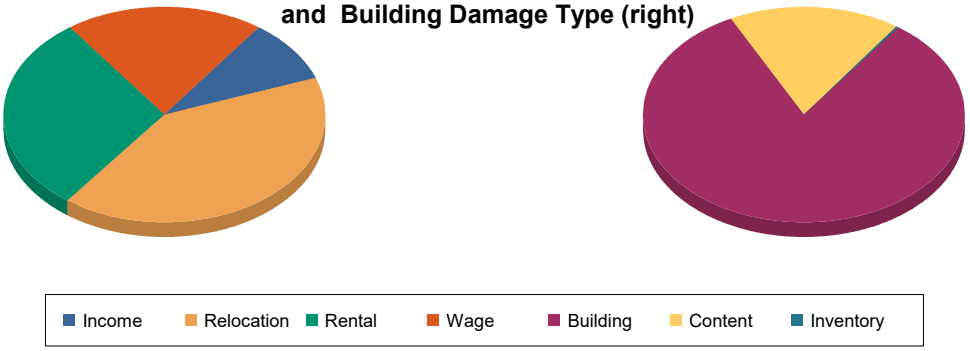
The total economic loss estimated for the hurricane is 6620.2 million dollars, which represents 0.94 % of the total replacement value of the region's buildings.

Building-Related Losses

The building related losses are broken into two categories: direct property damage losses and business interruption losses. The direct property damage losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the hurricane. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the hurricane.

The total property damage losses were 6,620 million dollars. 9% of the estimated losses were related to the business interruption of the region. By far, the largest loss was sustained by the residential occupancies which made up over 83% of the total loss. Table 5 below provides a summary of the losses associated with the building damage.

Loss by Business Interruption Type (left) and Building Damage Type (right)



Loss Type by General Occupancy

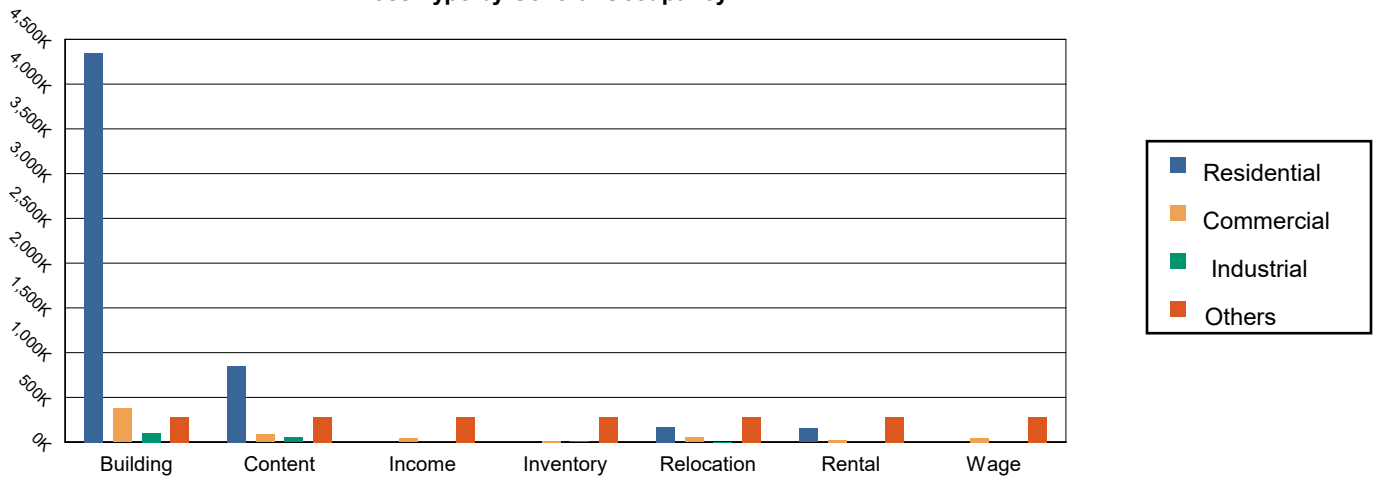


Table 5: Building-Related Economic Loss Estimates

(Thousands of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Property Damage						
	Building	4,347,292.94	377,566.73	105,322.42	142,995.54	4,973,177.64
	Content	850,660.56	90,746.19	52,291.03	29,457.60	1,023,155.39
	Inventory	0.00	15,316.24	6,429.74	1,825.56	23,571.53
	Subtotal	**5,197,953.50**	**483,629.16**	**164,043.19**	**174,278.70**	**6,019,904.56**
Business Interruption Loss						
	Income	0.00	41,318.46	1,034.47	14,632.99	56,985.91
	Relocation	167,402.18	51,657.86	5,656.12	19,486.93	244,203.08
	Rental	150,248.49	25,378.17	828.84	2,301.85	178,757.35
	Wage	0.00	46,199.40	1,688.90	72,434.33	120,322.63
	Subtotal	**317,650.67**	**164,553.89**	**9,208.33**	**108,856.09**	**600,268.98**

Total

Total	**5,515,604.17**	**648,183.05**	**173,251.52**	**283,134.79**	**6,620,173.53**

Appendix A: County Listing for the Region

Connecticut

- Fairfield
- Hartford
- Litchfield
- Middlesex
- New Haven
- New London
- Tolland
- Windham

Appendix B: Regional Population and Building Value Data

		Building Value (thousands of dollars)		
	Population	Residential	Non-Residential	Total
Connecticut				
Fairfield	957,419	138,202,527	64,140,539	202,343,066
Hartford	899,498	103,349,824	67,437,454	170,787,278
Litchfield	185,186	28,643,320	14,484,815	43,128,135
Middlesex	164,245	22,031,593	10,973,115	33,004,708
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Total	**3,605,944**	**450,456,119**	**255,774,915**	**706,231,034**
Study Region Total	**3,605,944**	**450,456,119**	**255,774,915**	**706,231,034**

Hazus: Hurricane Global Risk Report

Region Name: CT_HUR_Prob

Hurricane Scenario: Probabilistic 200-year Return Period

Print Date: Tuesday, April 11, 2023

Disclaimer:
Totals only reflect data for those census tracts/blocks included in the user's study region.

The estimates of social and economic impacts contained in this report were produced using Hazus loss estimation methodology software which is based on current scientific and engineering knowledge. There are uncertainties inherent in any loss estimation technique. Therefore, there may be significant differences between the modeled results contained in this report and the actual social and economic losses following a specific Hurricane. These results can be improved by using enhanced inventory data.

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General Description of the Region

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The hurricane loss estimates provided in this report are based on a region that includes 8 county(ies) from the following state(s):

- Connecticut

Note:
Appendix A contains a complete listing of the counties contained in the region.

The geographical size of the region is 4,990.78 square miles and contains 878 census tracts. There are over 1,418 thousand households in the region and a total population of 3,605,944 people. The distribution of population by State and County is provided in Appendix B.

There are an estimated 1,150 thousand buildings in the region with a total building replacement value (excluding contents) of 706,231 million dollars. Approximately 87% of the buildings (and 64% of the building value) are associated with residential housing.

Building Inventory

General Building Stock

Hazus estimates that there are 1,150,568 buildings in the region which have an aggregate total replacement valu million. Table 1 presents the relative distribution of the value with respect to the general occupancies. Appendix general distribution of the building value by State and County.

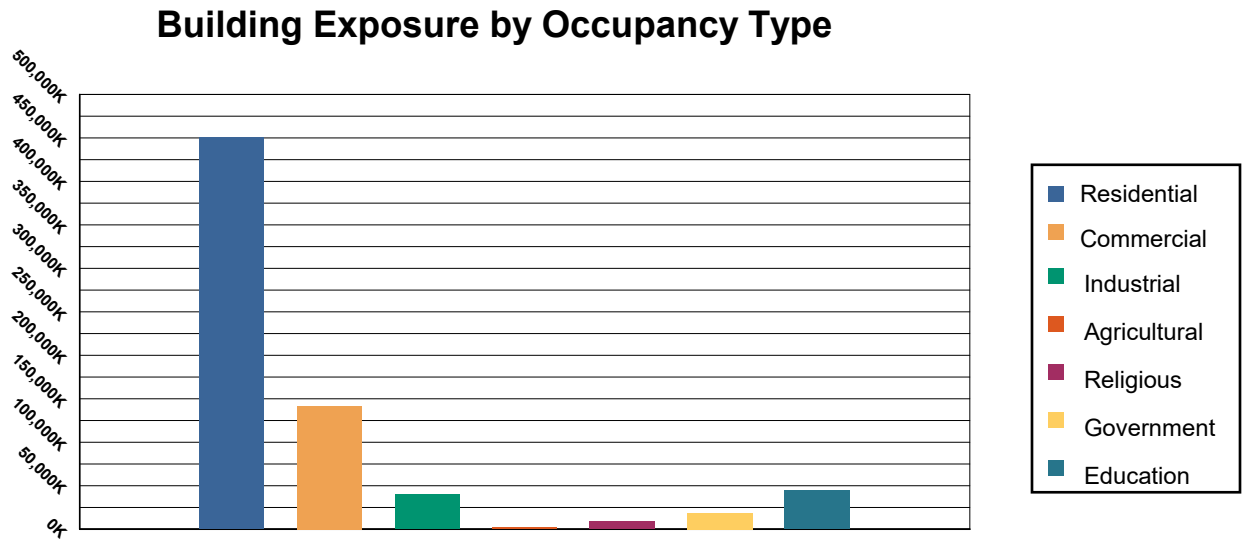


Table 1: Building Exposure by Occupancy Type

Occupancy	Exposure ($1000)	Percent of Tot
Residential	450,456,119	63.78%
Commercial	141,793,008	20.08%
Industrial	39,797,513	5.64%
Agricultural	1,666,239	0.24%
Religious	9,365,213	1.33%
Government	18,574,965	2.63%
Education	44,577,977	6.31%
Total	**706,231,034**	**100.00%**

Essential Facility Inventory

For essential facilities, there are 54 hospitals in the region with a total bed capacity of 10,483 beds. There are 1,350 schools, 569 fire stations, 198 police stations and 174 emergency operation facilities.

Hurricane Scenario

Hazus used the following set of information to define the hurricane parameters for the hurricane loss estimate provided in this report.

Scenario Name:	Probabilistic
Type:	Probabilistic

Building Damage

General Building Stock Damage

Hazus estimates that about 39,318 buildings will be at least moderately damaged. This is over 3% of the total number of buildings in the region. There are an estimated 926 buildings that will be completely destroyed. The definition of the 'damage states' is provided in the Hazus Hurricane technical manual. Table 2 below summarizes the expected damage by general occupancy for the buildings in the region. Table 3 summarizes the expected damage by general building type.

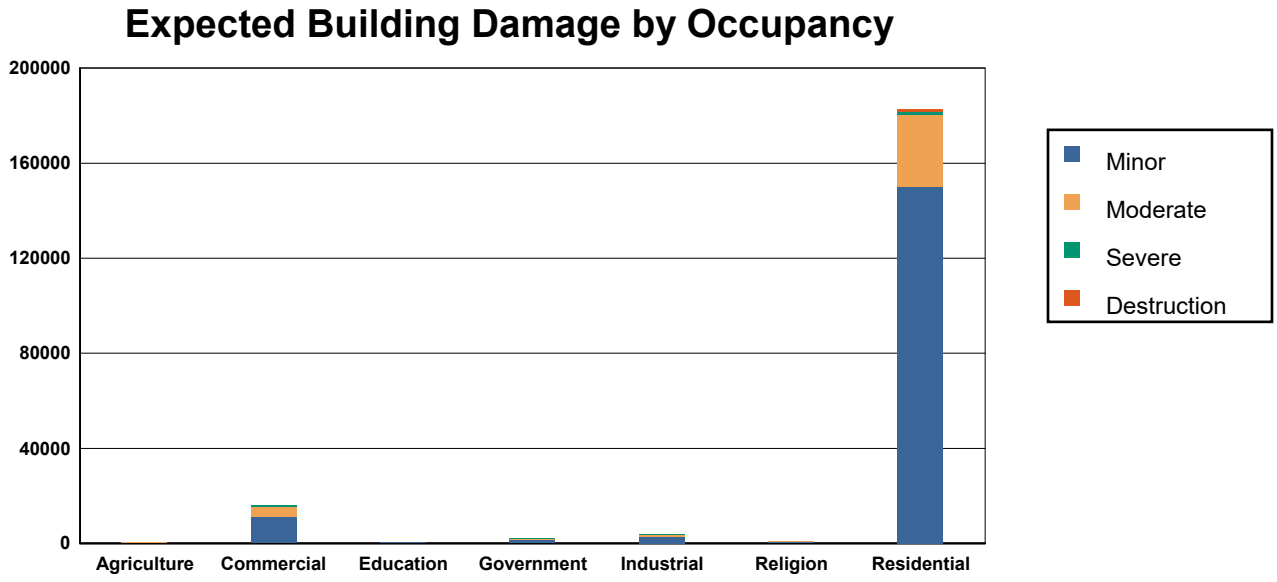


Table 2: Expected Building Damage by Occupancy : 200 - year Event

	None		Minor		Moderate		Severe		Destruction	
Occupancy	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Agriculture	2,632.94	83.37	372.27	11.79	100.07	3.17	47.36	1.50	5.36	0.17
Commercial	84,871.00	84.12	11,283.57	11.18	3,921.58	3.89	813.20	0.81	5.64	0.01
Education	2,524.90	85.82	323.83	11.01	85.40	2.90	7.87	0.27	0.00	0.00
Government	12,334.91	85.68	1,573.46	10.93	445.33	3.09	42.30	0.29	0.00	0.00
Industrial	21,110.61	84.87	2,670.22	10.73	881.79	3.54	199.15	0.80	13.23	0.05
Religion	5,573.92	84.22	840.23	12.70	187.26	2.83	16.59	0.25	0.00	0.00
Residential	814,853.88	81.67	150,284.64	15.06	30,013.56	3.01	1,629.85	0.16	902.07	0.09
Total	**943,902.16**		**167,348.22**		**35,634.98**		**2,756.33**		**926.31**	

Table 3: Expected Building Damage by Building Type : 200 - year Event

Building Type	None		Minor		Moderate		Severe		Destruction	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Concrete	17,160	83.51	2,489	12.11	840	4.09	59	0.29	0	0.00
Masonry	95,310	79.62	15,483	12.93	8,304	6.94	560	0.47	45	0.04
MH	5,696	94.24	193	3.19	107	1.77	5	0.09	43	0.72
Steel	63,159	84.88	7,424	9.98	3,067	4.12	754	1.01	7	0.01
Wood	768,389	82.67	140,486	15.11	18,422	1.98	1,364	0.15	817	0.09

Essential Facility Damage

Before the hurricane, the region had 10,483 hospital beds available for use. On the day of the hurricane, the model estimates that 10,483 hospital beds (100%) are available for use by patients already in the hospital and those injured by the hurricane. After one week, 100% of the beds will be in service. By 30 days, 100% will be operational.

Thematic Map of Essential Facilities

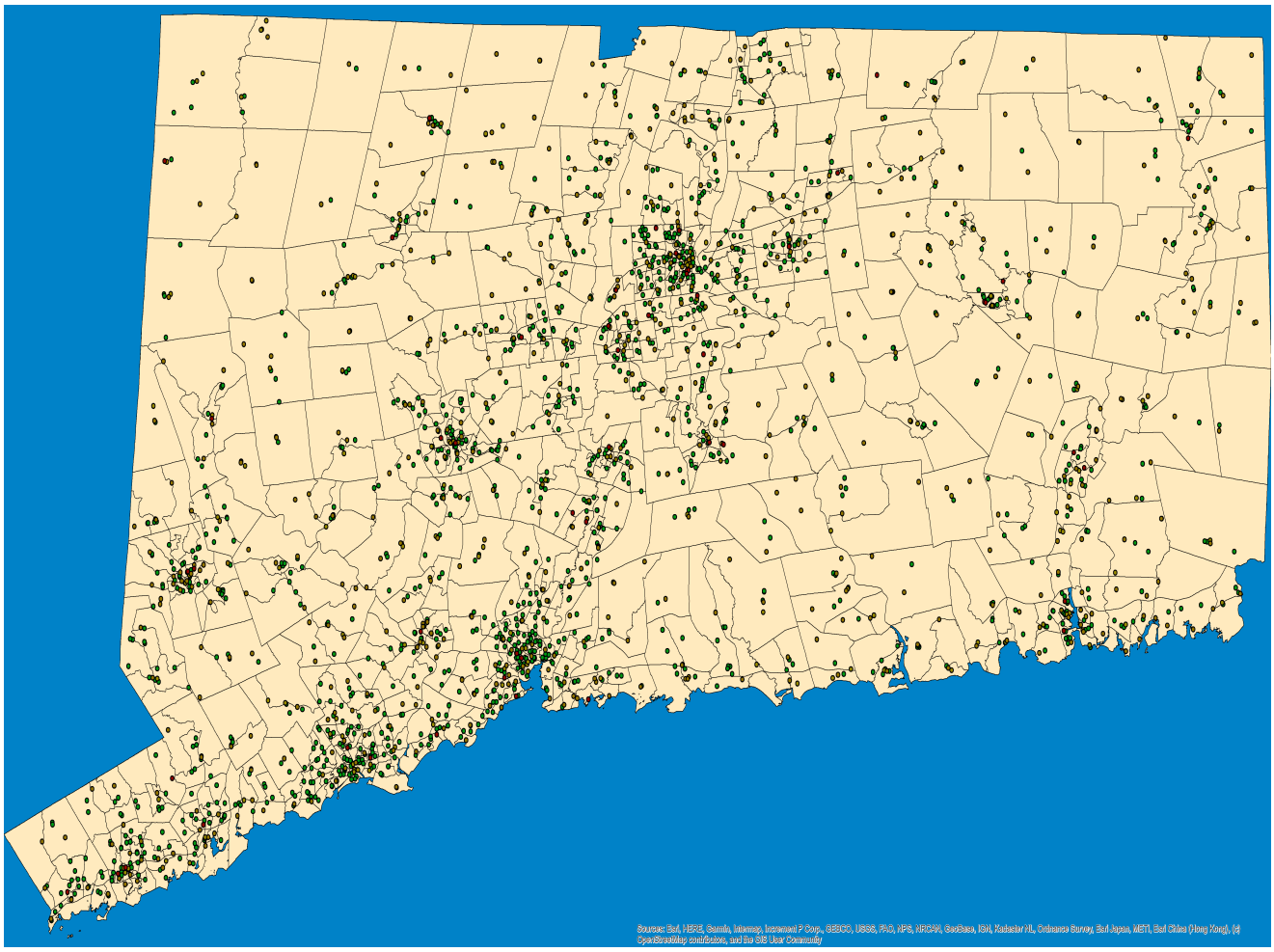
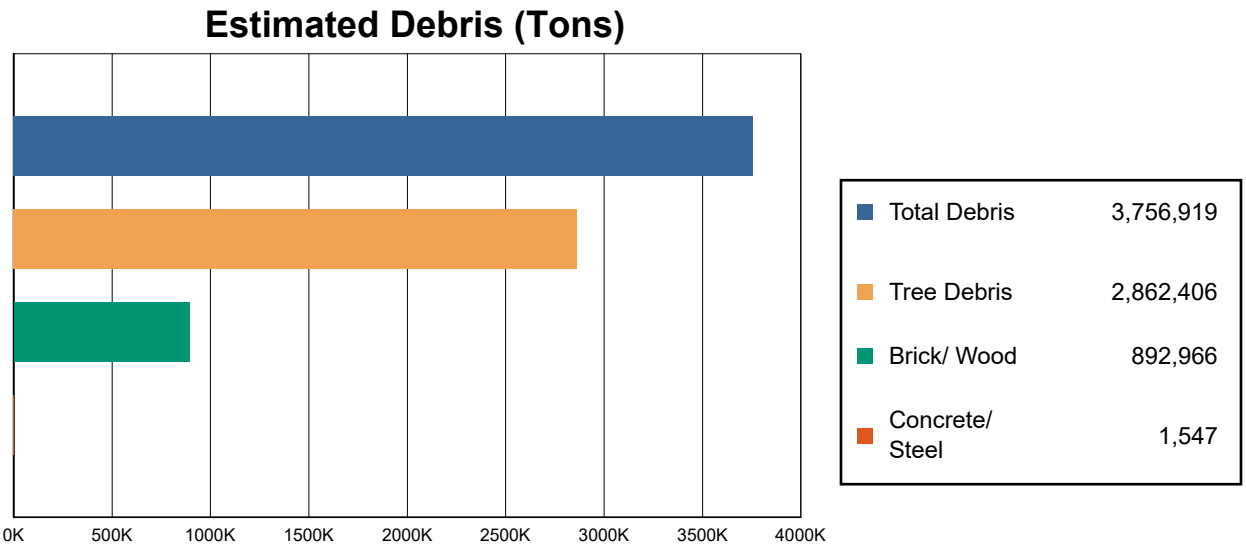


Table 4: Expected Damage to Essential Facilities

		# Facilities		
Classification	Total	Probability of at Least Moderate Damage > 50%	Probability of Complete Damage > 50%	Expected Loss of Use < 1 day
EOCs	174	0	0	174
Fire Stations	569	0	0	569
Hospitals	54	0	0	52
Police Stations	198	0	0	198
Schools	1,350	9	0	814

Induced Hurricane Damage

Debris Generation

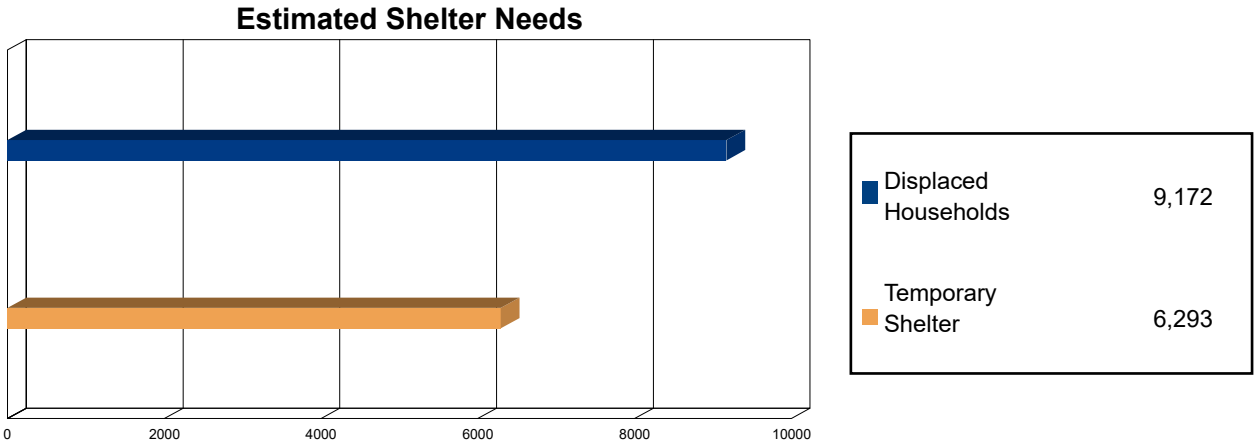


Hazus estimates the amount of debris that will be generated by the hurricane. The model breaks the debris into four general categories: a) Brick/Wood, b) Reinforced Concrete/Steel, c) Eligible Tree Debris, and d) Other Tree Debris. This distinction is made because of the different types of material handling equipment required to handle the debris.

The model estimates that a total of 3,756,919 tons of debris will be generated. Of the total amount, 1,988,687 tons (53%) is Other Tree Debris. Of the remaining 1,768,232 tons, Brick/Wood comprises 51% of the total, Reinforced Concrete/Steel comprises of 0% of the total, with the remainder being Eligible Tree Debris. If the building debris tonnage is converted to an estimated number of truckloads, it will require 35781 truckloads (@25 tons/truck) to remove the building debris generated by the hurricane. The number of Eligible Tree Debris truckloads will depend on how the 873,719 tons of Eligible Tree Debris are collected and processed. The volume of tree debris generally ranges from about 4 cubic yards per ton for chipped or compacted tree debris to about 10 cubic yards per ton for bulkier, uncompacted debris.

Social Impact

Shelter Requirement



Hazus estimates the number of households that are expected to be displaced from their homes due to the hurricane and the number of displaced people that will require accommodations in temporary public shelters. The model estimates 9,172 households to be displaced due to the hurricane. Of these, 6,293 people (out of a total population of 3,605,944) will seek temporary shelter in public shelters.

Economic Loss

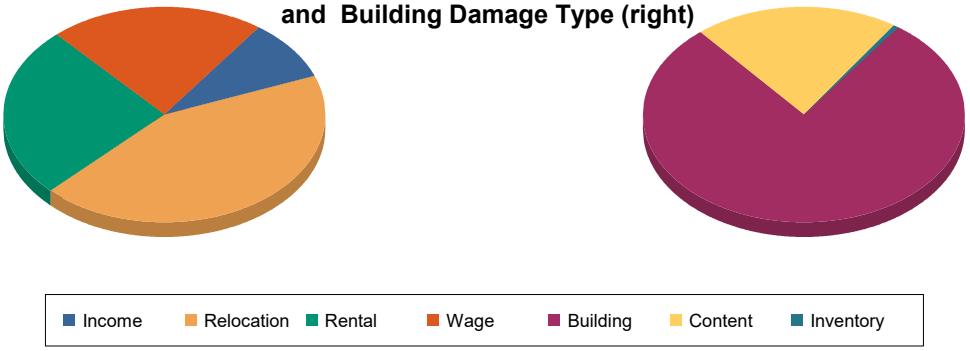
The total economic loss estimated for the hurricane is 12363.0 million dollars, which represents 1.75 % of the total replacement value of the region's buildings.

Building-Related Losses

The building related losses are broken into two categories: direct property damage losses and business interruption losses. The direct property damage losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the hurricane. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the hurricane.

The total property damage losses were 12,363 million dollars. 11% of the estimated losses were related to the business interruption of the region. By far, the largest loss was sustained by the residential occupancies which made up over 77% of the total loss. Table 5 below provides a summary of the losses associated with the building damage.

Loss by Business Interruption Type (left) and Building Damage Type (right)



Loss Type by General Occupancy

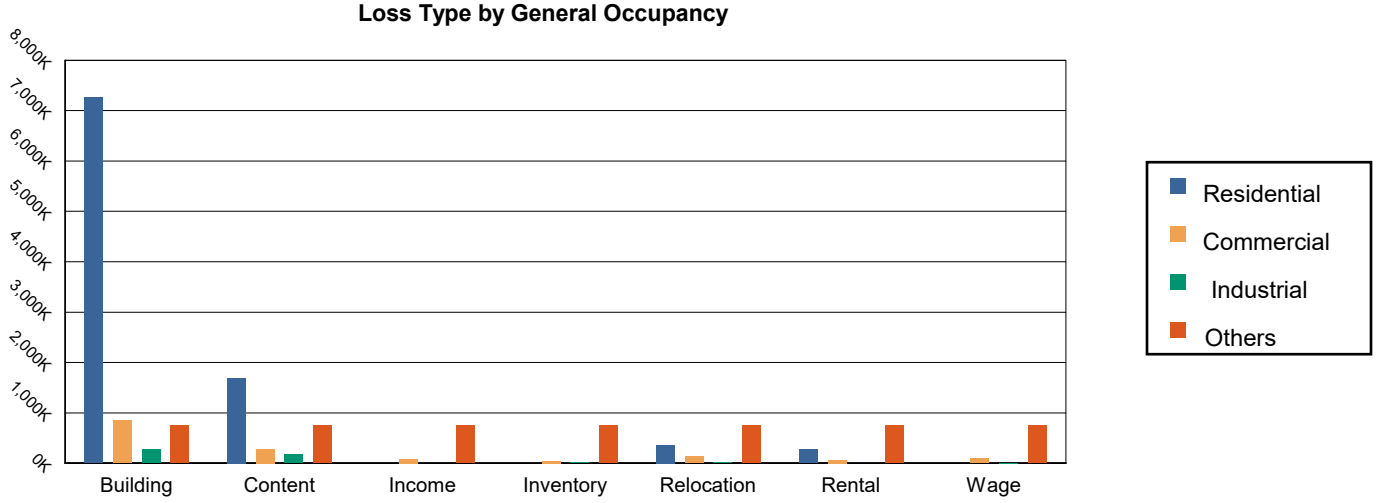


Table 5: Building-Related Economic Loss Estimates

(Thousands of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Property Damage						
	Building	7,262,589.66	845,736.87	274,592.35	342,098.92	8,725,017.79
	Content	1,689,276.30	278,471.40	170,293.61	109,582.25	2,247,623.55
	Inventory	0.00	47,422.62	20,678.17	4,894.15	72,994.93
	Subtotal	**8,951,865.95**	**1,171,630.88**	**465,564.13**	**456,575.31**	**11,045,636.28**
Business Interruption Loss						
	Income	15.15	83,136.89	2,900.15	35,331.44	121,383.63
	Relocation	360,330.50	129,614.91	18,126.70	62,356.32	570,428.42
	Rental	265,635.80	63,742.08	2,672.28	7,689.68	339,739.84
	Wage	35.70	93,512.06	4,702.02	187,571.05	285,820.84
	Subtotal	**626,017.14**	**370,005.94**	**28,401.16**	**292,948.49**	**1,317,372.73**

Total

Total	**9,577,883.09**	**1,541,636.83**	**493,965.29**	**749,523.80**	**12,363,009.00**

Appendix A: County Listing for the Region

Connecticut

- Fairfield
- Hartford
- Litchfield
- Middlesex
- New Haven
- New London
- Tolland
- Windham

Appendix B: Regional Population and Building Value Data

		Building Value (thousands of dollars)		
	Population	Residential	Non-Residential	Total
Connecticut				
Fairfield	957,419	138,202,527	64,140,539	202,343,066
Hartford	899,498	103,349,824	67,437,454	170,787,278
Litchfield	185,186	28,643,320	14,484,815	43,128,135
Middlesex	164,245	22,031,593	10,973,115	33,004,708
New Haven	864,835	92,892,604	61,159,705	154,052,309
New London	268,555	32,865,080	18,760,781	51,625,861
Tolland	149,788	19,496,288	9,789,702	29,285,990
Windham	116,418	12,974,883	9,028,804	22,003,687
Total	**3,605,944**	**450,456,119**	**255,774,915**	**706,231,034**
Study Region Total	**3,605,944**	**450,456,119**	**255,774,915**	**706,231,034**

Hazus: Hurricane Global Risk Report

Region Name: CT_HUR_Prob

Hurricane Scenario: Probabilistic 500-year Return Period

Print Date: Tuesday, April 11, 2023

Disclaimer:
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Note:
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The geographical size of the region is 4,990.78 square miles and contains 878 census tracts. There are over 1,418 thousand households in the region and a total population of 3,605,944 people. The distribution of population by State and County is provided in Appendix B.

There are an estimated 1,150 thousand buildings in the region with a total building replacement value (excluding contents) of 706,231 million dollars. Approximately 87% of the buildings (and 64% of the building value) are associated with residential housing.

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General Building Stock

Hazus estimates that there are 1,150,568 buildings in the region which have an aggregate total replacement valu million. Table 1 presents the relative distribution of the value with respect to the general occupancies. Appendix general distribution of the building value by State and County.

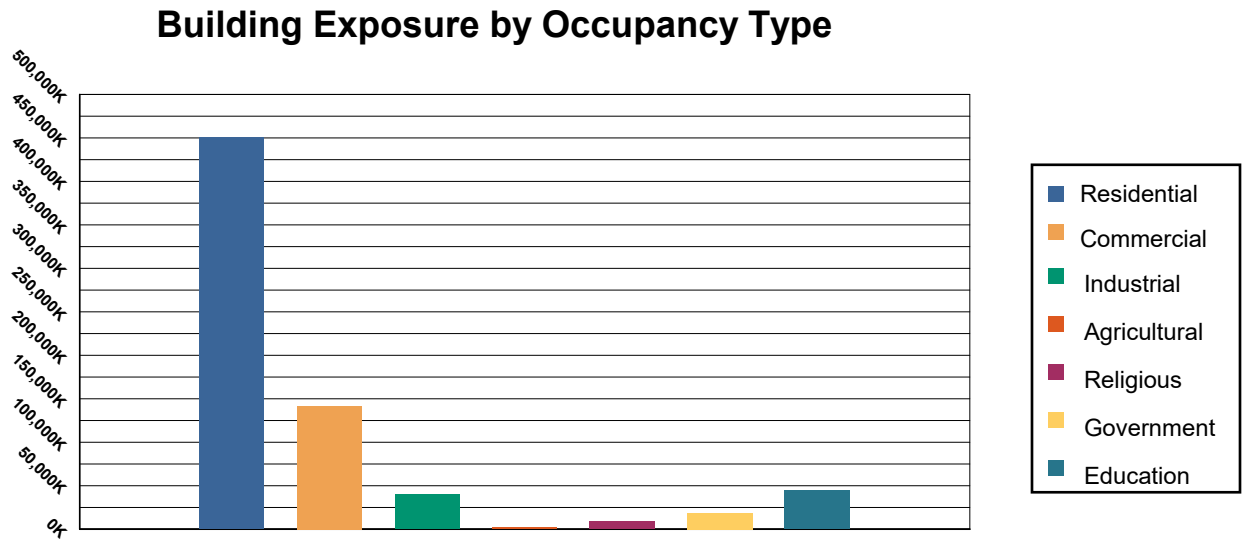


Table 1: Building Exposure by Occupancy Type

Occupancy	Exposure ($1000)	Percent of Tot
Residential	450,456,119	63.78%
Commercial	141,793,008	20.08%
Industrial	39,797,513	5.64%
Agricultural	1,666,239	0.24%
Religious	9,365,213	1.33%
Government	18,574,965	2.63%
Education	44,577,977	6.31%
Total	**706,231,034**	**100.00%**

Essential Facility Inventory

For essential facilities, there are 54 hospitals in the region with a total bed capacity of 10,483 beds. There are 1,350 schools, 569 fire stations, 198 police stations and 174 emergency operation facilities.

Hurricane Scenario

Hazus used the following set of information to define the hurricane parameters for the hurricane loss estimate provided in this report.

Scenario Name:	Probabilistic
Type:	Probabilistic

Building Damage

General Building Stock Damage

Hazus estimates that about 83,135 buildings will be at least moderately damaged. This is over 7% of the total number of buildings in the region. There are an estimated 3,192 buildings that will be completely destroyed. The definition of the 'damage states' is provided in the Hazus Hurricane technical manual. Table 2 below summarizes the expected damage by general occupancy for the buildings in the region. Table 3 summarizes the expected damage by general building type.

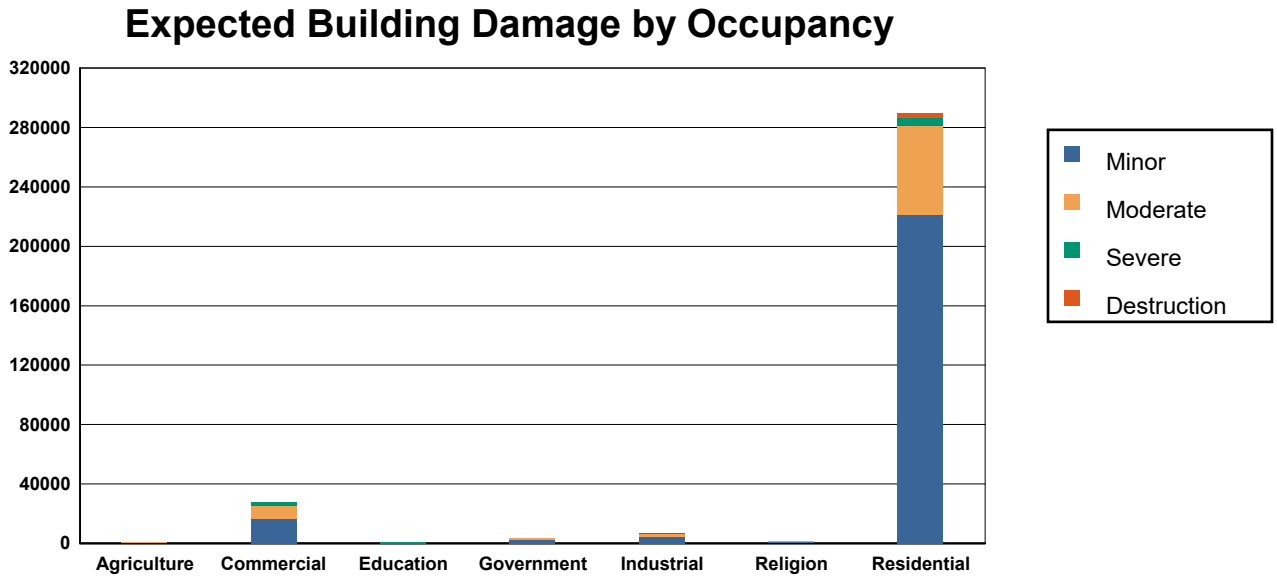


Table 2: Expected Building Damage by Occupancy : 500 - year Event

	None		Minor		Moderate		Severe		Destruction	
Occupancy	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Agriculture	2,260.09	71.57	583.27	18.47	201.07	6.37	98.84	3.13	14.74	0.47
Commercial	73,557.69	72.91	16,901.33	16.75	8,264.15	8.19	2,150.21	2.13	21.62	0.02
Education	2,216.47	75.34	489.20	16.63	202.65	6.89	33.68	1.14	0.00	0.00
Government	10,890.03	75.65	2,273.82	15.79	1,040.30	7.23	191.84	1.33	0.00	0.00
Industrial	18,239.58	73.32	4,024.15	16.18	2,005.88	8.06	567.97	2.28	37.42	0.15
Religion	4,835.96	73.07	1,263.75	19.10	446.47	6.75	71.82	1.09	0.00	0.00
Residential	708,176.20	70.98	221,721.05	22.22	59,312.27	5.94	5,356.22	0.54	3,118.27	0.31
Total	**820,176.01**		**247,256.58**		**71,472.78**		**8,470.59**		**3,192.04**	

Table 3: Expected Building Damage by Building Type : 500 - year Event

Building Type	None		Minor		Moderate		Severe		Destruction	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Concrete	14,729	71.68	3,557	17.31	1,984	9.66	278	1.36	0	0.00
Masonry	81,957	68.47	21,319	17.81	14,673	12.26	1,615	1.35	137	0.11
MH	5,524	91.40	253	4.19	178	2.95	12	0.20	76	1.26
Steel	55,027	73.95	10,915	14.67	6,422	8.63	2,021	2.72	25	0.03
Wood	668,775	71.95	211,771	22.78	41,534	4.47	4,500	0.48	2,898	0.31

Essential Facility Damage

Before the hurricane, the region had 10,483 hospital beds available for use. On the day of the hurricane, the model estimates that 10,396 hospital beds (99%) are available for use by patients already in the hospital and those injured by the hurricane. After one week, 100% of the beds will be in service. By 30 days, 100% will be operational.

Thematic Map of Essential Facilities

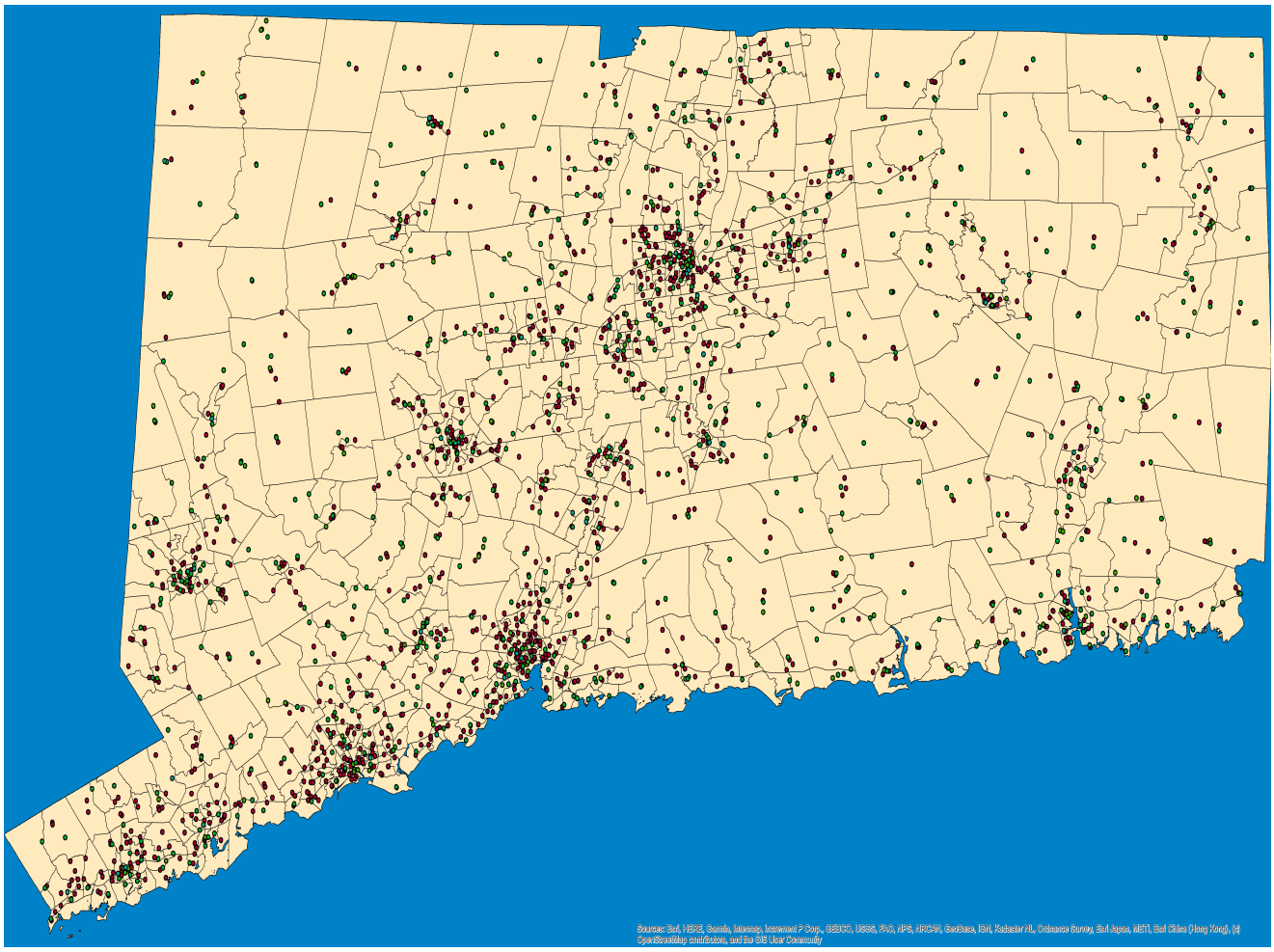
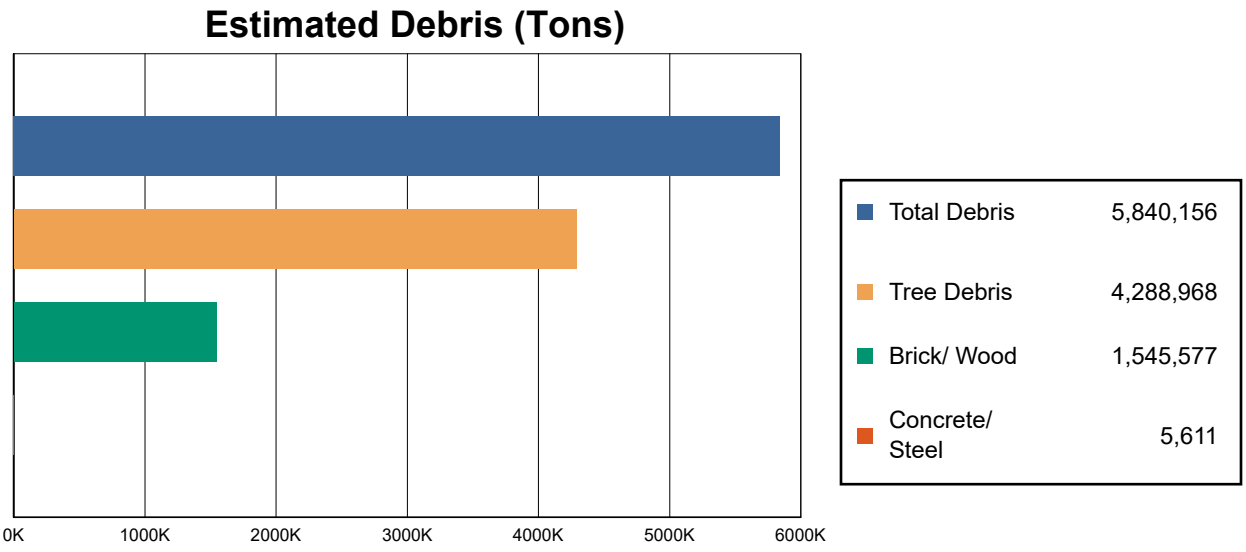


Table 4: Expected Damage to Essential Facilities

		# Facilities		
Classification	Total	Probability of at Least Moderate Damage > 50%	Probability of Complete Damage > 50%	Expected Loss of Use < 1 day
EOCs	174	0	0	174
Fire Stations	569	0	0	569
Hospitals	54	4	0	51
Police Stations	198	0	0	198
Schools	1,350	43	0	490

Induced Hurricane Damage

Debris Generation

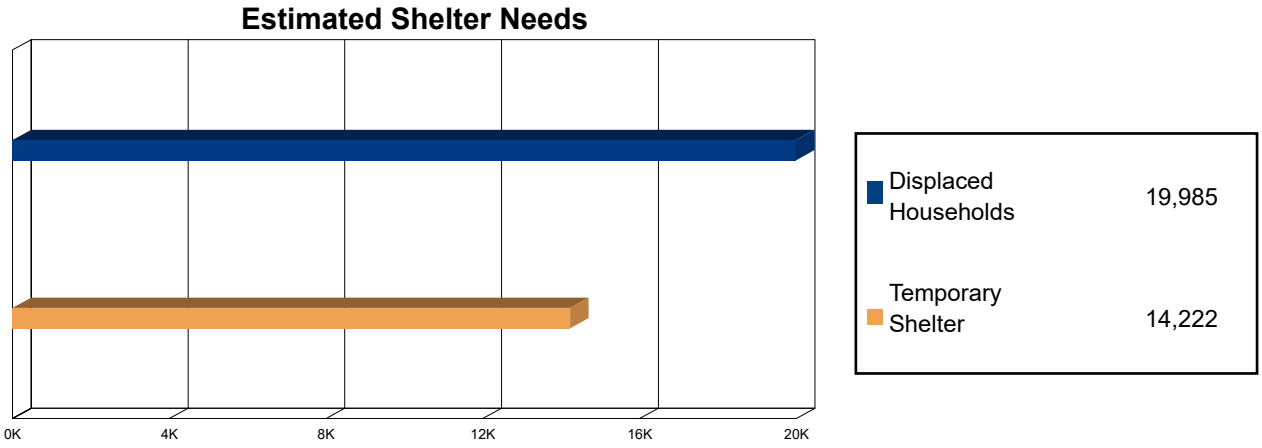


Hazus estimates the amount of debris that will be generated by the hurricane. The model breaks the debris into four general categories: a) Brick/Wood, b) Reinforced Concrete/Steel, c) Eligible Tree Debris, and d) Other Tree Debris. This distinction is made because of the different types of material handling equipment required to handle the debris.

The model estimates that a total of 5,840,156 tons of debris will be generated. Of the total amount, 2,875,578 tons (49%) is Other Tree Debris. Of the remaining 2,964,578 tons, Brick/Wood comprises 52% of the total, Reinforced Concrete/Steel comprises of 0% of the total, with the remainder being Eligible Tree Debris. If the building debris tonnage is converted to an estimated number of truckloads, it will require 62048 truckloads (@25 tons/truck) to remove the building debris generated by the hurricane. The number of Eligible Tree Debris truckloads will depend on how the 1,413,390 tons of Eligible Tree Debris are collected and processed. The volume of tree debris generally ranges from about 4 cubic yards per ton for chipped or compacted tree debris to about 10 cubic yards per ton for bulkier, uncompacted debris.

Social Impact

Shelter Requirement



Hazus estimates the number of households that are expected to be displaced from their homes due to the hurricane and the number of displaced people that will require accommodations in temporary public shelters. The model estimates 19,985 households to be displaced due to the hurricane. Of these, 14,222 people (out of a total population of 3,605,944) will seek temporary shelter in public shelters.

Economic Loss

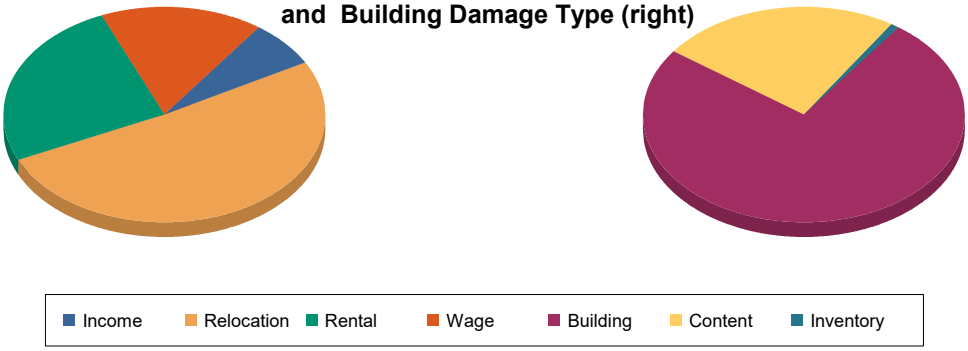
The total economic loss estimated for the hurricane is 24066.8 million dollars, which represents 3.41 % of the total replacement value of the region's buildings.

Building-Related Losses

The building related losses are broken into two categories: direct property damage losses and business interruption losses. The direct property damage losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the hurricane. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the hurricane.

The total property damage losses were 24,067 million dollars. 11% of the estimated losses were related to the business interruption of the region. By far, the largest loss was sustained by the residential occupancies which made up over 74% of the total loss. Table 5 below provides a summary of the losses associated with the building damage.

Loss by Business Interruption Type (left) and Building Damage Type (right)



Loss Type by General Occupancy

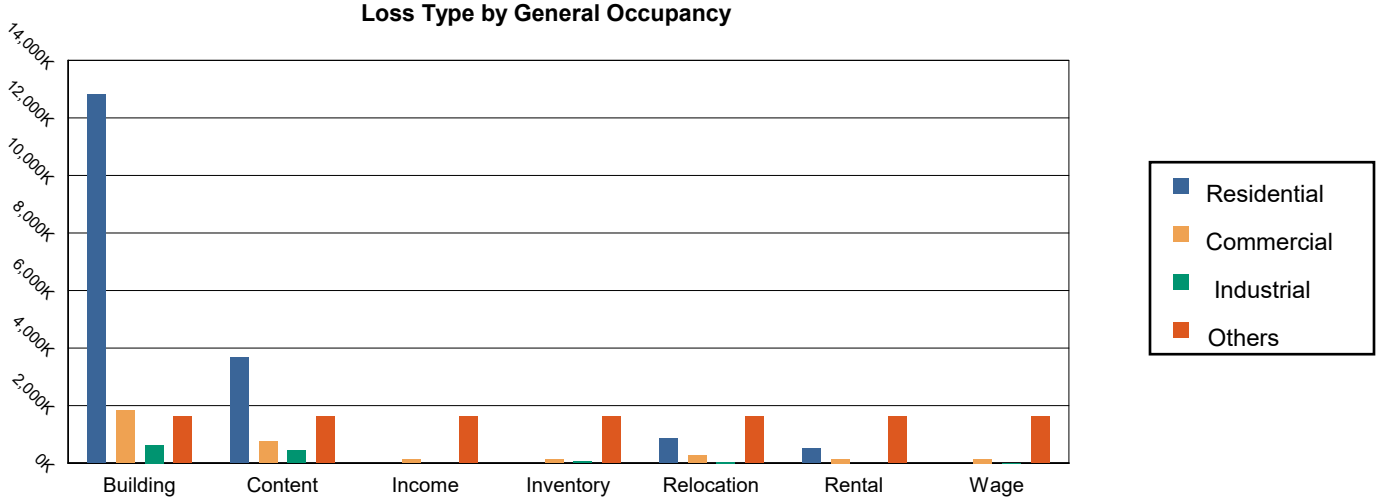


Table 5: Building-Related Economic Loss Estimates

(Thousands of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Property Damage						
	Building	12,817,010.02	1,819,211.16	629,934.71	791,213.78	16,057,369.67
	Content	3,662,851.85	751,171.04	444,426.09	338,860.20	5,197,309.17
	Inventory	0.00	123,533.49	53,268.61	11,484.26	188,286.36
	Subtotal	**16,479,861.87**	**2,693,915.69**	**1,127,629.41**	**1,141,558.23**	**21,442,965.19**
Business Interruption Loss						
	Income	260.84	125,884.43	5,821.05	49,229.84	181,196.15
	Relocation	862,887.48	283,333.12	43,539.07	155,387.67	1,345,147.33
	Rental	501,694.05	142,576.11	6,442.35	19,333.62	670,046.12
	Wage	614.40	146,417.65	9,454.95	270,955.02	427,442.02
	Subtotal	**1,365,456.77**	**698,211.30**	**65,257.41**	**494,906.14**	**2,623,831.62**

Total

Total	**17,845,318.63**	**3,392,126.99**	**1,192,886.82**	**1,636,464.37**	**24,066,796.82**

Appendix A: County Listing for the Region

Connecticut

- Fairfield
- Hartford
- Litchfield
- Middlesex
- New Haven
- New London
- Tolland
- Windham

Appendix B: Regional Population and Building Value Data

		Building Value (thousands of dollars)		
	Population	Residential	Non-Residential	Total
Connecticut				
Fairfield	957,419	138,202,527	64,140,539	202,343,066
Hartford	899,498	103,349,824	67,437,454	170,787,278
Litchfield	185,186	28,643,320	14,484,815	43,128,135
Middlesex	164,245	22,031,593	10,973,115	33,004,708
New Haven	864,835	92,892,604	61,159,705	154,052,309
New London	268,555	32,865,080	18,760,781	51,625,861
Tolland	149,788	19,496,288	9,789,702	29,285,990
Windham	116,418	12,974,883	9,028,804	22,003,687
Total	**3,605,944**	**450,456,119**	**255,774,915**	**706,231,034**
Study Region Total	**3,605,944**	**450,456,119**	**255,774,915**	**706,231,034**

Hazus: Hurricane Global Risk Report

Region Name: CT_HUR_Prob

Hurricane Scenario: Probabilistic 1000-year Return Period

Print Date: Tuesday, April 11, 2023

Disclaimer:
Totals only reflect data for those census tracts/blocks included in the user's study region.

The estimates of social and economic impacts contained in this report were produced using Hazus loss estimation methodology software which is based on current scientific and engineering knowledge. There are uncertainties inherent in any loss estimation technique. Therefore, there may be significant differences between the modeled results contained in this report and the actual social and economic losses following a specific Hurricane. These results can be improved by using enhanced inventory data.

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General Description of the Region

Hazus is a regional multi-hazard loss estimation model that was developed by the Federal Emergency Management Agency and the National Institute of Building Sciences. The primary purpose of Hazus is to provide a methodology and software application to develop multi-hazard losses at a regional scale. These loss estimates would be used primarily by local, state and regional officials to plan and stimulate efforts to reduce risks from multi-hazards and to prepare for emergency response and recovery.

The hurricane loss estimates provided in this report are based on a region that includes 8 county(ies) from the following state(s):

- Connecticut

Note:
Appendix A contains a complete listing of the counties contained in the region.

The geographical size of the region is 4,990.78 square miles and contains 878 census tracts. There are over 1,418 thousand households in the region and a total population of 3,605,944 people. The distribution of population by State and County is provided in Appendix B.

There are an estimated 1,150 thousand buildings in the region with a total building replacement value (excluding contents) of 706,231 million dollars. Approximately 87% of the buildings (and 64% of the building value) are associated with residential housing.

Building Inventory

General Building Stock

Hazus estimates that there are 1,150,568 buildings in the region which have an aggregate total replacement valu million. Table 1 presents the relative distribution of the value with respect to the general occupancies. Appendix general distribution of the building value by State and County.

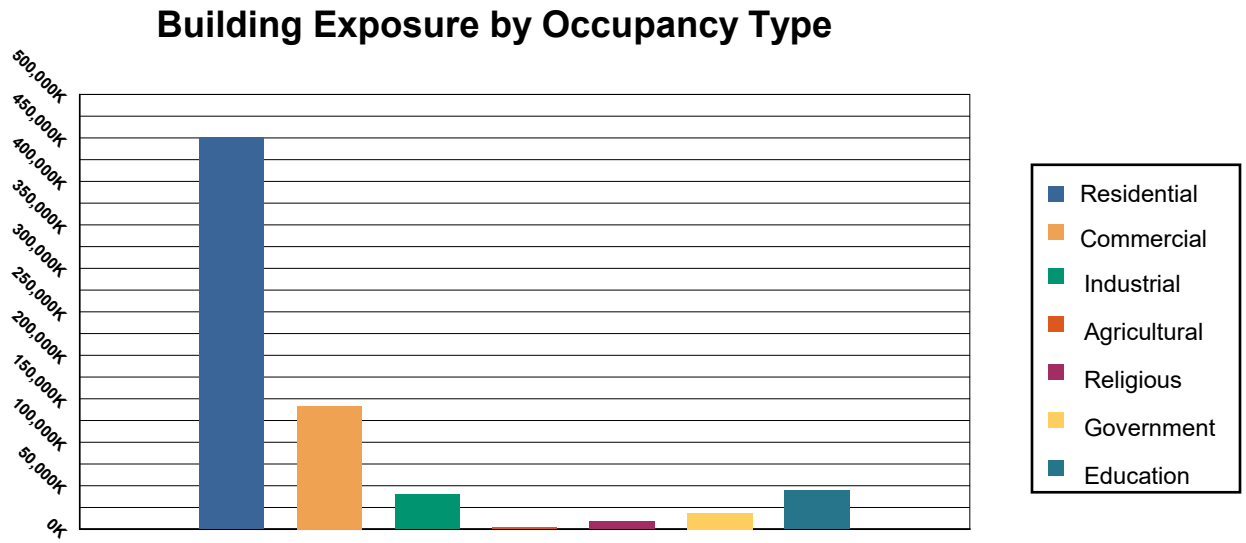


Table 1: Building Exposure by Occupancy Type

Occupancy	Exposure ($1000)	Percent of Tot
Residential	450,456,119	63.78%
Commercial	141,793,008	20.08%
Industrial	39,797,513	5.64%
Agricultural	1,666,239	0.24%
Religious	9,365,213	1.33%
Government	18,574,965	2.63%
Education	44,577,977	6.31%
Total	**706,231,034**	**100.00%**

Essential Facility Inventory

For essential facilities, there are 54 hospitals in the region with a total bed capacity of 10,483 beds. There are 1,350 schools, 569 fire stations, 198 police stations and 174 emergency operation facilities.

Hurricane Scenario

Hazus used the following set of information to define the hurricane parameters for the hurricane loss estimate provided in this report.

Scenario Name:	Probabilistic
Type:	Probabilistic

Building Damage

General Building Stock Damage

Hazus estimates that about 123,872 buildings will be at least moderately damaged. This is over 11% of the total number of buildings in the region. There are an estimated 6,038 buildings that will be completely destroyed. The definition of the 'damage states' is provided in the Hazus Hurricane technical manual. Table 2 below summarizes the expected damage by general occupancy for the buildings in the region. Table 3 summarizes the expected damage by general building type.

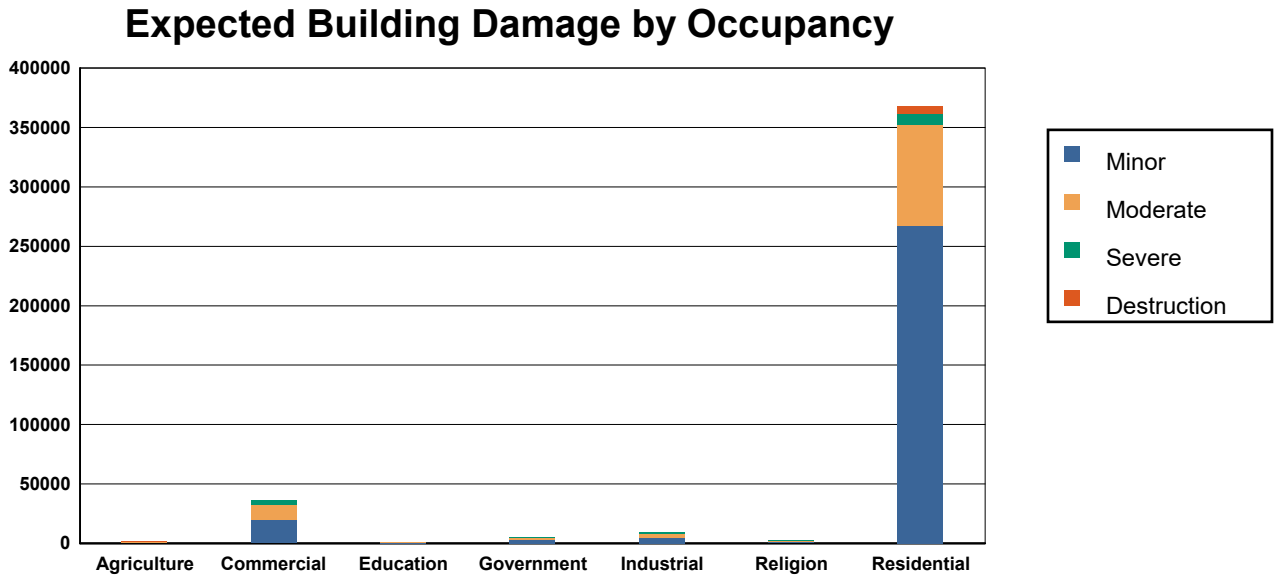


Table 2: Expected Building Damage by Occupancy : 1000 - year Event

	None		Minor		Moderate		Severe		Destruction	
Occupancy	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Agriculture	1,983.70	62.81	716.51	22.69	288.17	9.13	144.77	4.58	24.85	0.79
Commercial	65,033.53	64.46	20,185.47	20.01	12,013.64	11.91	3,620.72	3.59	41.65	0.04
Education	1,961.84	66.68	595.78	20.25	315.59	10.73	68.80	2.34	0.00	0.00
Government	9,705.44	67.42	2,738.63	19.02	1,572.29	10.92	379.65	2.64	0.00	0.00
Industrial	16,083.47	64.66	4,789.35	19.25	2,959.33	11.90	978.34	3.93	64.51	0.26
Religion	4,256.50	64.32	1,533.72	23.18	683.13	10.32	144.64	2.19	0.01	0.00
Residential	630,058.50	63.15	267,053.81	26.77	84,793.30	8.50	9,871.12	0.99	5,907.27	0.59
Total	**729,082.97**		**297,613.27**		**102,625.44**		**15,208.04**		**6,038.29**	

Table 3: Expected Building Damage by Building Type : 1000 - year Event

Building Type	None		Minor		Moderate		Severe		Destruction	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Concrete	12,890	62.73	4,121	20.06	2,973	14.47	564	2.75	0	0.00
Masonry	72,105	60.24	24,641	20.59	19,856	16.59	2,852	2.38	248	0.21
MH	5,364	88.75	310	5.12	242	4.01	20	0.33	108	1.79
Steel	48,744	65.51	12,918	17.36	9,303	12.50	3,400	4.57	46	0.06
Wood	595,652	64.08	257,748	27.73	62,249	6.70	8,314	0.89	5,515	0.59

Essential Facility Damage

Before the hurricane, the region had 10,483 hospital beds available for use. On the day of the hurricane, the model estimates that 10,396 hospital beds (99%) are available for use by patients already in the hospital and those injured by the hurricane. After one week, 100% of the beds will be in service. By 30 days, 100% will be operational.

Thematic Map of Essential Facilities

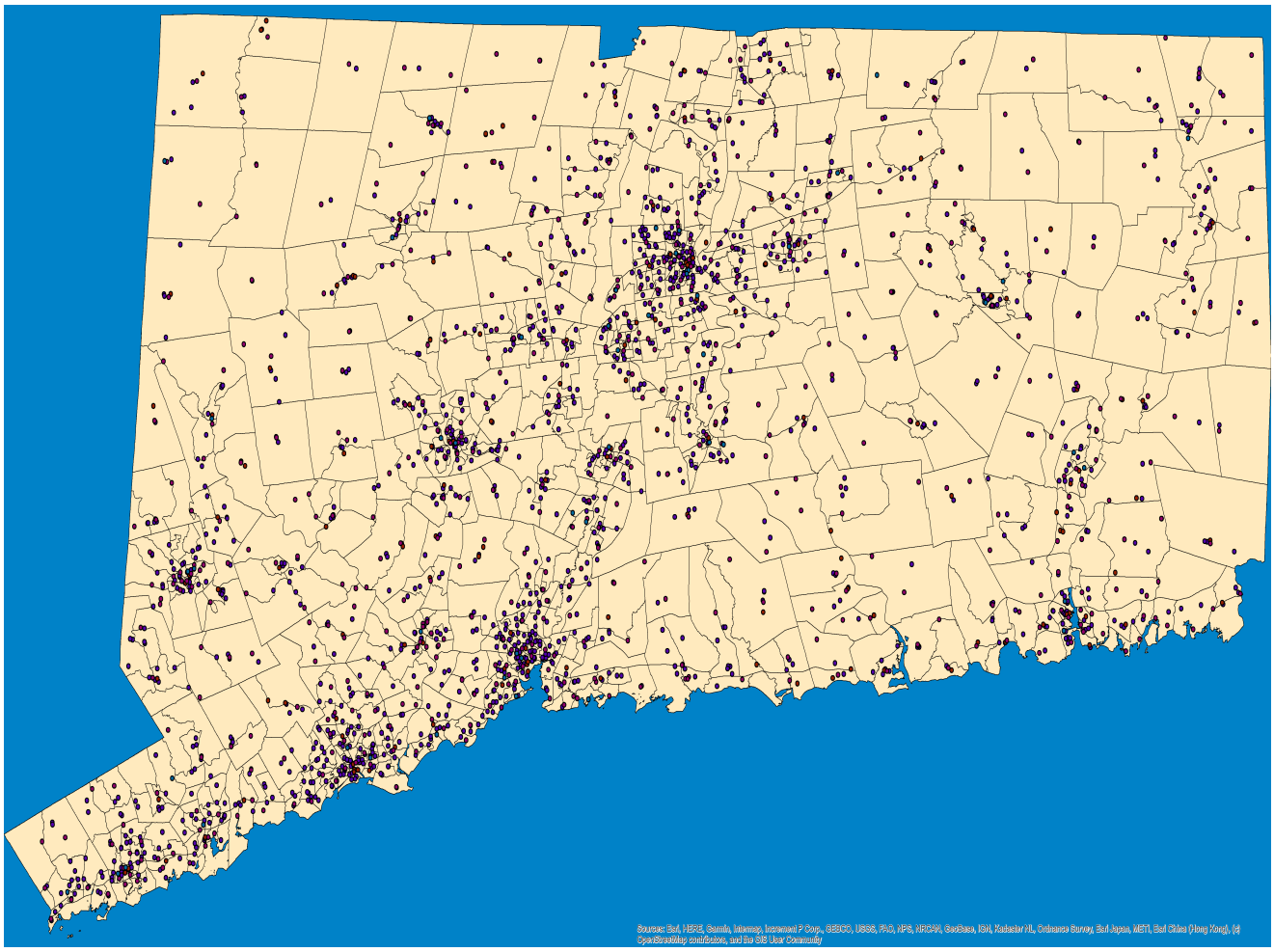
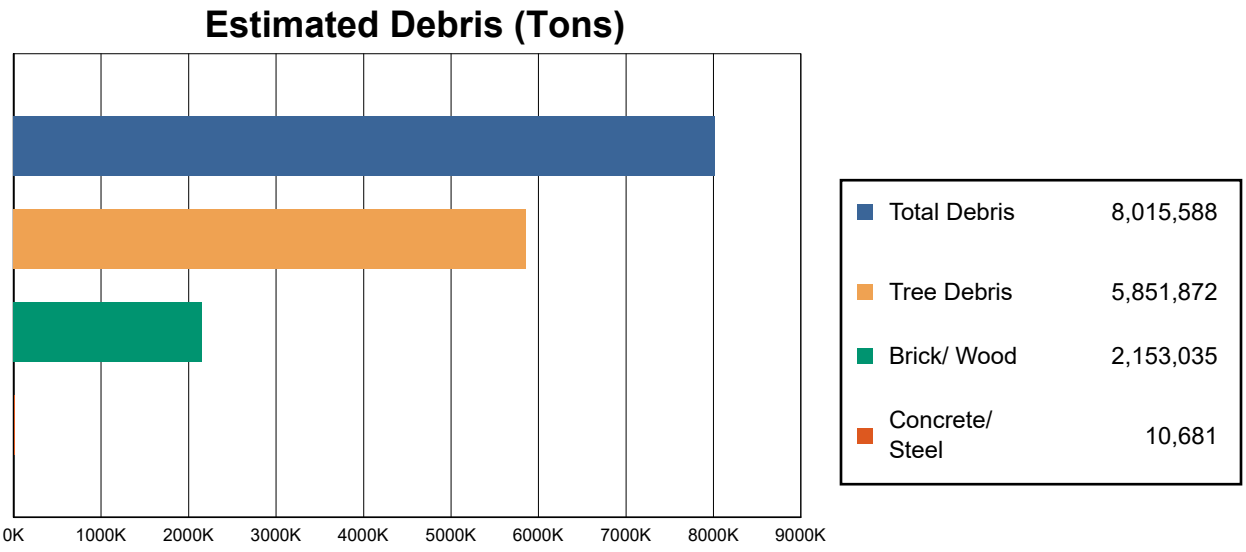


Table 4: Expected Damage to Essential Facilities

		# Facilities		
Classification	Total	Probability of at Least Moderate Damage > 50%	Probability of Complete Damage > 50%	Expected Loss of Use < 1 day
EOCs	174	0	0	174
Fire Stations	569	0	0	569
Hospitals	54	6	0	47
Police Stations	198	0	0	198
Schools	1,350	103	0	268

Induced Hurricane Damage

Debris Generation

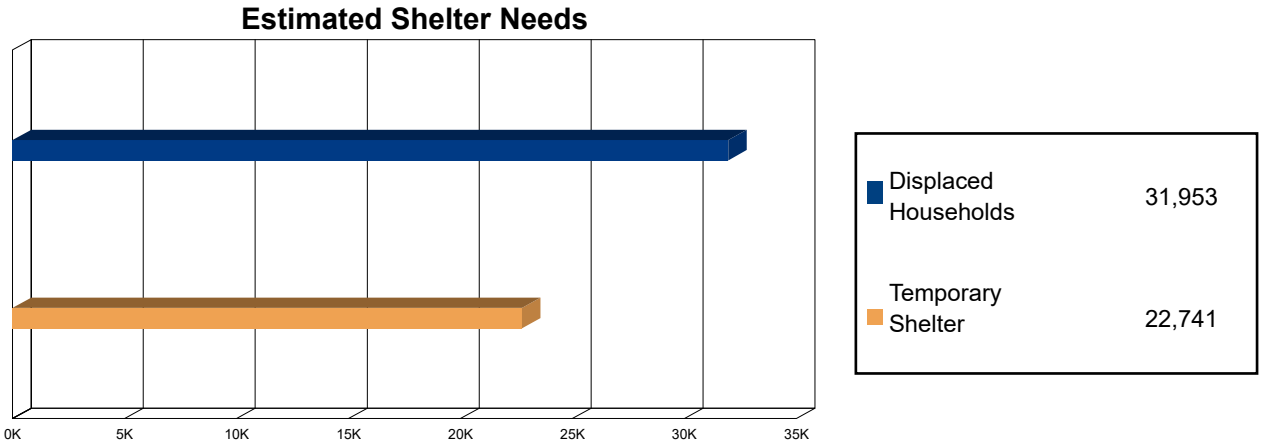


Hazus estimates the amount of debris that will be generated by the hurricane. The model breaks the debris into four general categories: a) Brick/Wood, b) Reinforced Concrete/Steel, c) Eligible Tree Debris, and d) Other Tree Debris. This distinction is made because of the different types of material handling equipment required to handle the debris.

The model estimates that a total of 8,015,588 tons of debris will be generated. Of the total amount, 3,955,589 tons (49%) is Other Tree Debris. Of the remaining 4,059,999 tons, Brick/Wood comprises 53% of the total, Reinforced Concrete/Steel comprises of 0% of the total, with the remainder being Eligible Tree Debris. If the building debris tonnage is converted to an estimated number of truckloads, it will require 86549 truckloads (@25 tons/truck) to remove the building debris generated by the hurricane. The number of Eligible Tree Debris truckloads will depend on how the 1,896,283 tons of Eligible Tree Debris are collected and processed. The volume of tree debris generally ranges from about 4 cubic yards per ton for chipped or compacted tree debris to about 10 cubic yards per ton for bulkier, uncompacted debris.

Social Impact

Shelter Requirement



Hazus estimates the number of households that are expected to be displaced from their homes due to the hurricane and the number of displaced people that will require accommodations in temporary public shelters. The model estimates 31,953 households to be displaced due to the hurricane. Of these, 22,741 people (out of a total population of 3,605,944) will seek temporary shelter in public shelters.

Economic Loss

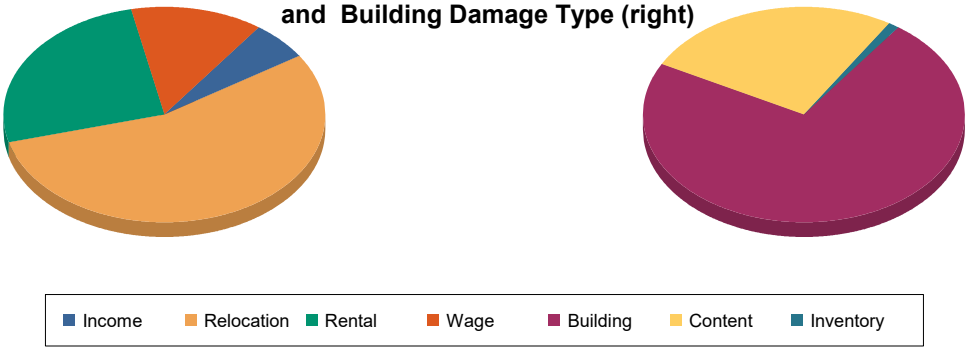
The total economic loss estimated for the hurricane is 35992.3 million dollars, which represents 5.10 % of the total replacement value of the region's buildings.

Building-Related Losses

The building related losses are broken into two categories: direct property damage losses and business interruption losses. The direct property damage losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the hurricane. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the hurricane.

The total property damage losses were 35,992 million dollars. 11% of the estimated losses were related to the business interruption of the region. By far, the largest loss was sustained by the residential occupancies which made up over 72% of the total loss. Table 5 below provides a summary of the losses associated with the building damage.

Loss by Business Interruption Type (left) and Building Damage Type (right)



Loss Type by General Occupancy

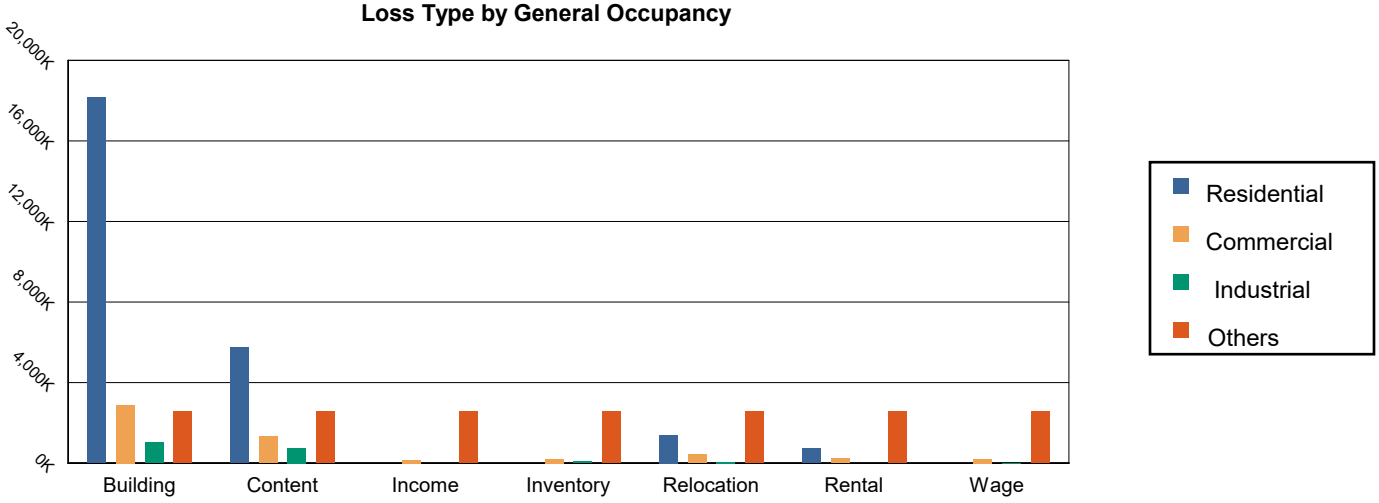


Table 5: Building-Related Economic Loss Estimates

(Thousands of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Property Damage						
	Building	18,149,549.29	2,888,601.47	1,011,992.92	1,281,080.92	23,331,224.60
	Content	5,732,901.58	1,315,218.89	749,039.04	602,192.65	8,399,352.17
	Inventory	0.00	212,128.27	89,579.76	18,041.30	319,749.33
	Subtotal	**23,882,450.87**	**4,415,948.63**	**1,850,611.72**	**1,901,314.88**	**32,050,326.10**
Business Interruption Loss						
	Income	805.82	168,144.01	9,296.23	54,065.36	232,311.41
	Relocation	1,399,640.28	447,545.79	69,249.40	253,532.24	2,169,967.71
	Rental	738,304.62	227,586.33	10,352.71	32,347.64	1,008,591.29
	Wage	1,897.55	203,575.86	15,109.76	310,478.42	531,061.59
	Subtotal	**2,140,648.27**	**1,046,851.99**	**104,008.09**	**650,423.65**	**3,941,932.00**

Total

Total	**26,023,099.14**	**5,462,800.62**	**1,954,619.81**	**2,551,738.53**	**35,992,258.10**

Appendix A: County Listing for the Region

Connecticut

- Fairfield
- Hartford
- Litchfield
- Middlesex
- New Haven
- New London
- Tolland
- Windham

Appendix B: Regional Population and Building Value Data

		Building Value (thousands of dollars)		
	Population	Residential	Non-Residential	Total
Connecticut				
Fairfield	957,419	138,202,527	64,140,539	202,343,066
Hartford	899,498	103,349,824	67,437,454	170,787,278
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Total	**3,605,944**	**450,456,119**	**255,774,915**	**706,231,034**
Study Region Total	**3,605,944**	**450,456,119**	**255,774,915**	**706,231,034**

Hazus: Hurricane Global Risk Report

Region Name: CT_HUR_1960donna

Hurricane Scenario: 1960-DONNA

Print Date: Thursday, April 20, 2023

Disclaimer:
Totals only reflect data for those census tracts/blocks included in the user's study region.

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General Description of the Region

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The hurricane loss estimates provided in this report are based on a region that includes 8 county(ies) from the following state(s):

- Connecticut

Note:
Appendix A contains a complete listing of the counties contained in the region.

The geographical size of the region is 4,990.78 square miles and contains 878 census tracts. There are over 1,418 thousand households in the region and a total population of 3,605,944 people. The distribution of population by State and County is provided in Appendix B.

There are an estimated 1,150 thousand buildings in the region with a total building replacement value (excluding contents) of 706,231 million dollars. Approximately 87% of the buildings (and 64% of the building value) are associated with residential housing.

Building Inventory

General Building Stock

Hazus estimates that there are 1,150,568 buildings in the region which have an aggregate total replacement valu million. Table 1 presents the relative distribution of the value with respect to the general occupancies. Appendix general distribution of the building value by State and County.

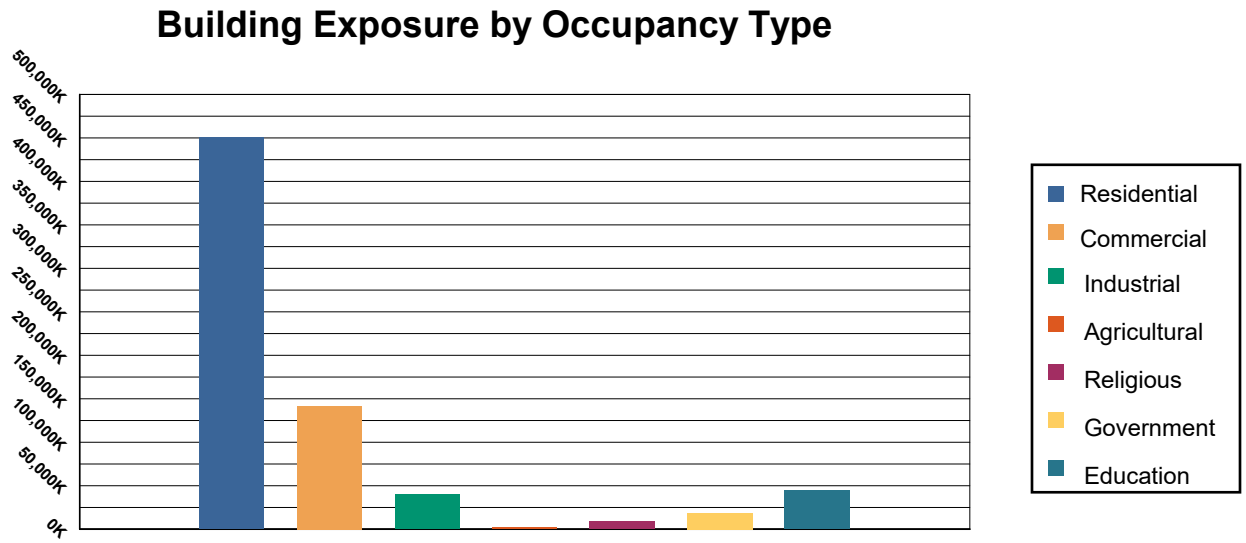


Table 1: Building Exposure by Occupancy Type

Occupancy	Exposure ($1000)	Percent of Tot
Residential	450,456,119	63.78%
Commercial	141,793,008	20.08%
Industrial	39,797,513	5.64%
Agricultural	1,666,239	0.24%
Religious	9,365,213	1.33%
Government	18,574,965	2.63%
Education	44,577,977	6.31%
Total	**706,231,034**	**100.00%**

Essential Facility Inventory

For essential facilities, there are 54 hospitals in the region with a total bed capacity of 10,483 beds. There are 1,350 schools, 569 fire stations, 198 police stations and 174 emergency operation facilities.

Hurricane Scenario

Hazus used the following set of information to define the hurricane parameters for the hurricane loss estimate provided in this report.

Scenario Name:	1960-DONNA
Type:	Historic
Max Peak Gust in Study Region:	96 mph

Building Damage

General Building Stock Damage

Hazus estimates that about 1,756 buildings will be at least moderately damaged. This is over 0% of the total number of buildings in the region. There are an estimated 5 buildings that will be completely destroyed. The definition of the 'damage states' is provided in the Hazus Hurricane technical manual. Table 2 below summarizes the expected damage by general occupancy for the buildings in the region. Table 3 summarizes the expected damage by general building type.

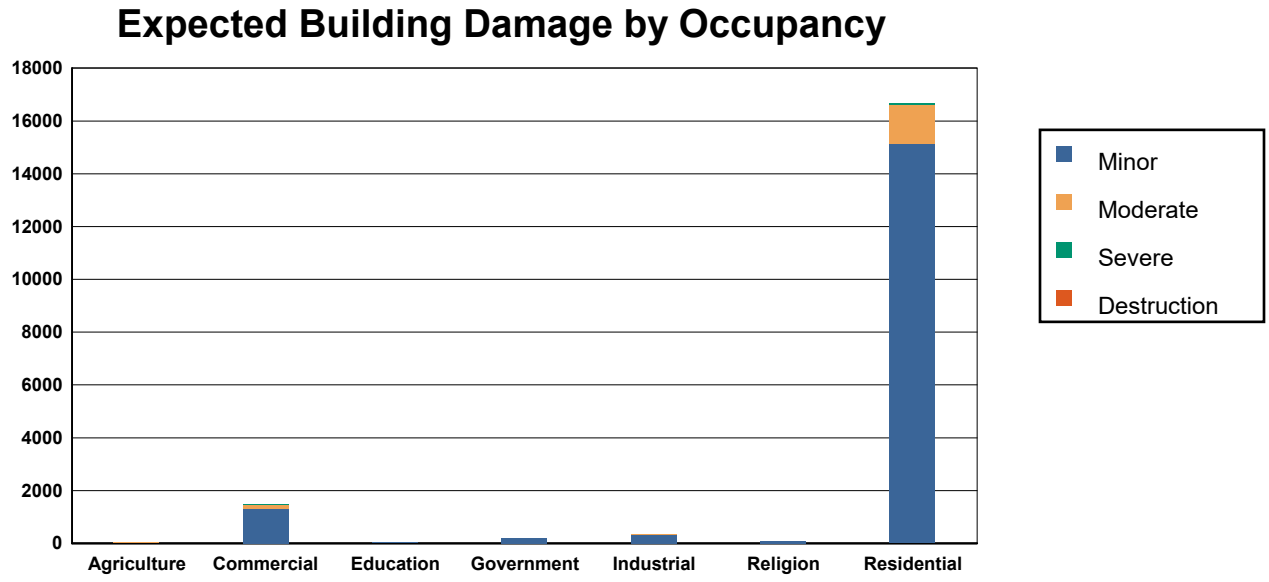


Table 2: Expected Building Damage by Occupancy

	None		Minor		Moderate		Severe		Destruction	
Occupancy	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Agriculture	3,113.17	98.58	39.07	1.24	4.29	0.14	1.42	0.05	0.04	0.00
Commercial	99,420.32	98.54	1,300.58	1.29	159.98	0.16	14.12	0.01	0.00	0.00
Education	2,904.53	98.73	36.45	1.24	1.01	0.03	0.01	0.00	0.00	0.00
Government	14,201.31	98.65	189.56	1.32	5.07	0.04	0.06	0.00	0.00	0.00
Industrial	24,549.30	98.69	308.21	1.24	14.85	0.06	2.59	0.01	0.06	0.00
Religion	6,533.92	98.73	80.69	1.22	3.27	0.05	0.12	0.00	0.00	0.00
Residential	980,993.06	98.33	15,141.71	1.52	1,499.63	0.15	44.95	0.00	4.65	0.00
Total	**1,131,715.60**		**17,096.28**		**1,688.10**		**63.27**		**4.76**	

Table 3: Expected Building Damage by Building Type

Building Type	None		Minor		Moderate		Severe		Destruction	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Concrete	20,213	98.36	325	1.58	11	0.06	0	0.00	0	0.00
Masonry	116,569	97.38	2,577	2.15	540	0.45	16	0.01	0	0.00
MH	6,019	99.59	19	0.31	5	0.08	0	0.00	1	0.02
Steel	73,349	98.57	935	1.26	115	0.15	12	0.02	0	0.00
Wood	916,903	98.65	11,990	1.29	551	0.06	31	0.00	4	0.00

Essential Facility Damage

Before the hurricane, the region had 10,483 hospital beds available for use. On the day of the hurricane, the model estimates that 10,483 hospital beds (100%) are available for use by patients already in the hospital and those injured by the hurricane. After one week, 100% of the beds will be in service. By 30 days, 100% will be operational.

Thematic Map of Essential Facilities

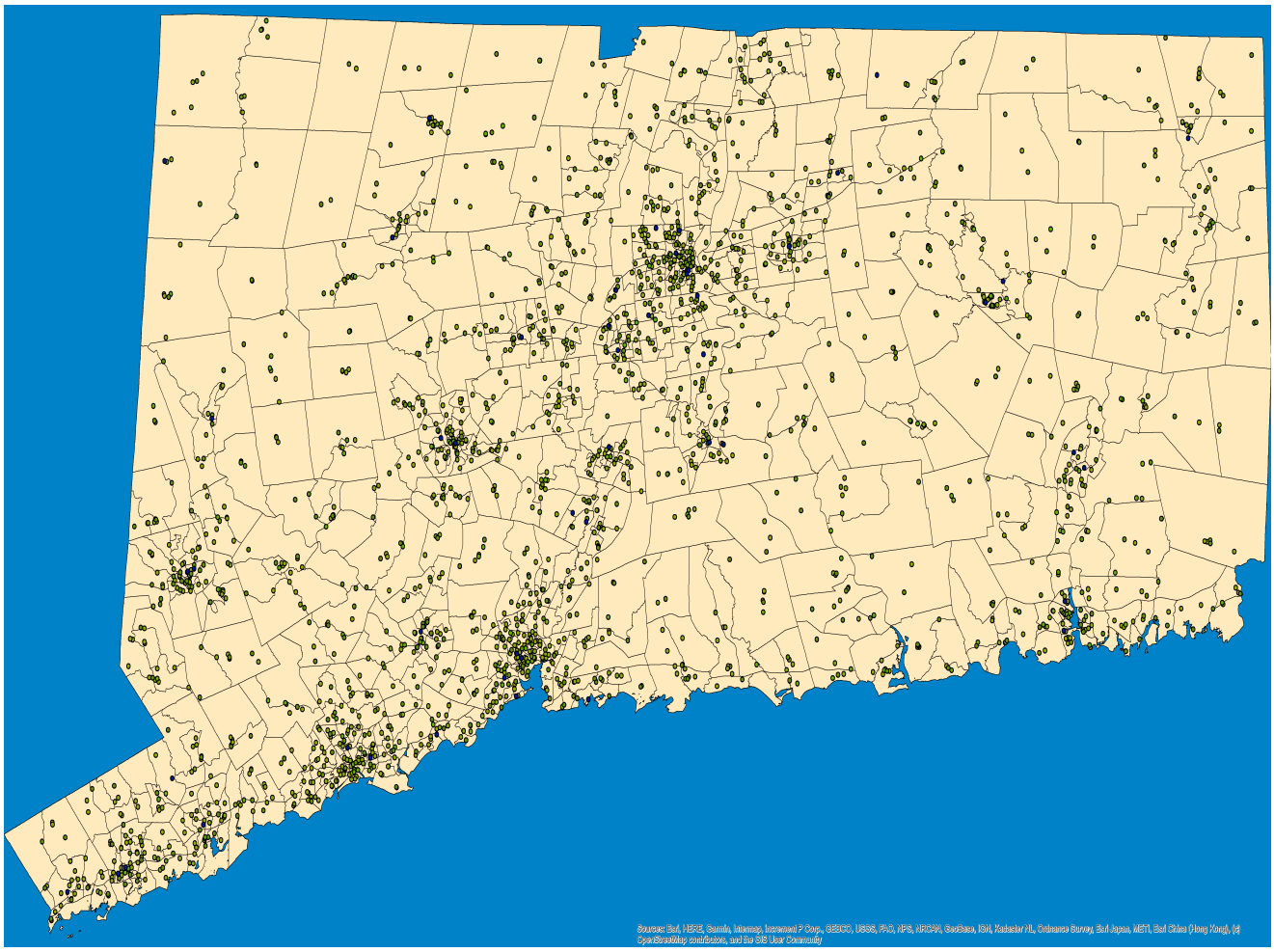
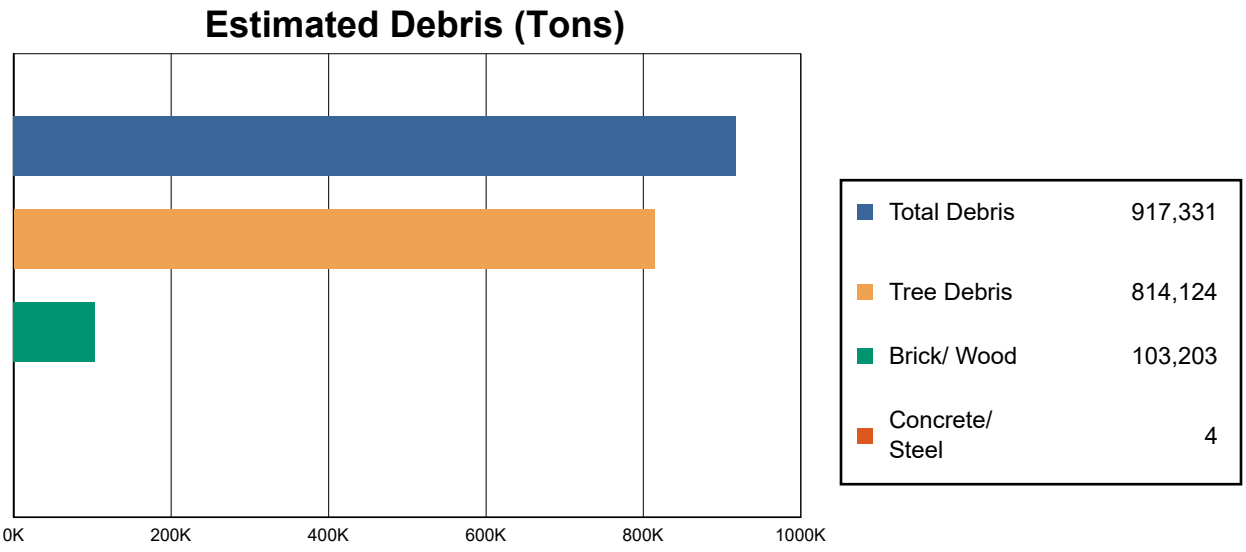


Table 4: Expected Damage to Essential Facilities

Classification	Total	# Facilities		
		Probability of at Least Moderate Damage > 50%	Probability of Complete Damage > 50%	Expected Loss of Use < 1 day
EOCs	174	0	0	174
Fire Stations	569	0	0	569
Hospitals	54	0	0	54
Police Stations	198	0	0	198
Schools	1,350	0	0	1,350

Induced Hurricane Damage

Debris Generation

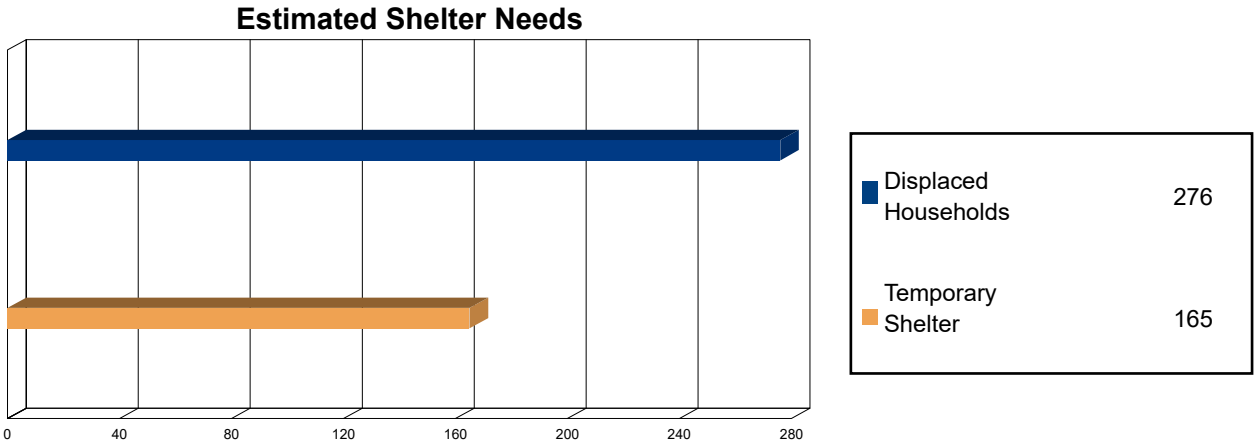


Hazus estimates the amount of debris that will be generated by the hurricane. The model breaks the debris into four general categories: a) Brick/Wood, b) Reinforced Concrete/Steel, c) Eligible Tree Debris, and d) Other Tree Debris. This distinction is made because of the different types of material handling equipment required to handle the debris.

The model estimates that a total of 917,331 tons of debris will be generated. Of the total amount, 635,929 tons (69%) is Other Tree Debris. Of the remaining 281,402 tons, Brick/Wood comprises 37% of the total, Reinforced Concrete/Steel comprises of 0% of the total, with the remainder being Eligible Tree Debris. If the building debris tonnage is converted to an estimated number of truckloads, it will require 4128 truckloads (@25 tons/truck) to remove the building debris generated by the hurricane. The number of Eligible Tree Debris truckloads will depend on how the 178,195 tons of Eligible Tree Debris are collected and processed. The volume of tree debris generally ranges from about 4 cubic yards per ton for chipped or compacted tree debris to about 10 cubic yards per ton for bulkier, uncompacted debris.

Social Impact

Shelter Requirement



Hazus estimates the number of households that are expected to be displaced from their homes due to the hurricane and the number of displaced people that will require accommodations in temporary public shelters. The model estimates 276 households to be displaced due to the hurricane. Of these, 165 people (out of a total population of 3,605,944) will seek temporary shelter in public shelters.

Economic Loss

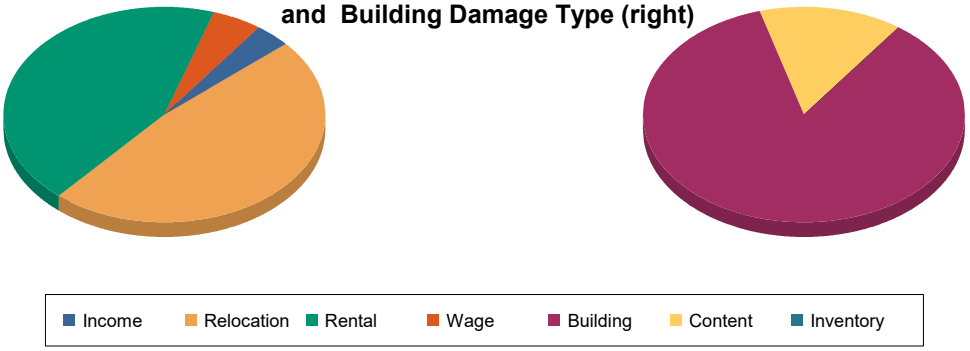
The total economic loss estimated for the hurricane is 1410.2 million dollars, which represents 0.20 % of the total replacement value of the region's buildings.

Building-Related Losses

The building related losses are broken into two categories: direct property damage losses and business interruption losses. The direct property damage losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the hurricane. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the hurricane.

The total property damage losses were 1,410 million dollars. 5% of the estimated losses were related to the business interruption of the region. By far, the largest loss was sustained by the residential occupancies which made up over 92% of the total loss. Table 5 below provides a summary of the losses associated with the building damage.

Loss by Business Interruption Type (left) and Building Damage Type (right)



Loss Type by General Occupancy

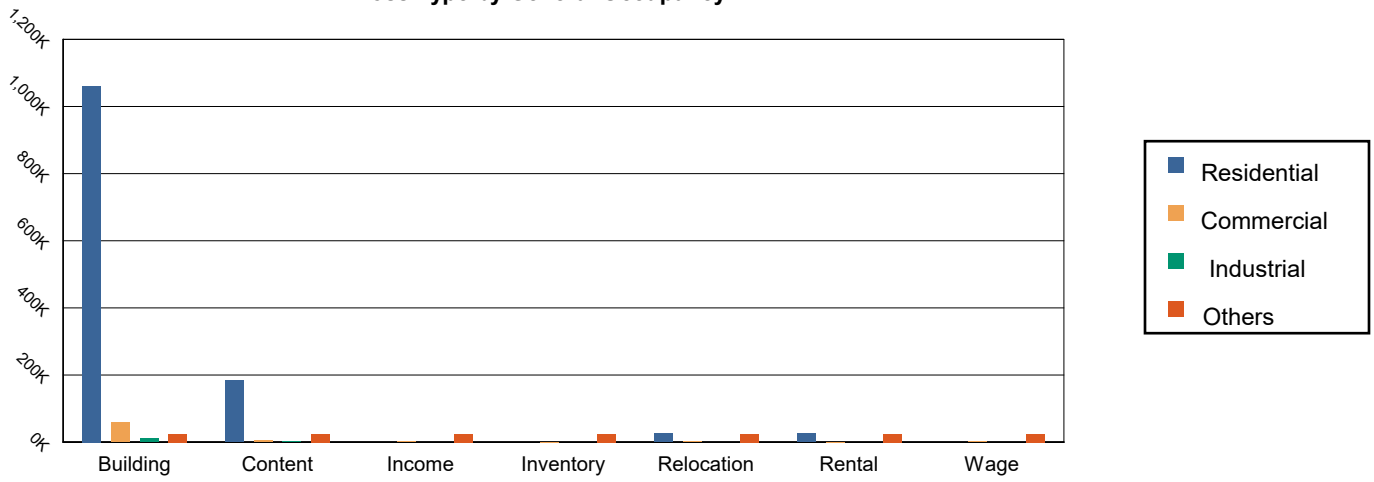


Table 5: Building-Related Economic Loss Estimates

(Thousands of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Property Damage						
	Building	1,060,901.39	58,403.28	11,800.01	22,020.28	1,153,124.96
	Content	183,844.99	5,478.38	1,817.84	709.96	191,851.18
	Inventory	0.00	925.43	235.74	120.65	1,281.82
	Subtotal	**1,244,746.38**	**64,807.10**	**13,853.59**	**22,850.89**	**1,346,257.96**
Business Interruption Loss						
	Income	0.00	1,970.60	25.24	397.28	2,393.11
	Relocation	26,780.10	2,998.24	159.21	500.43	30,437.98
	Rental	26,874.48	1,023.85	17.83	38.35	27,954.53
	Wage	0.00	1,623.15	41.72	1,456.92	3,121.79
	Subtotal	**53,654.58**	**7,615.84**	**244.00**	**2,392.99**	**63,907.41**

Total

Total	**1,298,400.96**	**72,422.94**	**14,097.59**	**25,243.88**	**1,410,165.37**

Appendix A: County Listing for the Region

Connecticut

- Fairfield
- Hartford
- Litchfield
- Middlesex
- New Haven
- New London
- Tolland
- Windham

Appendix B: Regional Population and Building Value Data

		Building Value (thousands of dollars)		
	Population	Residential	Non-Residential	Total
Connecticut				
Fairfield	957,419	138,202,527	64,140,539	202,343,066
Hartford	899,498	103,349,824	67,437,454	170,787,278
Litchfield	185,186	28,643,320	14,484,815	43,128,135
Middlesex	164,245	22,031,593	10,973,115	33,004,708
New Haven	864,835	92,892,604	61,159,705	154,052,309
New London	268,555	32,865,080	18,760,781	51,625,861
Tolland	149,788	19,496,288	9,789,702	29,285,990
Windham	116,418	12,974,883	9,028,804	22,003,687
Total	**3,605,944**	**450,456,119**	**255,774,915**	**706,231,034**
Study Region Total	**3,605,944**	**450,456,119**	**255,774,915**	**706,231,034**

Hazus: Hurricane Global Risk Report

Region Name: CT_HUR_1985gloria

Hurricane Scenario: 1985-GLORIA

Print Date: Tuesday, April 18, 2023

Disclaimer:
Totals only reflect data for those census tracts/blocks included in the user's study region.

The estimates of social and economic impacts contained in this report were produced using Hazus loss estimation methodology software which is based on current scientific and engineering knowledge. There are uncertainties inherent in any loss estimation technique. Therefore, there may be significant differences between the modeled results contained in this report and the actual social and economic losses following a specific Hurricane. These results can be improved by using enhanced inventory data.

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General Description of the Region

Hazus is a regional multi-hazard loss estimation model that was developed by the Federal Emergency Management Agency and the National Institute of Building Sciences. The primary purpose of Hazus is to provide a methodology and software application to develop multi-hazard losses at a regional scale. These loss estimates would be used primarily by local, state and regional officials to plan and stimulate efforts to reduce risks from multi-hazards and to prepare for emergency response and recovery.

The hurricane loss estimates provided in this report are based on a region that includes 8 county(ies) from the following state(s):

- Connecticut

Note:
Appendix A contains a complete listing of the counties contained in the region.

The geographical size of the region is 4,990.78 square miles and contains 878 census tracts. There are over 1,418 thousand households in the region and a total population of 3,605,944 people. The distribution of population by State and County is provided in Appendix B.

There are an estimated 1,150 thousand buildings in the region with a total building replacement value (excluding contents) of 706,231 million dollars. Approximately 87% of the buildings (and 64% of the building value) are associated with residential housing.

Building Inventory

General Building Stock

Hazus estimates that there are 1,150,568 buildings in the region which have an aggregate total replacement valu million. Table 1 presents the relative distribution of the value with respect to the general occupancies. Appendix general distribution of the building value by State and County.

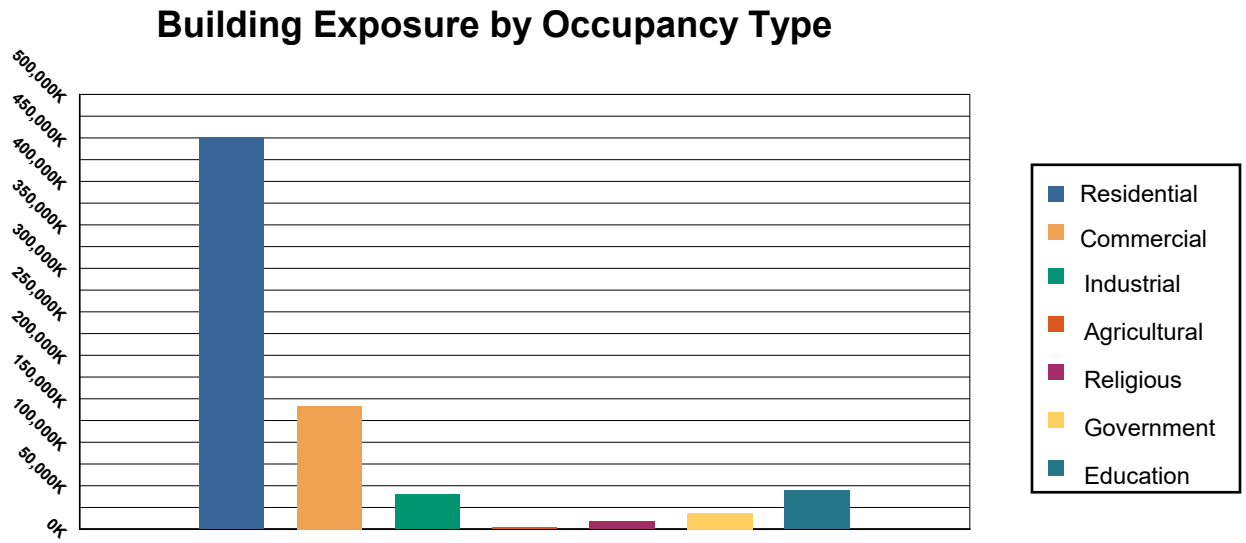


Table 1: Building Exposure by Occupancy Type

Occupancy	Exposure ($1000)	Percent of Tot
Residential	450,456,119	63.78%
Commercial	141,793,008	20.08%
Industrial	39,797,513	5.64%
Agricultural	1,666,239	0.24%
Religious	9,365,213	1.33%
Government	18,574,965	2.63%
Education	44,577,977	6.31%
Total	**706,231,034**	**100.00%**

Essential Facility Inventory

For essential facilities, there are 54 hospitals in the region with a total bed capacity of 10,483 beds. There are 1,350 schools, 569 fire stations, 198 police stations and 174 emergency operation facilities.

Hurricane Scenario

Hazus used the following set of information to define the hurricane parameters for the hurricane loss estimate provided in this report.

Scenario Name:	1985-GLORIA
Type:	Historic
Max Peak Gust in Study Region:	94 mph

Building Damage

General Building Stock Damage

Hazus estimates that about 2,133 buildings will be at least moderately damaged. This is over 0% of the total number of buildings in the region. There are an estimated 4 buildings that will be completely destroyed. The definition of the 'damage states' is provided in the Hazus Hurricane technical manual. Table 2 below summarizes the expected damage by general occupancy for the buildings in the region. Table 3 summarizes the expected damage by general building type.

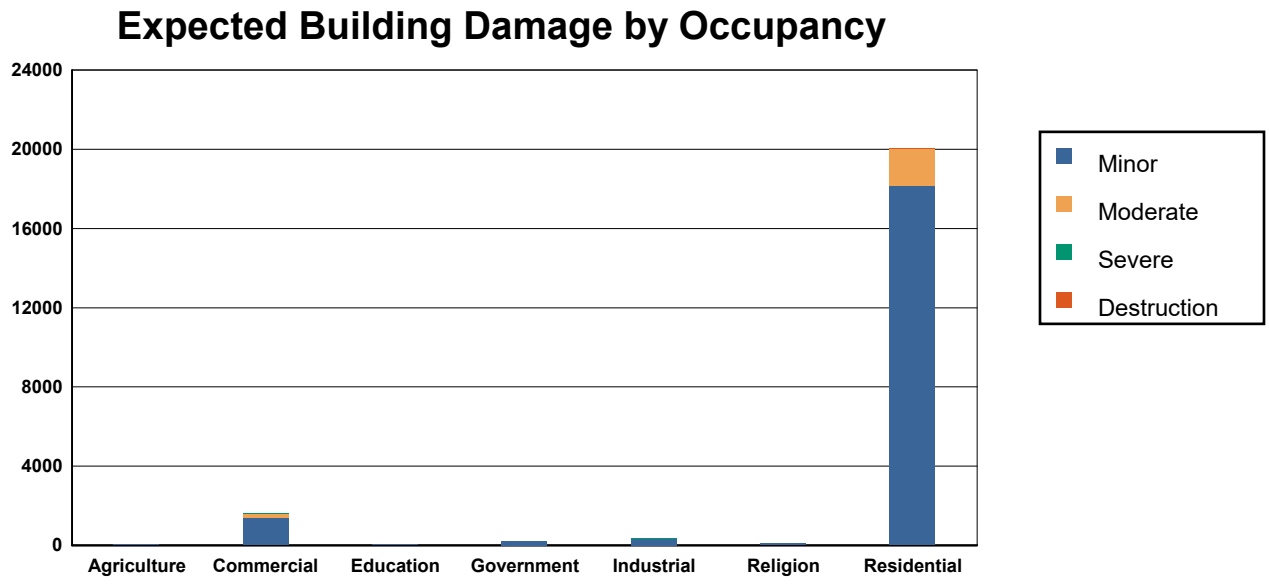


Table 2: Expected Building Damage by Occupancy

	None		Minor		Moderate		Severe		Destruction	
Occupancy	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Agriculture	3,106.68	98.37	43.94	1.39	5.44	0.17	1.89	0.06	0.05	0.00
Commercial	99,279.43	98.40	1,408.63	1.40	188.79	0.19	18.16	0.02	0.00	0.00
Education	2,899.60	98.56	41.07	1.40	1.32	0.04	0.00	0.00	0.00	0.00
Government	14,183.50	98.52	206.82	1.44	5.67	0.04	0.02	0.00	0.00	0.00
Industrial	24,513.78	98.55	337.34	1.36	19.87	0.08	3.93	0.02	0.09	0.00
Religion	6,525.81	98.61	88.76	1.34	3.24	0.05	0.20	0.00	0.00	0.00
Residential	977,622.89	97.99	18,177.17	1.82	1,834.16	0.18	46.32	0.00	3.47	0.00
Total	**1,128,131.70**		**20,303.71**		**2,058.48**		**70.52**		**3.61**	

Table 3: Expected Building Damage by Building Type

Building Type	None		Minor		Moderate		Severe		Destruction	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Concrete	20,194	98.27	343	1.67	12	0.06	0	0.00	0	0.00
Masonry	116,281	97.14	2,756	2.30	646	0.54	19	0.02	0	0.00
MH	6,019	99.58	19	0.31	5	0.08	0	0.00	2	0.03
Steel	73,260	98.45	998	1.34	137	0.18	16	0.02	0	0.00
Wood	913,877	98.32	14,889	1.60	675	0.07	33	0.00	3	0.00

Essential Facility Damage

Before the hurricane, the region had 10,483 hospital beds available for use. On the day of the hurricane, the model estimates that 10,483 hospital beds (100%) are available for use by patients already in the hospital and those injured by the hurricane. After one week, 100% of the beds will be in service. By 30 days, 100% will be operational.

Thematic Map of Essential Facilities

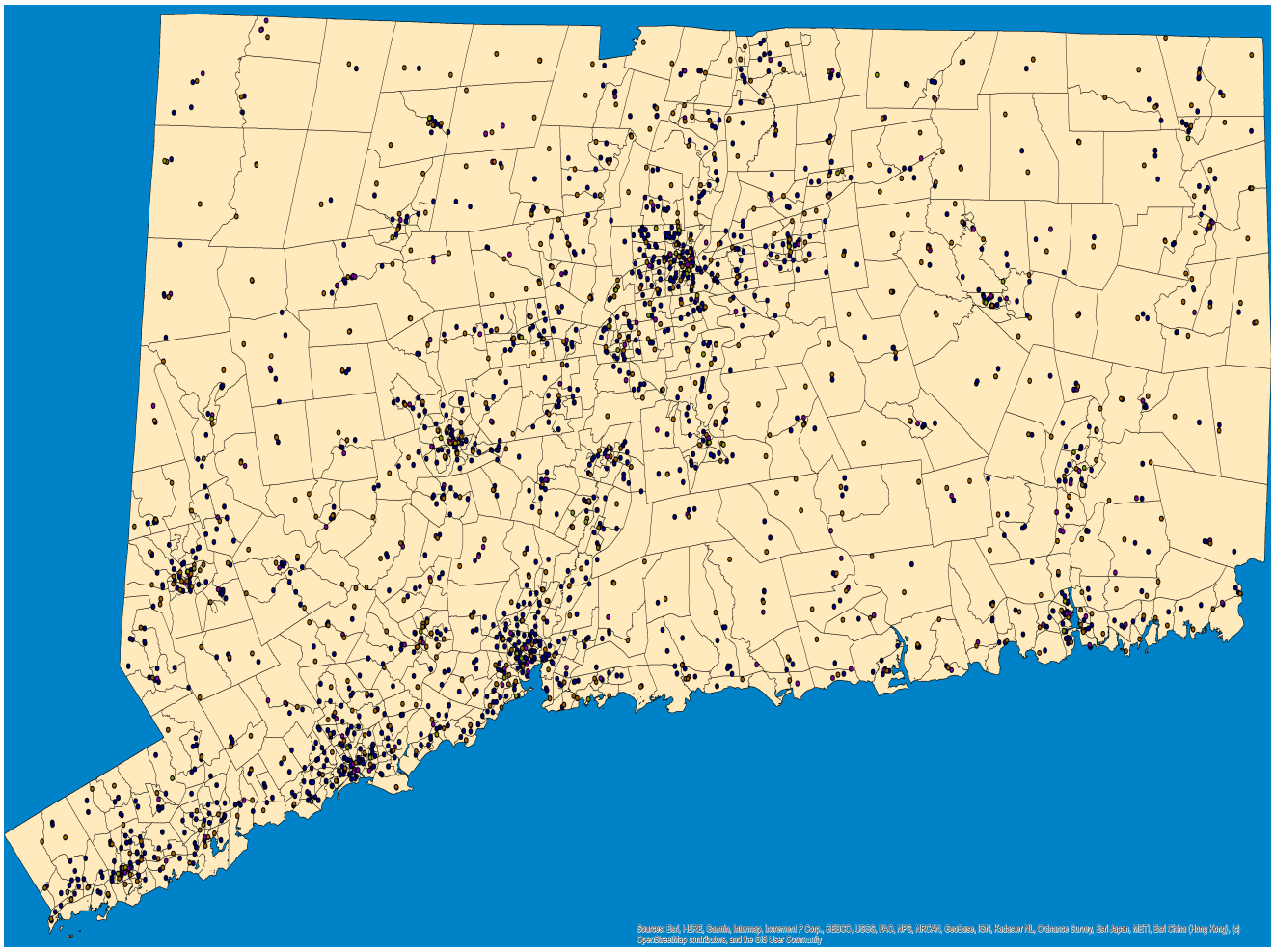
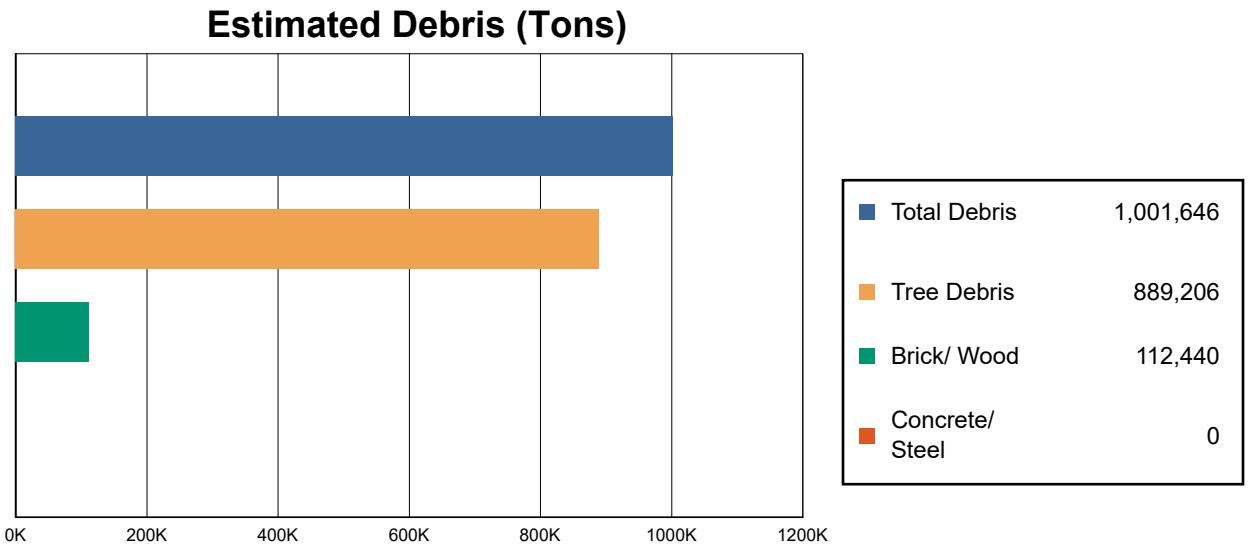


Table 4: Expected Damage to Essential Facilities

		# Facilities		
Classification	Total	Probability of at Least Moderate Damage > 50%	Probability of Complete Damage > 50%	Expected Loss of Use < 1 day
EOCs	174	0	0	174
Fire Stations	569	0	0	569
Hospitals	54	0	0	54
Police Stations	198	0	0	198
Schools	1,350	0	0	1,350

Induced Hurricane Damage

Debris Generation

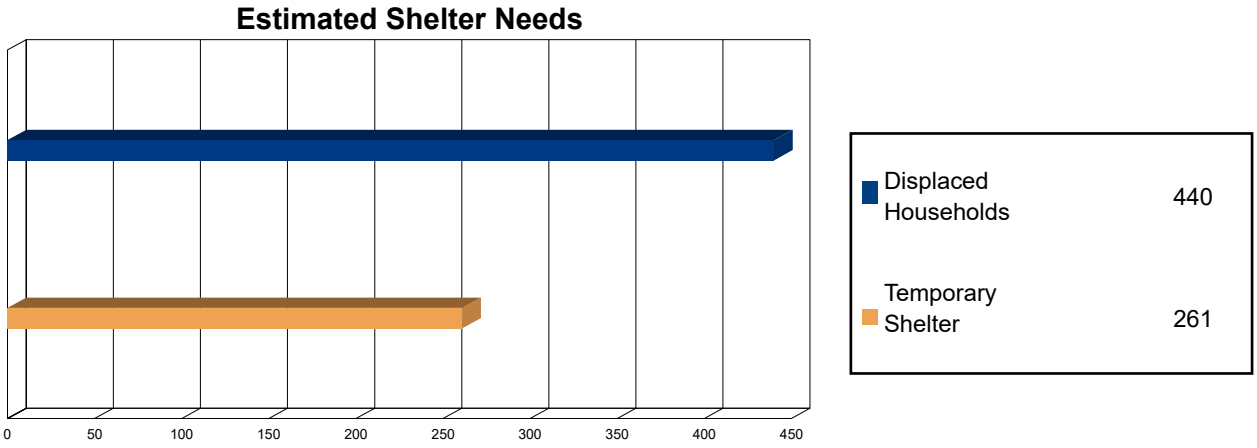


Hazus estimates the amount of debris that will be generated by the hurricane. The model breaks the debris into four general categories: a) Brick/Wood, b) Reinforced Concrete/Steel, c) Eligible Tree Debris, and d) Other Tree Debris. This distinction is made because of the different types of material handling equipment required to handle the debris.

The model estimates that a total of 1,001,646 tons of debris will be generated. Of the total amount, 676,039 tons (67%) is Other Tree Debris. Of the remaining 325,607 tons, Brick/Wood comprises 35% of the total, Reinforced Concrete/Steel comprises of 0% of the total, with the remainder being Eligible Tree Debris. If the building debris tonnage is converted to an estimated number of truckloads, it will require 4498 truckloads (@25 tons/truck) to remove the building debris generated by the hurricane. The number of Eligible Tree Debris truckloads will depend on how the 213,167 tons of Eligible Tree Debris are collected and processed. The volume of tree debris generally ranges from about 4 cubic yards per ton for chipped or compacted tree debris to about 10 cubic yards per ton for bulkier, uncompacted debris.

Social Impact

Shelter Requirement



Hazus estimates the number of households that are expected to be displaced from their homes due to the hurricane and the number of displaced people that will require accommodations in temporary public shelters. The model estimates 440 households to be displaced due to the hurricane. Of these, 261 people (out of a total population of 3,605,944) will seek temporary shelter in public shelters.

Economic Loss

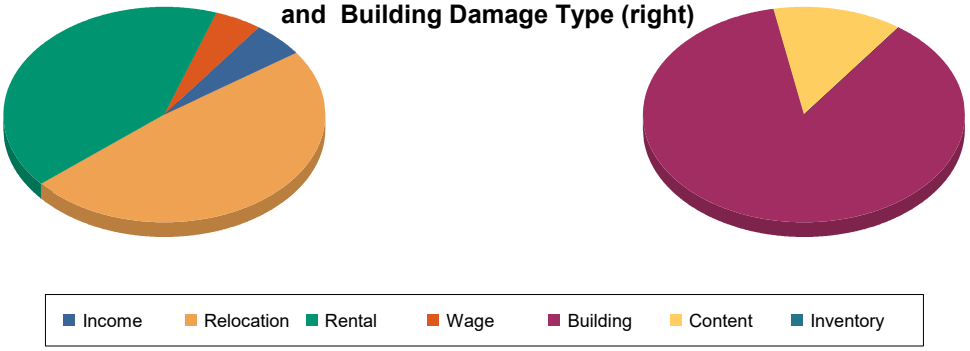
The total economic loss estimated for the hurricane is 1446.5 million dollars, which represents 0.20 % of the total replacement value of the region's buildings.

Building-Related Losses

The building related losses are broken into two categories: direct property damage losses and business interruption losses. The direct property damage losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the hurricane. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the hurricane.

The total property damage losses were 1,447 million dollars. 5% of the estimated losses were related to the business interruption of the region. By far, the largest loss was sustained by the residential occupancies which made up over 91% of the total loss. Table 5 below provides a summary of the losses associated with the building damage.

Loss by Business Interruption Type (left) and Building Damage Type (right)



Loss Type by General Occupancy

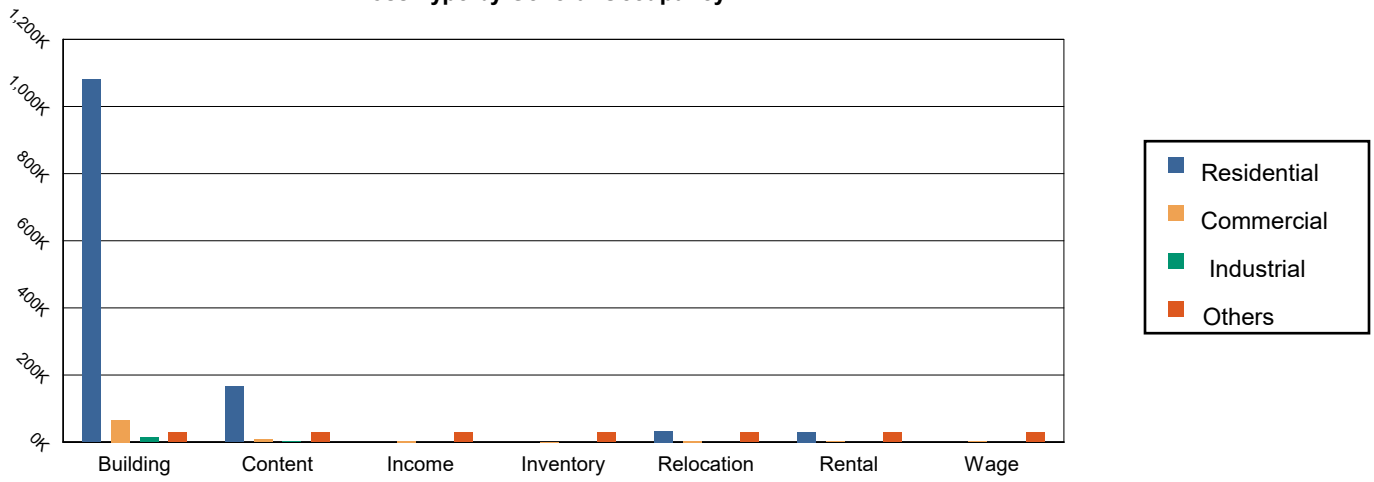


Table 5: Building-Related Economic Loss Estimates

(Thousands of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Property Damage						
	Building	1,080,730.47	65,856.55	14,719.65	25,776.89	1,187,083.56
	Content	166,331.69	7,756.50	2,939.57	1,171.73	178,199.49
	Inventory	0.00	1,342.68	376.22	152.31	1,871.21
	Subtotal	**1,247,062.16**	**74,955.73**	**18,035.44**	**27,100.93**	**1,367,154.26**
Business Interruption Loss						
	Income	0.00	3,641.32	32.34	479.80	4,153.46
	Relocation	33,403.23	4,406.24	215.69	568.97	38,594.12
	Rental	31,057.36	1,780.42	21.98	38.82	32,898.59
	Wage	0.00	2,356.85	53.62	1,310.59	3,721.06
	Subtotal	**64,460.60**	**12,184.82**	**323.63**	**2,398.18**	**79,367.23**

Total

Total	**1,311,522.75**	**87,140.55**	**18,359.07**	**29,499.11**	**1,446,521.49**

Appendix A: County Listing for the Region

Connecticut

- Fairfield
- Hartford
- Litchfield
- Middlesex
- New Haven
- New London
- Tolland
- Windham

Appendix B: Regional Population and Building Value Data

		Building Value (thousands of dollars)		
	Population	Residential	Non-Residential	Total
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Hazus: Hurricane Global Risk Report

Region Name: CT_HUR_2020isaias

Hurricane Scenario: 2020-ISAIAS

Print Date: Thursday, April 20, 2023

Disclaimer:
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There are an estimated 1,150 thousand buildings in the region with a total building replacement value (excluding contents) of 706,231 million dollars. Approximately 87% of the buildings (and 64% of the building value) are associated with residential housing.

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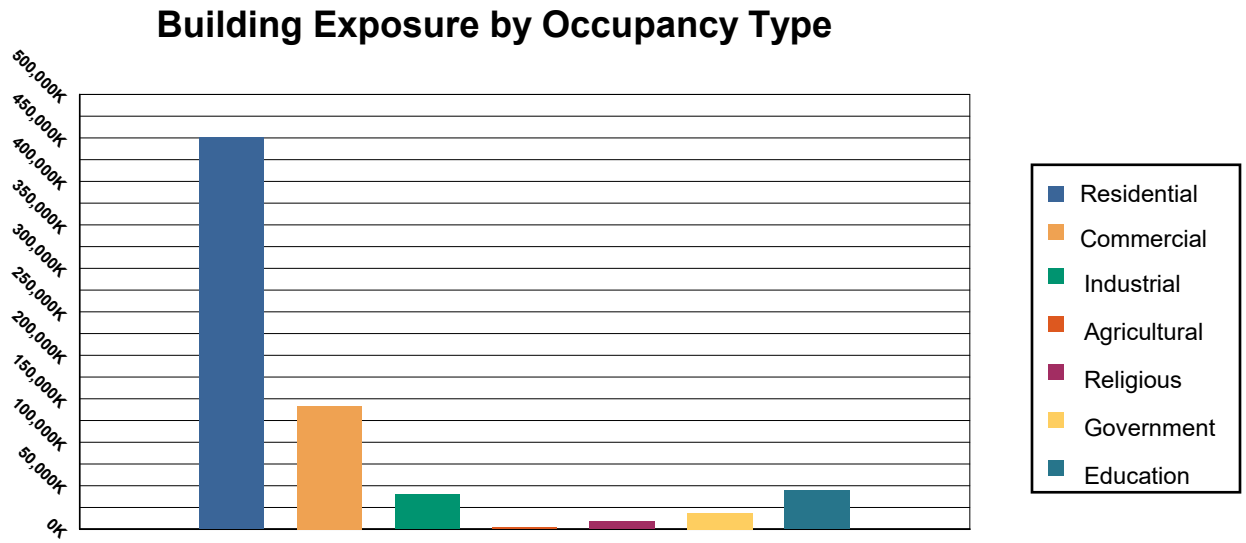


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Occupancy	Exposure ($1000)	Percent of Tot
Residential	450,456,119	63.78%
Commercial	141,793,008	20.08%
Industrial	39,797,513	5.64%
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Total	**706,231,034**	**100.00%**

Essential Facility Inventory

For essential facilities, there are 54 hospitals in the region with a total bed capacity of 10,483 beds. There are 1,350 schools, 569 fire stations, 198 police stations and 174 emergency operation facilities.

Hurricane Scenario

Hazus used the following set of information to define the hurricane parameters for the hurricane loss estimate provided in this report.

Scenario Name:	2020-ISAIAS
Type:	Historic
Max Peak Gust in Study Region:	68 mph

Building Damage

General Building Stock Damage

Hazus estimates that about 53 buildings will be at least moderately damaged. This is over 0% of the total number of buildings in the region. There are an estimated 0 buildings that will be completely destroyed. The definition of the 'damage states' is provided in the Hazus Hurricane technical manual. Table 2 below summarizes the expected damage by general occupancy for the buildings in the region. Table 3 summarizes the expected damage by general building type.

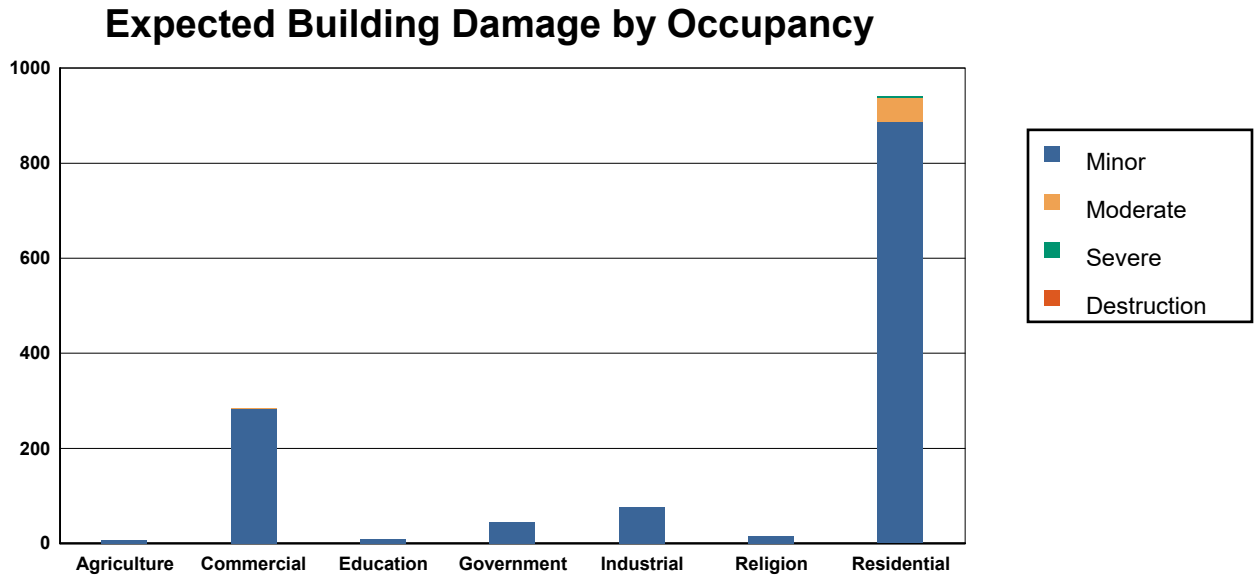


Table 2: Expected Building Damage by Occupancy

	None		Minor		Moderate		Severe		Destruction	
Occupancy	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Agriculture	3,151.38	99.79	6.58	0.21	0.04	0.00	0.00	0.00	0.00	0.00
Commercial	100,611.32	99.72	282.80	0.28	0.87	0.00	0.00	0.00	0.00	0.00
Education	2,933.34	99.71	8.66	0.29	0.00	0.00	0.00	0.00	0.00	0.00
Government	14,351.89	99.69	44.11	0.31	0.00	0.00	0.00	0.00	0.00	0.00
Industrial	24,798.83	99.69	76.17	0.31	0.00	0.00	0.00	0.00	0.00	0.00
Religion	6,602.33	99.76	15.54	0.23	0.12	0.00	0.00	0.00	0.00	0.00
Residential	996,743.87	99.91	887.98	0.09	49.97	0.01	2.18	0.00	0.00	0.00
Total	**1,149,192.97**		**1,321.84**		**51.00**		**2.18**		**0.00**	

Table 3: Expected Building Damage by Building Type

Building Type	None		Minor		Moderate		Severe		Destruction	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Concrete	20,472	99.62	77	0.38	0	0.00	0	0.00	0	0.00
Masonry	119,167	99.55	518	0.43	15	0.01	2	0.00	0	0.00
MH	6,044	100.00	0	0.00	0	0.00	0	0.00	0	0.00
Steel	74,182	99.69	228	0.31	0	0.00	0	0.00	0	0.00
Wood	929,175	99.97	276	0.03	26	0.00	1	0.00	0	0.00

Essential Facility Damage

Before the hurricane, the region had 10,483 hospital beds available for use. On the day of the hurricane, the model estimates that 10,483 hospital beds (100%) are available for use by patients already in the hospital and those injured by the hurricane. After one week, 100% of the beds will be in service. By 30 days, 100% will be operational.

Thematic Map of Essential Facilities

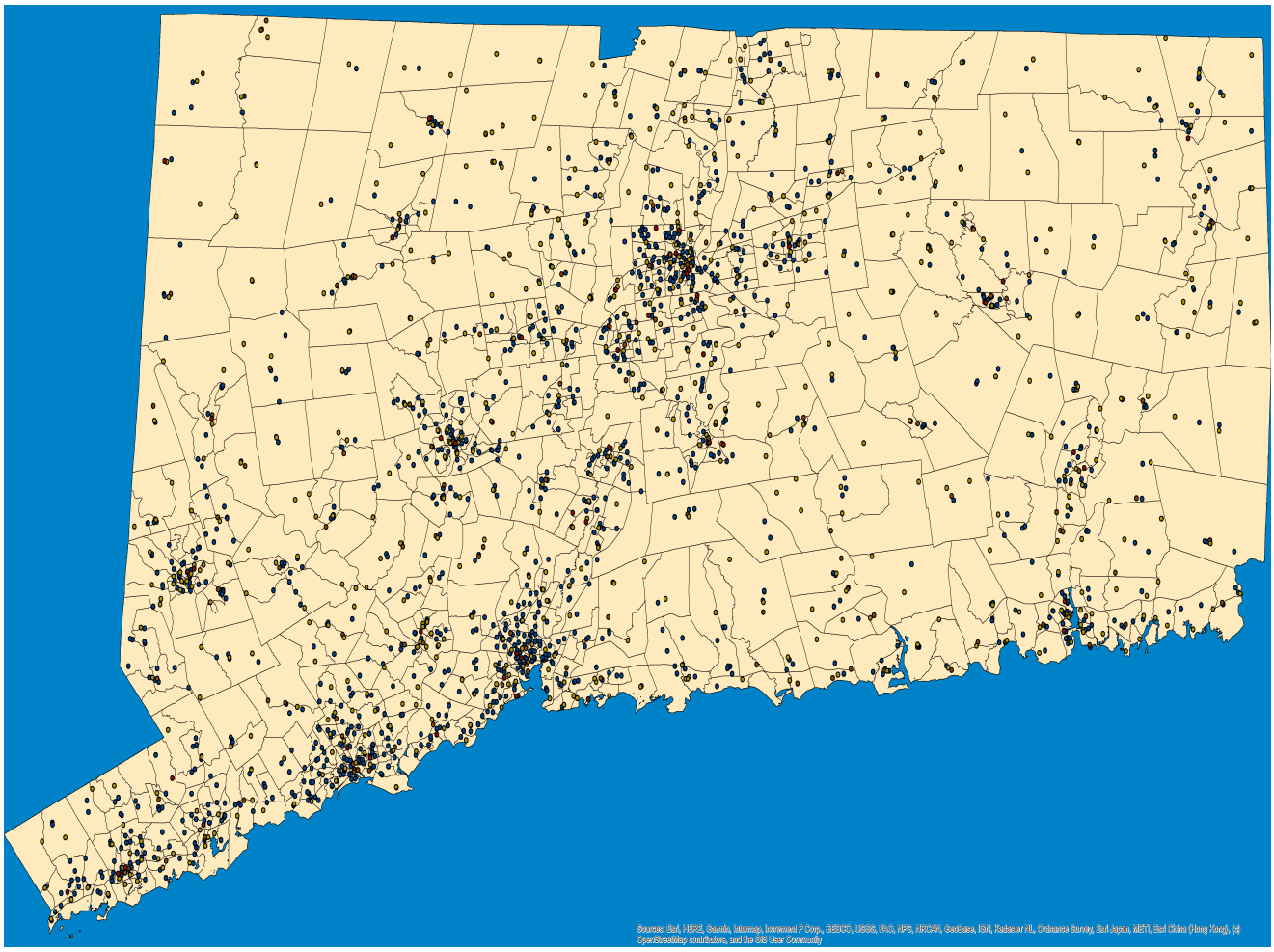
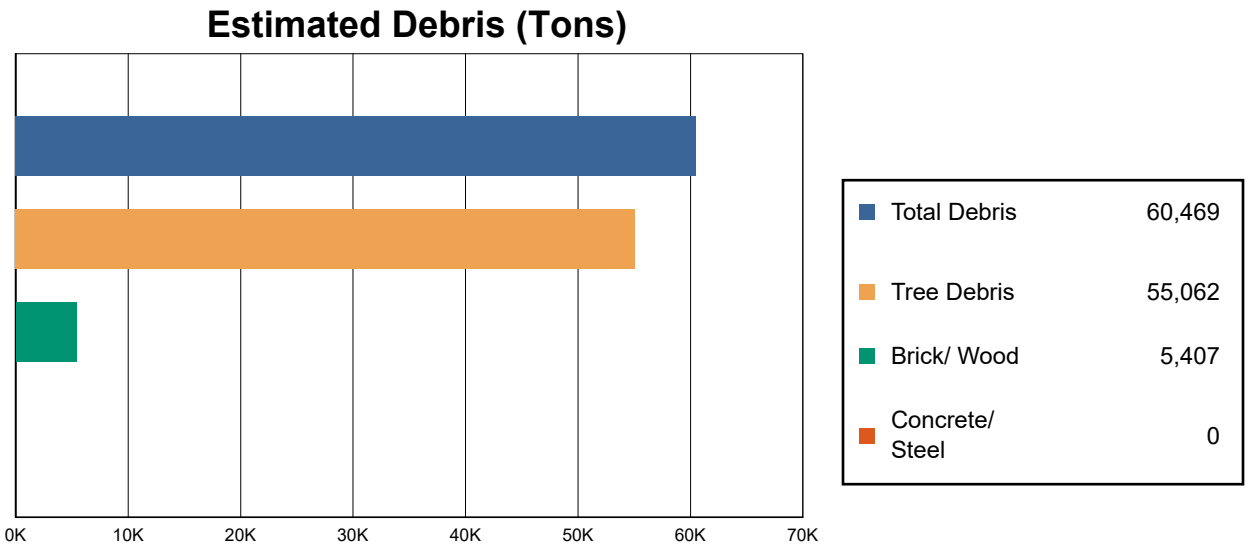


Table 4: Expected Damage to Essential Facilities

Classification	Total	# Facilities		
		Probability of at Least Moderate Damage > 50%	Probability of Complete Damage > 50%	Expected Loss of Use < 1 day
EOCs	174	0	0	174
Fire Stations	569	0	0	569
Hospitals	54	0	0	54
Police Stations	198	0	0	198
Schools	1,350	0	0	1,350

Induced Hurricane Damage

Debris Generation

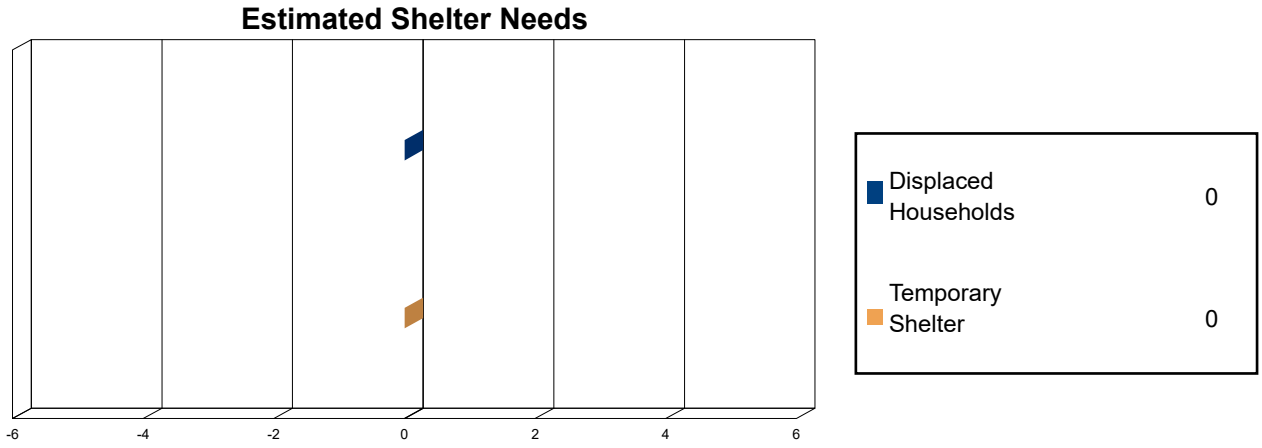


Hazus estimates the amount of debris that will be generated by the hurricane. The model breaks the debris into four general categories: a) Brick/Wood, b) Reinforced Concrete/Steel, c) Eligible Tree Debris, and d) Other Tree Debris. This distinction is made because of the different types of material handling equipment required to handle the debris.

The model estimates that a total of 60,469 tons of debris will be generated. Of the total amount, 42,298 tons (70%) is Other Tree Debris. Of the remaining 18,171 tons, Brick/Wood comprises 30% of the total, Reinforced Concrete/Steel comprises of 0% of the total, with the remainder being Eligible Tree Debris. If the building debris tonnage is converted to an estimated number of truckloads, it will require 216 truckloads (@25 tons/truck) to remove the building debris generated by the hurricane. The number of Eligible Tree Debris truckloads will depend on how the 12,764 tons of Eligible Tree Debris are collected and processed. The volume of tree debris generally ranges from about 4 cubic yards per ton for chipped or compacted tree debris to about 10 cubic yards per ton for bulkier, uncompacted debris.

Social Impact

Shelter Requirement



Hazus estimates the number of households that are expected to be displaced from their homes due to the hurricane and the number of displaced people that will require accommodations in temporary public shelters. The model estimates 0 households to be displaced due to the hurricane. Of these, 0 people (out of a total population of 3,605,944) will seek temporary shelter in public shelters.

Economic Loss

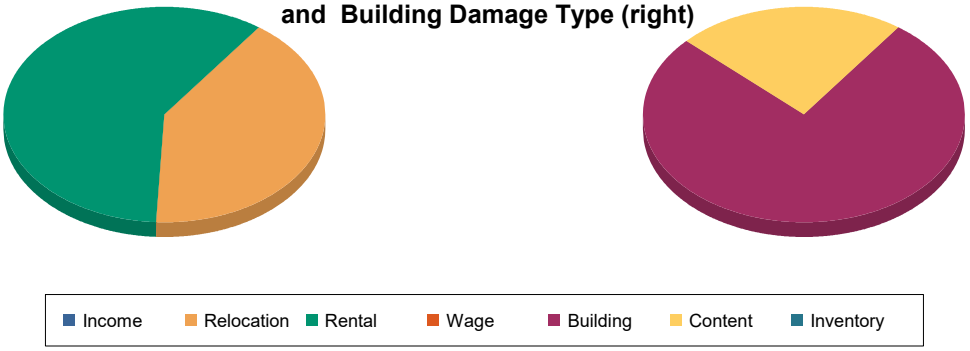
The total economic loss estimated for the hurricane is 158.4 million dollars, which represents 0.02 % of the total replacement value of the region's buildings.

Building-Related Losses

The building related losses are broken into two categories: direct property damage losses and business interruption losses. The direct property damage losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the hurricane. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the hurricane.

The total property damage losses were 158 million dollars. 1% of the estimated losses were related to the business interruption of the region. By far, the largest loss was sustained by the residential occupancies which made up over 92% of the total loss. Table 5 below provides a summary of the losses associated with the building damage.

Loss by Business Interruption Type (left) and Building Damage Type (right)



Loss Type by General Occupancy

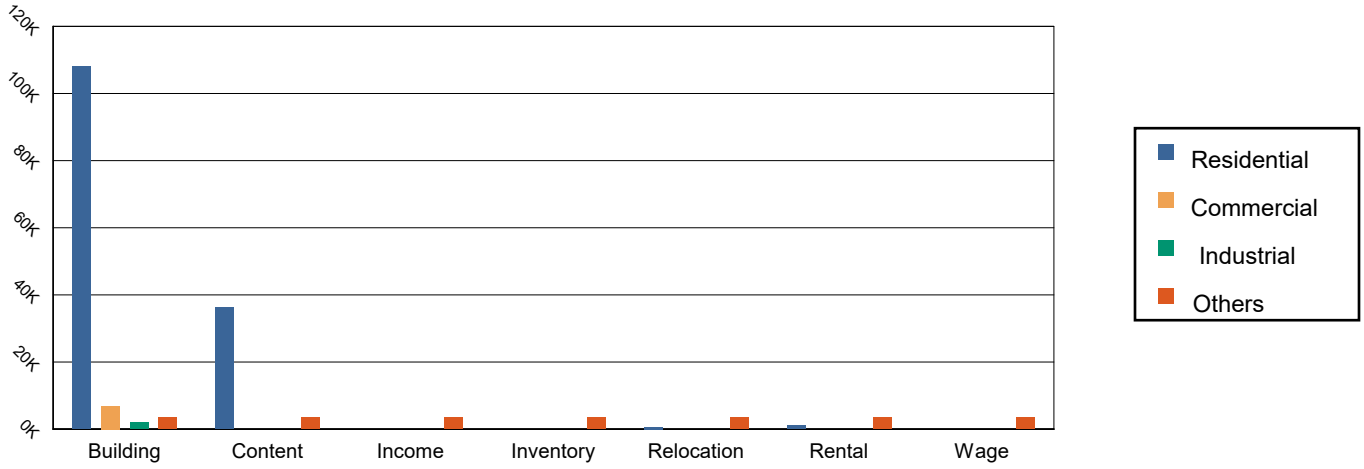


Table 5: Building-Related Economic Loss Estimates

(Thousands of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Property Damage						
	Building	108,091.33	6,910.10	2,018.15	3,453.60	120,473.18
	Content	36,197.60	0.00	0.00	0.00	36,197.60
	Inventory	0.00	0.00	0.00	0.00	0.00
	Subtotal	**144,288.94**	**6,910.10**	**2,018.15**	**3,453.60**	**156,670.78**
Business Interruption Loss						
	Income	0.00	0.00	0.00	0.00	0.00
	Relocation	699.21	8.82	0.00	0.95	708.98
	Rental	1,033.09	0.00	0.00	0.00	1,033.09
	Wage	0.00	0.00	0.00	0.00	0.00
	Subtotal	**1,732.30**	**8.82**	**0.00**	**0.95**	**1,742.07**

Total

Total	**146,021.23**	**6,918.92**	**2,018.15**	**3,454.55**	**158,412.86**

Appendix A: County Listing for the Region

Connecticut

- Fairfield
- Hartford
- Litchfield
- Middlesex
- New Haven
- New London
- Tolland
- Windham

Appendix B: Regional Population and Building Value Data

		Building Value (thousands of dollars)		
	Population	Residential	Non-Residential	Total
Connecticut				
Fairfield	957,419	138,202,527	64,140,539	202,343,066
Hartford	899,498	103,349,824	67,437,454	170,787,278
Litchfield	185,186	28,643,320	14,484,815	43,128,135
Middlesex	164,245	22,031,593	10,973,115	33,004,708
New Haven	864,835	92,892,604	61,159,705	154,052,309
New London	268,555	32,865,080	18,760,781	51,625,861
Tolland	149,788	19,496,288	9,789,702	29,285,990
Windham	116,418	12,974,883	9,028,804	22,003,687
Total	**3,605,944**	**450,456,119**	**255,774,915**	**706,231,034**
Study Region Total	**3,605,944**	**450,456,119**	**255,774,915**	**706,231,034**

Hazus: Hurricane Global Risk Report

Region Name: CT_HUR_2012sandy

Hurricane Scenario: 2012-SANDY

Print Date: Tuesday, April 18, 2023

Disclaimer:
Totals only reflect data for those census tracts/blocks included in the user's study region.

The estimates of social and economic impacts contained in this report were produced using Hazus loss estimation methodology software which is based on current scientific and engineering knowledge. There are uncertainties inherent in any loss estimation technique. Therefore, there may be significant differences between the modeled results contained in this report and the actual social and economic losses following a specific Hurricane. These results can be improved by using enhanced inventory data.

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General Description of the Region

Hazus is a regional multi-hazard loss estimation model that was developed by the Federal Emergency Management Agency and the National Institute of Building Sciences. The primary purpose of Hazus is to provide a methodology and software application to develop multi-hazard losses at a regional scale. These loss estimates would be used primarily by local, state and regional officials to plan and stimulate efforts to reduce risks from multi-hazards and to prepare for emergency response and recovery.

The hurricane loss estimates provided in this report are based on a region that includes 8 county(ies) from the following state(s):

- Connecticut

Note:
Appendix A contains a complete listing of the counties contained in the region.

The geographical size of the region is 4,990.78 square miles and contains 878 census tracts. There are over 1,418 thousand households in the region and a total population of 3,605,944 people. The distribution of population by State and County is provided in Appendix B.

There are an estimated 1,150 thousand buildings in the region with a total building replacement value (excluding contents) of 706,231 million dollars. Approximately 87% of the buildings (and 64% of the building value) are associated with residential housing.

Building Inventory

General Building Stock

Hazus estimates that there are 1,150,568 buildings in the region which have an aggregate total replacement valu million. Table 1 presents the relative distribution of the value with respect to the general occupancies. Appendix general distribution of the building value by State and County.

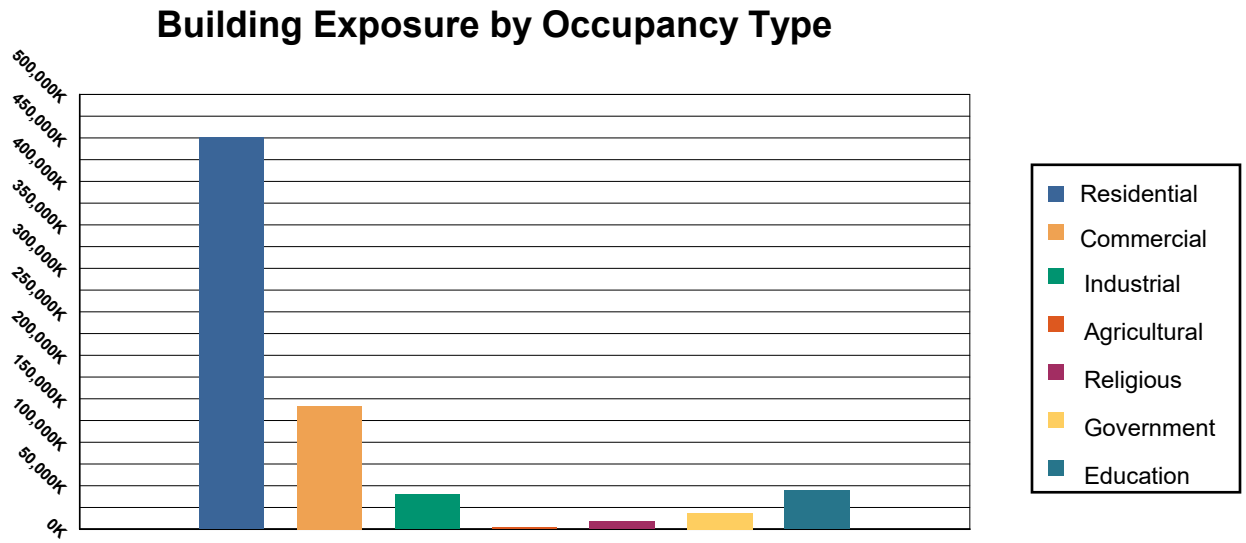


Table 1: Building Exposure by Occupancy Type

Occupancy	Exposure ($1000)	Percent of Tot
Residential	450,456,119	63.78%
Commercial	141,793,008	20.08%
Industrial	39,797,513	5.64%
Agricultural	1,666,239	0.24%
Religious	9,365,213	1.33%
Government	18,574,965	2.63%
Education	44,577,977	6.31%
Total	**706,231,034**	**100.00%**

Essential Facility Inventory

For essential facilities, there are 54 hospitals in the region with a total bed capacity of 10,483 beds. There are 1,350 schools, 569 fire stations, 198 police stations and 174 emergency operation facilities.

Hurricane Scenario

Hazus used the following set of information to define the hurricane parameters for the hurricane loss estimate provided in this report.

Scenario Name:	2012-SANDY
Type:	Historic
Max Peak Gust in Study Region:	71 mph

Building Damage

General Building Stock Damage

Hazus estimates that about 53 buildings will be at least moderately damaged. This is over 0% of the total number of buildings in the region. There are an estimated 0 buildings that will be completely destroyed. The definition of the 'damage states' is provided in the Hazus Hurricane technical manual. Table 2 below summarizes the expected damage by general occupancy for the buildings in the region. Table 3 summarizes the expected damage by general building type.

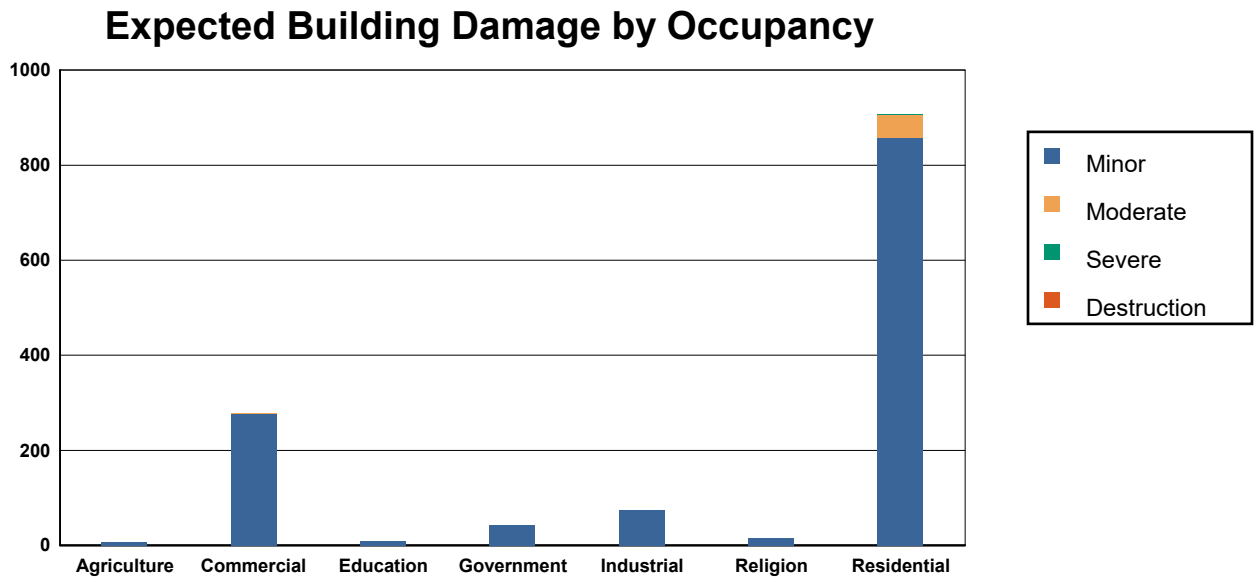


Table 2: Expected Building Damage by Occupancy

	None		Minor		Moderate		Severe		Destruction	
Occupancy	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Agriculture	3,151.46	99.79	6.50	0.21	0.04	0.00	0.00	0.00	0.00	0.00
Commercial	100,617.26	99.72	276.63	0.27	1.11	0.00	0.00	0.00	0.00	0.00
Education	2,933.58	99.71	8.42	0.29	0.00	0.00	0.00	0.00	0.00	0.00
Government	14,353.53	99.70	42.47	0.30	0.00	0.00	0.00	0.00	0.00	0.00
Industrial	24,800.99	99.70	74.00	0.30	0.01	0.00	0.00	0.00	0.00	0.00
Religion	6,602.68	99.77	15.20	0.23	0.11	0.00	0.00	0.00	0.00	0.00
Residential	996,775.82	99.91	856.89	0.09	49.12	0.00	2.16	0.00	0.00	0.00
Total	**1,149,235.33**		**1,280.11**		**50.40**		**2.16**		**0.00**	

Table 3: Expected Building Damage by Building Type

Building Type	None		Minor		Moderate		Severe		Destruction	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Concrete	20,474	99.63	75	0.37	0	0.00	0	0.00	0	0.00
Masonry	119,184	99.57	501	0.42	16	0.01	1	0.00	0	0.00
MH	6,044	100.00	0	0.00	0	0.00	0	0.00	0	0.00
Steel	74,188	99.70	222	0.30	1	0.00	0	0.00	0	0.00
Wood	929,180	99.97	271	0.03	26	0.00	1	0.00	0	0.00

Essential Facility Damage

Before the hurricane, the region had 10,483 hospital beds available for use. On the day of the hurricane, the model estimates that 10,483 hospital beds (100%) are available for use by patients already in the hospital and those injured by the hurricane. After one week, 100% of the beds will be in service. By 30 days, 100% will be operational.

Thematic Map of Essential Facilities

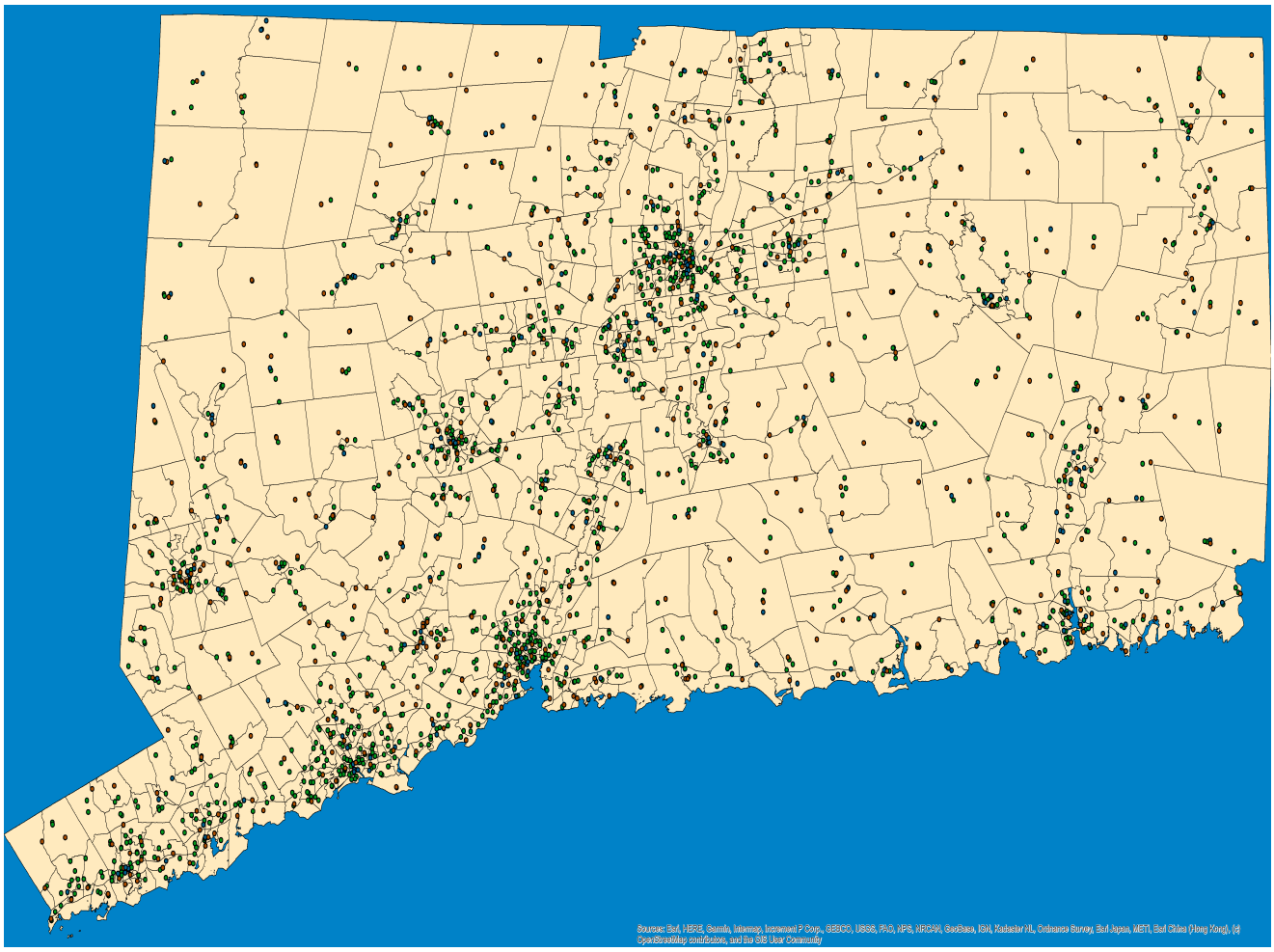
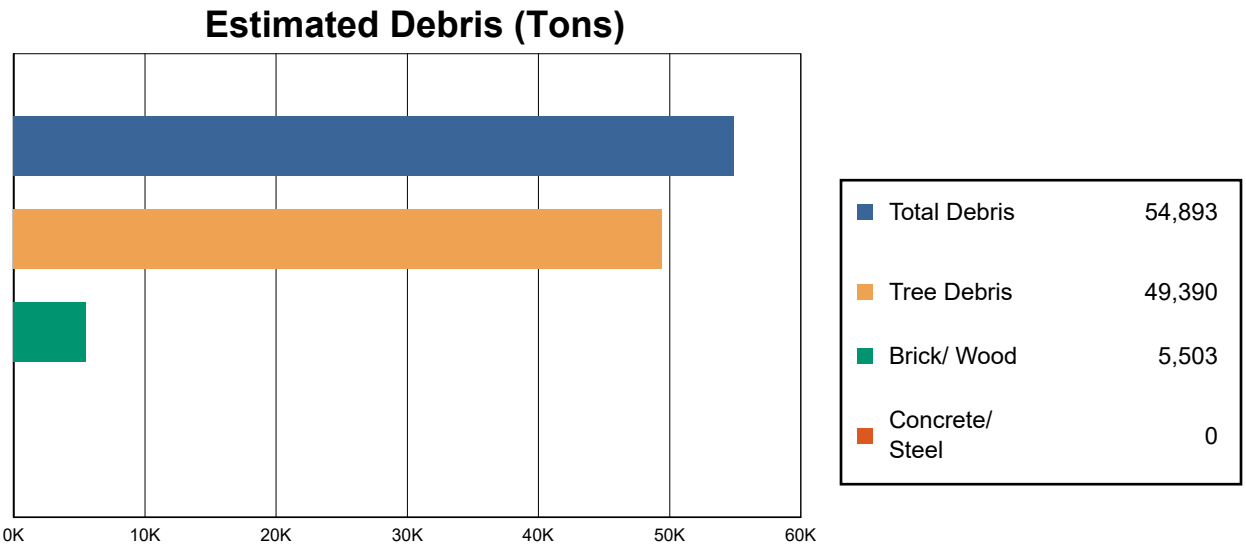


Table 4: Expected Damage to Essential Facilities

		# Facilities		
Classification	Total	Probability of at Least Moderate Damage > 50%	Probability of Complete Damage > 50%	Expected Loss of Use < 1 day
EOCs	174	0	0	174
Fire Stations	569	0	0	569
Hospitals	54	0	0	54
Police Stations	198	0	0	198
Schools	1,350	0	0	1,350

Induced Hurricane Damage

Debris Generation

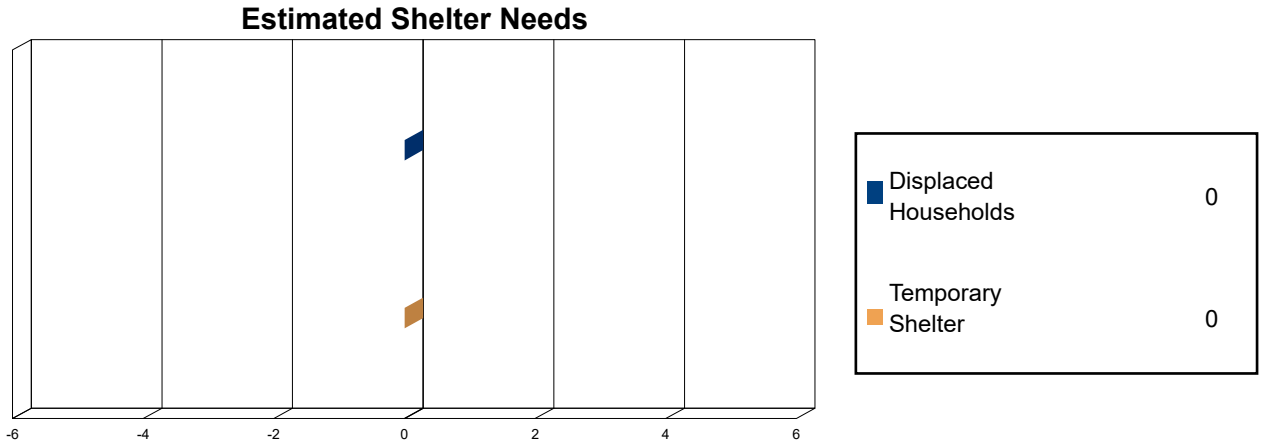


Hazus estimates the amount of debris that will be generated by the hurricane. The model breaks the debris into four general categories: a) Brick/Wood, b) Reinforced Concrete/Steel, c) Eligible Tree Debris, and d) Other Tree Debris. This distinction is made because of the different types of material handling equipment required to handle the debris.

The model estimates that a total of 54,893 tons of debris will be generated. Of the total amount, 36,612 tons (67%) is Other Tree Debris. Of the remaining 18,281 tons, Brick/Wood comprises 30% of the total, Reinforced Concrete/Steel comprises of 0% of the total, with the remainder being Eligible Tree Debris. If the building debris tonnage is converted to an estimated number of truckloads, it will require 220 truckloads (@25 tons/truck) to remove the building debris generated by the hurricane. The number of Eligible Tree Debris truckloads will depend on how the 12,778 tons of Eligible Tree Debris are collected and processed. The volume of tree debris generally ranges from about 4 cubic yards per ton for chipped or compacted tree debris to about 10 cubic yards per ton for bulkier, uncompacted debris.

Social Impact

Shelter Requirement



Hazus estimates the number of households that are expected to be displaced from their homes due to the hurricane and the number of displaced people that will require accommodations in temporary public shelters. The model estimates 0 households to be displaced due to the hurricane. Of these, 0 people (out of a total population of 3,605,944) will seek temporary shelter in public shelters.

Economic Loss

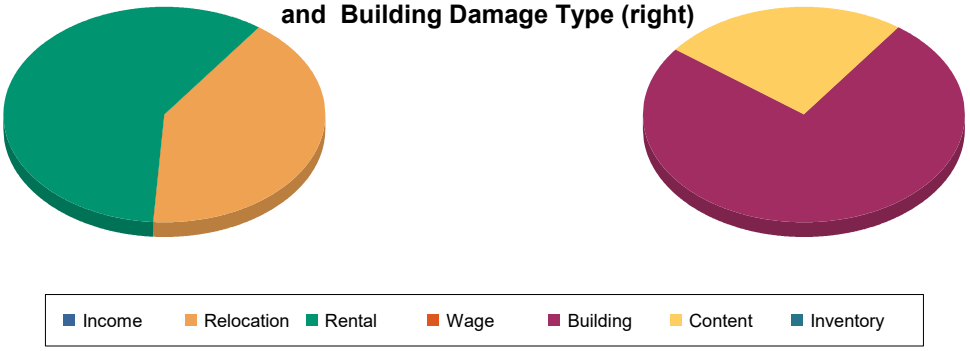
The total economic loss estimated for the hurricane is 143.0 million dollars, which represents 0.02 % of the total replacement value of the region's buildings.

Building-Related Losses

The building related losses are broken into two categories: direct property damage losses and business interruption losses. The direct property damage losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the hurricane. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the hurricane.

The total property damage losses were 143 million dollars. 1% of the estimated losses were related to the business interruption of the region. By far, the largest loss was sustained by the residential occupancies which made up over 94% of the total loss. Table 5 below provides a summary of the losses associated with the building damage.

Loss by Business Interruption Type (left) and Building Damage Type (right)



Loss Type by General Occupancy

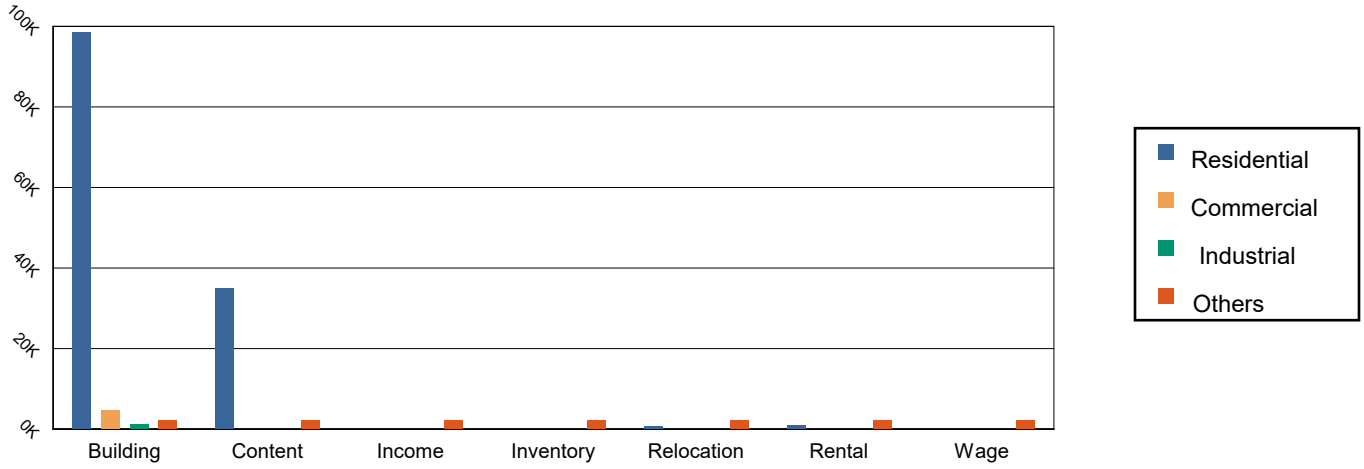


Table 5: Building-Related Economic Loss Estimates

(Thousands of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Property Damage						
	Building	98,483.93	4,577.49	1,089.05	2,202.17	106,352.64
	Content	34,943.42	0.00	0.00	0.00	34,943.42
	Inventory	0.00	0.00	0.00	0.00	0.00
	Subtotal	**133,427.35**	**4,577.49**	**1,089.05**	**2,202.17**	**141,296.06**
Business Interruption Loss						
	Income	0.00	0.00	0.00	0.00	0.00
	Relocation	682.70	11.82	0.00	0.89	695.41
	Rental	1,000.93	0.00	0.00	0.00	1,000.93
	Wage	0.00	0.00	0.00	0.00	0.00
	Subtotal	**1,683.63**	**11.82**	**0.00**	**0.89**	**1,696.34**

Total

Total	**135,110.99**	**4,589.31**	**1,089.05**	**2,203.05**	**142,992.40**

Appendix A: County Listing for the Region

Connecticut

- Fairfield
- Hartford
- Litchfield
- Middlesex
- New Haven
- New London
- Tolland
- Windham

Appendix B: Regional Population and Building Value Data

		Building Value (thousands of dollars)		
	Population	Residential	Non-Residential	Total
Connecticut				
Fairfield	957,419	138,202,527	64,140,539	202,343,066
Hartford	899,498	103,349,824	67,437,454	170,787,278
Litchfield	185,186	28,643,320	14,484,815	43,128,135
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Windham	116,418	12,974,883	9,028,804	22,003,687
Total	**3,605,944**	**450,456,119**	**255,774,915**	**706,231,034**
Study Region Total	**3,605,944**	**450,456,119**	**255,774,915**	**706,231,034**

Hazus: Hurricane Global Risk Report

Region Name: CT_HUR_1938unnamed

Hurricane Scenario: 1938-UNNAMED-06

Print Date: Tuesday, April 11, 2023

Disclaimer:
Totals only reflect data for those census tracts/blocks included in the user's study region.

The estimates of social and economic impacts contained in this report were produced using Hazus loss estimation methodology software which is based on current scientific and engineering knowledge. There are uncertainties inherent in any loss estimation technique. Therefore, there may be significant differences between the modeled results contained in this report and the actual social and economic losses following a specific Hurricane. These results can be improved by using enhanced inventory data.

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General Description of the Region

Hazus is a regional multi-hazard loss estimation model that was developed by the Federal Emergency Management Agency and the National Institute of Building Sciences. The primary purpose of Hazus is to provide a methodology and software application to develop multi-hazard losses at a regional scale. These loss estimates would be used primarily by local, state and regional officials to plan and stimulate efforts to reduce risks from multi-hazards and to prepare for emergency response and recovery.

The hurricane loss estimates provided in this report are based on a region that includes 8 county(ies) from the following state(s):

- Connecticut

Note:
Appendix A contains a complete listing of the counties contained in the region.

The geographical size of the region is 4,990.78 square miles and contains 878 census tracts. There are over 1,418 thousand households in the region and a total population of 3,605,944 people. The distribution of population by State and County is provided in Appendix B.

There are an estimated 1,150 thousand buildings in the region with a total building replacement value (excluding contents) of 706,231 million dollars. Approximately 87% of the buildings (and 64% of the building value) are associated with residential housing.

Building Inventory

General Building Stock

Hazus estimates that there are 1,150,568 buildings in the region which have an aggregate total replacement valu million. Table 1 presents the relative distribution of the value with respect to the general occupancies. Appendix general distribution of the building value by State and County.

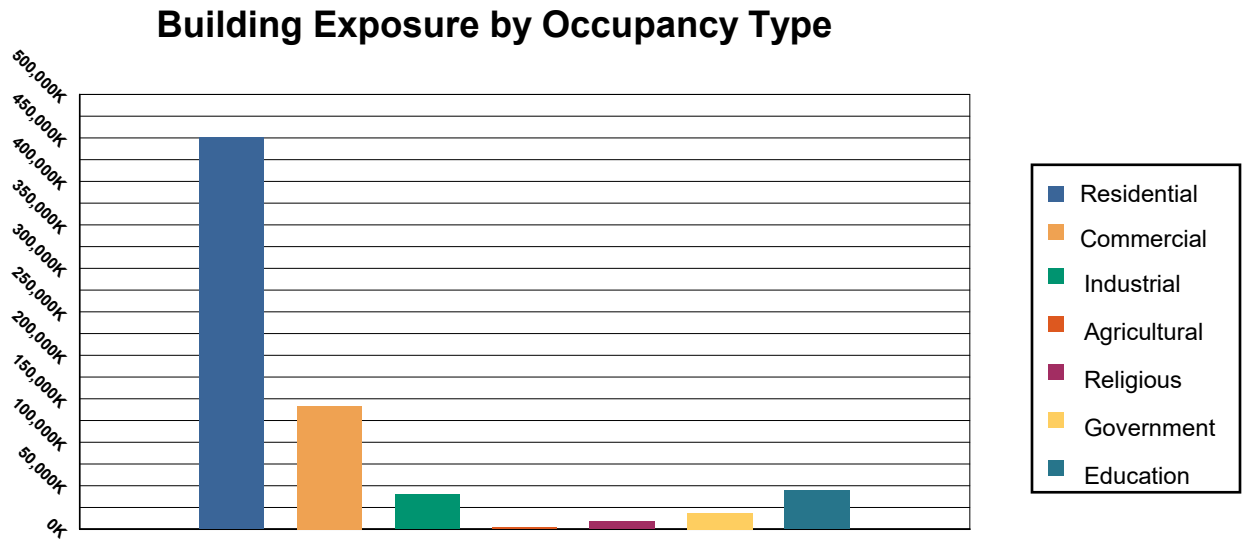


Table 1: Building Exposure by Occupancy Type

Occupancy	Exposure ($1000)	Percent of Tot
Residential	450,456,119	63.78%
Commercial	141,793,008	20.08%
Industrial	39,797,513	5.64%
Agricultural	1,666,239	0.24%
Religious	9,365,213	1.33%
Government	18,574,965	2.63%
Education	44,577,977	6.31%
Total	**706,231,034**	**100.00%**

Essential Facility Inventory

For essential facilities, there are 54 hospitals in the region with a total bed capacity of 10,483 beds. There are 1,350 schools, 569 fire stations, 198 police stations and 174 emergency operation facilities.

Hurricane Scenario

Hazus used the following set of information to define the hurricane parameters for the hurricane loss estimate provided in this report.

Scenario Name:	1938-UNNAMED-06
Type:	Historic
Max Peak Gust in Study Region:	129 mph

Building Damage

General Building Stock Damage

Hazus estimates that about 109,650 buildings will be at least moderately damaged. This is over 10% of the total number of buildings in the region. There are an estimated 5,353 buildings that will be completely destroyed. The definition of the 'damage states' is provided in the Hazus Hurricane technical manual. Table 2 below summarizes the expected damage by general occupancy for the buildings in the region. Table 3 summarizes the expected damage by general building type.

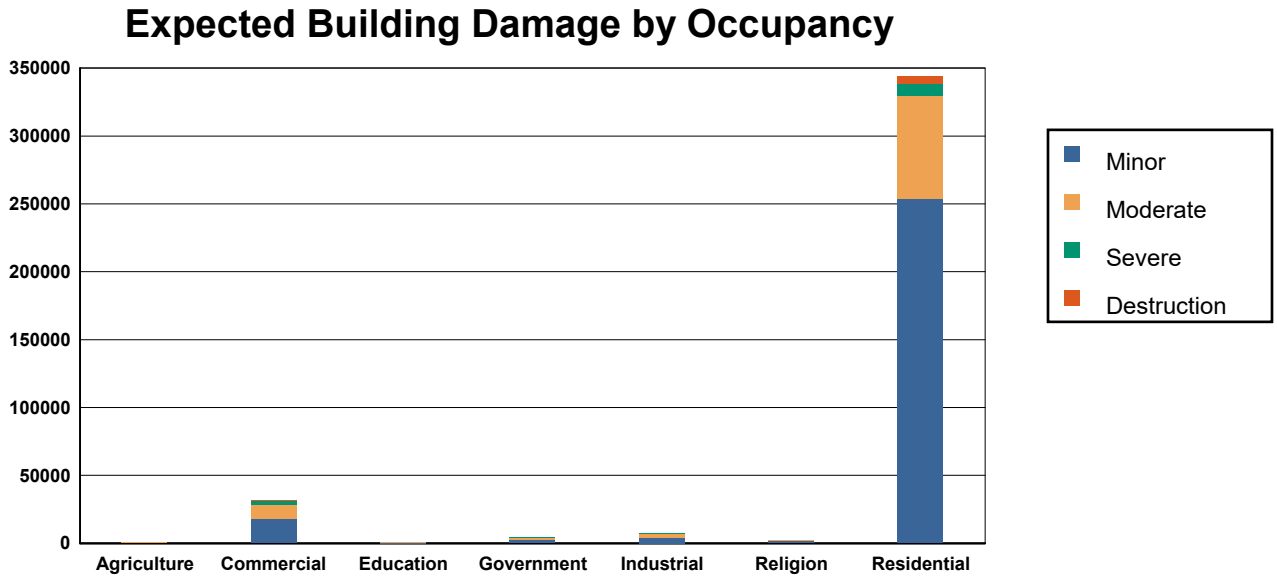


Table 2: Expected Building Damage by Occupancy

	None		Minor		Moderate		Severe		Destruction	
Occupancy	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Agriculture	2,137.46	67.68	636.42	20.15	242.82	7.69	121.23	3.84	20.07	0.64
Commercial	69,257.82	68.64	18,393.56	18.23	10,150.21	10.06	3,057.67	3.03	35.74	0.04
Education	2,076.95	70.60	542.36	18.44	267.96	9.11	54.72	1.86	0.00	0.00
Government	10,050.03	69.81	2,685.12	18.65	1,383.71	9.61	277.13	1.93	0.00	0.00
Industrial	17,566.12	70.62	4,268.48	17.16	2,305.41	9.27	688.38	2.77	46.60	0.19
Religion	4,523.48	68.35	1,422.75	21.50	566.71	8.56	105.03	1.59	0.03	0.00
Residential	654,103.98	65.56	253,253.03	25.38	76,538.01	7.67	8,538.37	0.86	5,250.60	0.53
Total	**759,715.85**		**281,201.72**		**91,454.83**		**12,842.54**		**5,353.06**	

Table 3: Expected Building Damage by Building Type

Building Type	None		Minor		Moderate		Severe		Destruction	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Concrete	13,881	67.55	3,830	18.64	2,439	11.87	399	1.94	0	0.00
Masonry	76,584	63.98	23,165	19.35	17,488	14.61	2,263	1.89	202	0.17
MH	4,630	76.60	605	10.01	523	8.66	48	0.80	237	3.93
Steel	51,791	69.60	11,928	16.03	7,895	10.61	2,760	3.71	37	0.05
Wood	619,160	66.61	243,351	26.18	54,874	5.90	7,263	0.78	4,830	0.52

Essential Facility Damage

Before the hurricane, the region had 10,483 hospital beds available for use. On the day of the hurricane, the model estimates that 10,101 hospital beds (96%) are available for use by patients already in the hospital and those injured by the hurricane. After one week, 100% of the beds will be in service. By 30 days, 100% will be operational.

Thematic Map of Essential Facilities

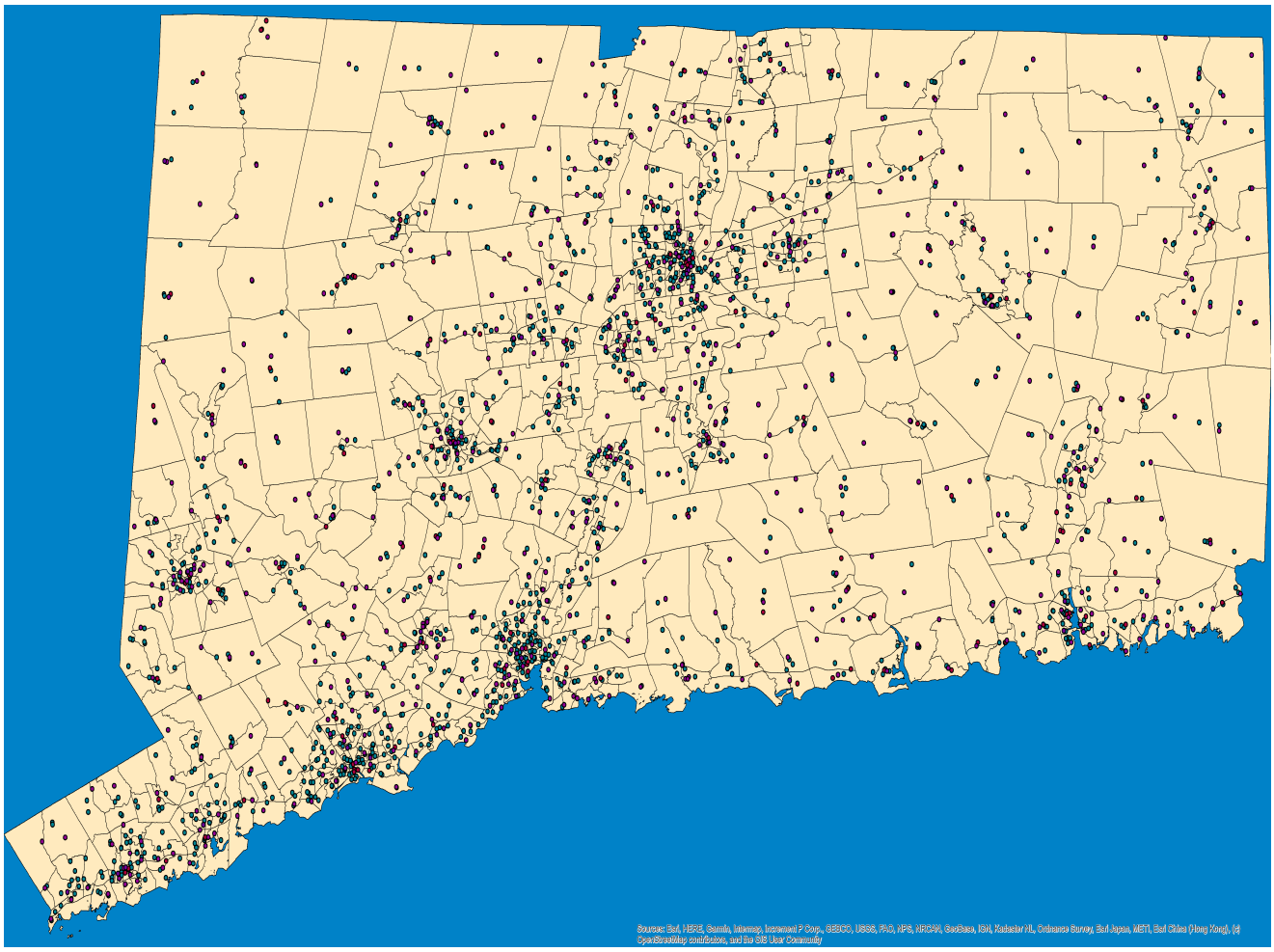
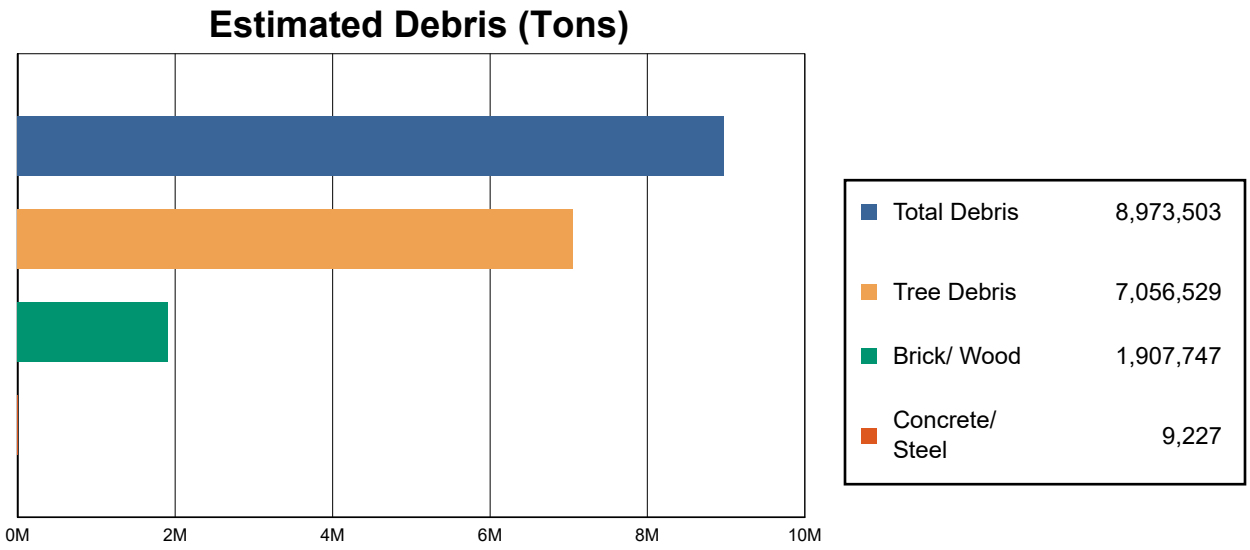


Table 4: Expected Damage to Essential Facilities

Classification	Total	# Facilities		
		Probability of at Least Moderate Damage > 50%	Probability of Complete Damage > 50%	Expected Loss of Use < 1 day
EOCs	174	1	0	174
Fire Stations	569	0	0	569
Hospitals	54	2	0	43
Police Stations	198	4	0	198
Schools	1,350	84	0	338

Induced Hurricane Damage

Debris Generation

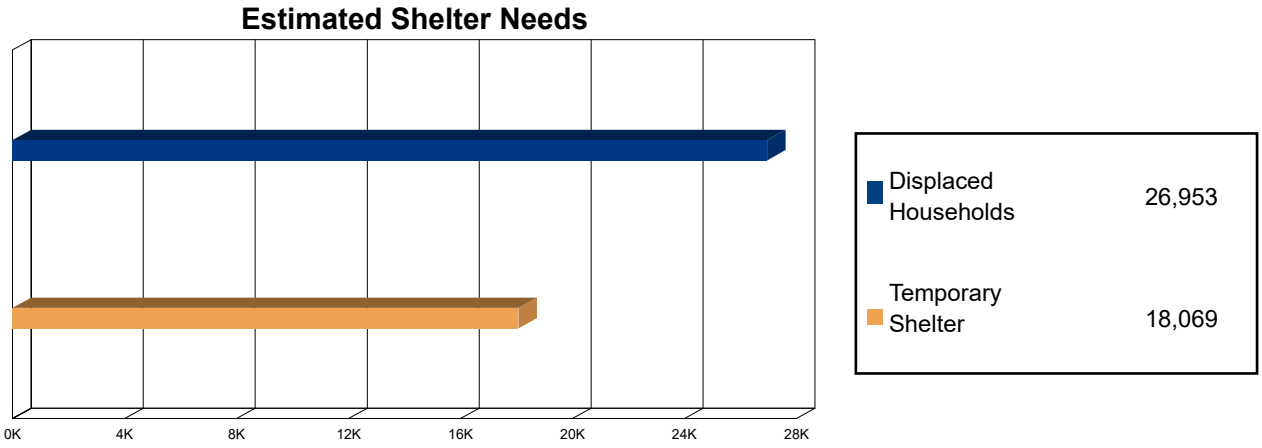


Hazus estimates the amount of debris that will be generated by the hurricane. The model breaks the debris into four general categories: a) Brick/Wood, b) Reinforced Concrete/Steel, c) Eligible Tree Debris, and d) Other Tree Debris. This distinction is made because of the different types of material handling equipment required to handle the debris.

The model estimates that a total of 8,973,503 tons of debris will be generated. Of the total amount, 5,173,365 tons (58%) is Other Tree Debris. Of the remaining 3,800,138 tons, Brick/Wood comprises 50% of the total, Reinforced Concrete/Steel comprises of 0% of the total, with the remainder being Eligible Tree Debris. If the building debris tonnage is converted to an estimated number of truckloads, it will require 76679 truckloads (@25 tons/truck) to remove the building debris generated by the hurricane. The number of Eligible Tree Debris truckloads will depend on how the 1,883,164 tons of Eligible Tree Debris are collected and processed. The volume of tree debris generally ranges from about 4 cubic yards per ton for chipped or compacted tree debris to about 10 cubic yards per ton for bulkier, uncompacted debris.

Social Impact

Shelter Requirement



Hazus estimates the number of households that are expected to be displaced from their homes due to the hurricane and the number of displaced people that will require accommodations in temporary public shelters. The model estimates 26,953 households to be displaced due to the hurricane. Of these, 18,069 people (out of a total population of 3,605,944) will seek temporary shelter in public shelters.

Economic Loss

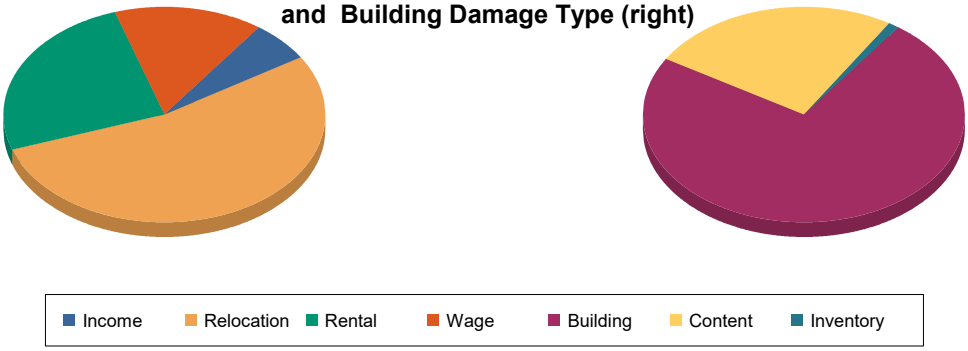
The total economic loss estimated for the hurricane is 30809.7 million dollars, which represents 4.36 % of the total replacement value of the region's buildings.

Building-Related Losses

The building related losses are broken into two categories: direct property damage losses and business interruption losses. The direct property damage losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the hurricane. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the hurricane.

The total property damage losses were 30,810 million dollars. 11% of the estimated losses were related to the business interruption of the region. By far, the largest loss was sustained by the residential occupancies which made up over 72% of the total loss. Table 5 below provides a summary of the losses associated with the building damage.

Loss by Business Interruption Type (left) and Building Damage Type (right)



Loss Type by General Occupancy

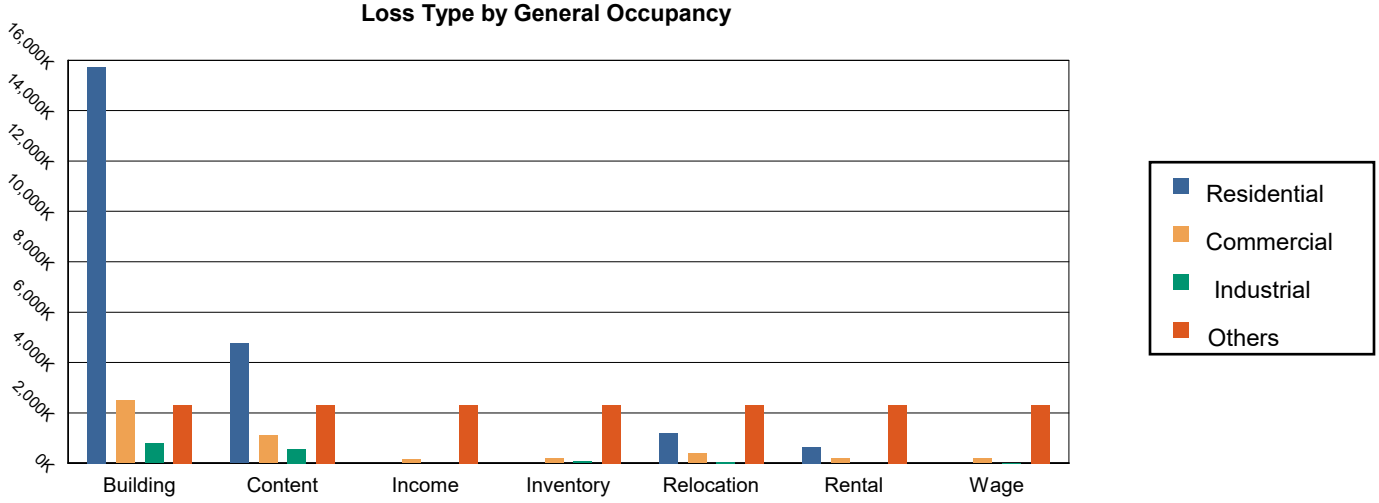


Table 5: Building-Related Economic Loss Estimates

(Thousands of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Property Damage						
	Building	15,735,293.94	2,473,513.14	788,037.81	1,134,980.89	20,131,825.77
	Content	4,751,071.64	1,095,846.38	563,056.05	529,283.33	6,939,257.40
	Inventory	0.00	187,318.84	68,316.20	15,678.20	271,313.24
	Subtotal	**20,486,365.57**	**3,756,678.36**	**1,419,410.06**	**1,679,942.42**	**27,342,396.41**
Business Interruption Loss						
	Income	1,250.27	150,644.57	7,318.53	51,970.29	211,183.66
	Relocation	1,200,495.01	383,894.86	53,573.96	225,403.36	1,863,367.19
	Rental	644,835.18	193,840.29	7,914.56	28,186.96	874,776.99
	Wage	2,943.37	175,971.62	11,893.59	327,133.50	517,942.08
	Subtotal	**1,849,523.82**	**904,351.34**	**80,700.64**	**632,694.11**	**3,467,269.91**

Total

Total	**22,335,889.40**	**4,661,029.70**	**1,500,110.70**	**2,312,636.53**	**30,809,666.32**

Appendix A: County Listing for the Region

Connecticut

- Fairfield
- Hartford
- Litchfield
- Middlesex
- New Haven
- New London
- Tolland
- Windham

Appendix B: Regional Population and Building Value Data

		Building Value (thousands of dollars)		
	Population	Residential	Non-Residential	Total
Connecticut				
Fairfield	957,419	138,202,527	64,140,539	202,343,066
Hartford	899,498	103,349,824	67,437,454	170,787,278
Litchfield	185,186	28,643,320	14,484,815	43,128,135
Middlesex	164,245	22,031,593	10,973,115	33,004,708
New Haven	864,835	92,892,604	61,159,705	154,052,309
New London	268,555	32,865,080	18,760,781	51,625,861
Tolland	149,788	19,496,288	9,789,702	29,285,990
Windham	116,418	12,974,883	9,028,804	22,003,687
Total	**3,605,944**	**450,456,119**	**255,774,915**	**706,231,034**
Study Region Total	**3,605,944**	**450,456,119**	**255,774,915**	**706,231,034**

Quick Assessment Report

April 11, 2023

Study Region : CT_HUR_Prob

Scenario : Probabilistic

Regional Statistics

Area (Square Miles)	4,991
Number of Census Tracts	878
Number of People in the Region	3,605,944

General Building Stock

Occupancy	*Building Count*	*Dollar Exposure ($ K)*
Residential	997,684	450,456,119
Commercial	100,895	141,793,008
Other	51,989	113,981,907
Total	1,150,568	706,231,034

Scenario Results

Number of Residential Buildings Damaged

Return Period	*Minor*	*Moderate*	*Severe*	*Destruction*	*Total*
10	542	29	0	0	571
20	2,710	195	13	0	2,918
50	37,641	6,037	302	169	44,149
100	89,751	13,686	470	205	104,111
200	150,285	30,014	1,630	902	182,830
500	221,721	59,312	5,356	3,118	289,508
1000	267,054	84,793	9,871	5,907	367,625

Number of Buildings Damaged

Return Period	*Minor*	*Moderate*	*Severe*	*Destruction*	*Total*
10	827	29	0	0	856
20	3,452	210	13	0	3,675
50	41,746	7,009	493	172	49,421
100	99,792	15,917	846	211	116,767
200	167,348	35,635	2,756	926	206,666
500	247,257	71,473	8,471	3,192	330,392
1000	297,613	102,625	15,208	6,038	421,485

Shelter Requirements

Return Period	*Displaced Households (#Households)*	*Short Term Shelter (#People)*
10	0	0
20	0	0
50	1,606	939
100	4,159	2,859
200	9,172	6,293
500	19,985	14,222
1000	31,953	22,741

Economic Loss (x 1000)

	Property Damage (Capital Stock) Losses		*Business Interruption*
ReturnPeriod	***Residential***	***Total***	***(Income) Losses***
10	28,078	28,380	99
20	420,662	451,510	9,072
50	2,289,715	2,644,408	256,809
100	5,197,953	6,019,905	600,269
200	8,951,866	11,045,636	1,317,373
500	16,479,862	21,442,965	2,623,832
1000	23,882,451	32,050,326	3,941,932
Annualized	203,665	250,948	26,087

Disclaimer:

Totals only reflect data for those census tracts/blocks included in the user's study region.

The estimates of social and economic impacts contained in this report were produced using HAZUS loss estimation methodology software which is based on current scientific and engineering knowledge. There are uncertainties inherent in any loss estimation technique. Therefore, there may be significant differences between the modeled results contained in this report and the actual social and economic losses following a specific Hurricane. These results can be improved by using enhanced inventory data.

Quick Assessment Report

April 20, 2023

Study Region : CT_HUR_1960donna
Scenario : 1960-DONNA

Scenario Description : Historic

Peak Gust Wind Speed (mph) : 96

Regional Statistics

Area (Square Miles)	4,991
Number of Census Tracts	878
Number of People in the Region	3,605,944

General Building Stock

Occupancy	*Building Count*	*Dollar Exposure ($ M)*
Residential	997,684	450,456
Commercial	100,895	141,793
Other	51,989	113,982
Total	1,150,568	706,231

Scenario Results

Number of Buildings Damaged

*FEMA PDA**	*Residential*	*Commercial*	*Other*	*Total*
Affected	15,000	1,300	700	17,000
Minor	1,500	200	30	1,700
Major	40	10	<10	60
Destroyed	<10	0	0	<10
Total	17,000	1,500	700	19,000

Shelter Requirements

Displaced Households (# Households)	300
Short Term Shelter (# People)	200

Economic Loss ($ Millions)

Capital Stock		1,346
Residential Property	1,245	
Commercial Property	65	
Other Property	37	
Business Interruption (Income)		64
Total Direct Economic Loss		1,410

**Hazus damage estimates are presented using FEMA Preliminary Damage Assessment (PDA) categories. These estimates should be used for planning purposes and may not reflect actual observed damages from the PDA process.*

Disclaimer:

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Quick Assessment Report

April 18, 2023

Study Region : CT_HUR_1985gloria
Scenario : 1985-GLORIA

Scenario Description : Historic

Peak Gust Wind Speed (mph) : 94

Regional Statistics

Area (Square Miles)	4,991
Number of Census Tracts	878
Number of People in the Region	3,605,944

General Building Stock

Occupancy	*Building Count*	*Dollar Exposure ($ M)*
Residential	997,684	450,456
Commercial	100,895	141,793
Other	51,989	113,982
Total	1,150,568	706,231

Scenario Results

Number of Buildings Damaged

*FEMA PDA**	*Residential*	*Commercial*	*Other*	*Total*
Affected	18,000	1,400	700	20,000
Minor	1,800	200	40	2,100
Major	50	20	<10	70
Destroyed	<10	0	0	<10
Total	20,000	1,600	800	22,000

Shelter Requirements

Displaced Households (# Households)	400
Short Term Shelter (# People)	300

Economic Loss ($ Millions)

Capital Stock		1,367
Residential Property	1,247	
Commercial Property	75	
Other Property	45	
Business Interruption (Income)		79
Total Direct Economic Loss		1,447

**Hazus damage estimates are presented using FEMA Preliminary Damage Assessment (PDA) categories. These estimates should be used for planning purposes and may not reflect actual observed damages from the PDA process.*

Disclaimer:

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Quick Assessment Report

April 20, 2023

Study Region : CT_HUR_2020isaias
Scenario : 2020-ISAIAS

Scenario Description : Historic

Peak Gust Wind Speed (mph) : 68

Regional Statistics

Area (Square Miles)	4,991
Number of Census Tracts	878
Number of People in the Region	3,605,944

General Building Stock

Occupancy	*Building Count*	*Dollar Exposure ($ M)*
Residential	997,684	450,456
Commercial	100,895	141,793
Other	51,989	113,982
Total	1,150,568	706,231

Scenario Results

Number of Buildings Damaged

*FEMA PDA**	*Residential*	*Commercial*	*Other*	*Total*
Affected	900	300	200	1,300
Minor	50	0	0	50
Major	<10	0	0	<10
Destroyed	0	0	0	0
Total	900	300	200	1,400

Shelter Requirements

Displaced Households (# Households)	0
Short Term Shelter (# People)	0

Economic Loss ($ Millions)

Capital Stock		157
Residential Property	144	
Commercial Property	7	
Other Property	5	
Business Interruption (Income)		2
Total Direct Economic Loss		158

**Hazus damage estimates are presented using FEMA Preliminary Damage Assessment (PDA) categories. These estimates should be used for planning purposes and may not reflect actual observed damages from the PDA process.*

Disclaimer:

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Quick Assessment Report

April 18, 2023

Study Region : CT_HUR_2012sandy
Scenario : 2012-SANDY

Scenario Description : Historic

Peak Gust Wind Speed (mph) : 71

Regional Statistics

Area (Square Miles)	4,991
Number of Census Tracts	878
Number of People in the Region	3,605,944

General Building Stock

Occupancy	*Building Count*	*Dollar Exposure ($ M)*
Residential	997,684	450,456
Commercial	100,895	141,793
Other	51,989	113,982
Total	1,150,568	706,231

Scenario Results

Number of Buildings Damaged

*FEMA PDA**	*Residential*	*Commercial*	*Other*	*Total*
Affected	900	300	100	1,300
Minor	50	<10	0	50
Major	<10	0	0	<10
Destroyed	0	0	0	0
Total	900	300	100	1,300

Shelter Requirements

Displaced Households (# Households)	0
Short Term Shelter (# People)	0

Economic Loss ($ Millions)

Capital Stock		141
Residential Property	133	
Commercial Property	5	
Other Property	3	
Business Interruption (Income)		2
Total Direct Economic Loss		143

**Hazus damage estimates are presented using FEMA Preliminary Damage Assessment (PDA) categories. These estimates should be used for planning purposes and may not reflect actual observed damages from the PDA process.*

Disclaimer:

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Quick Assessment Report

April 11, 2023

Study Region : CT_HUR_1938unnamed
Scenario : 1938-UNNAMED-06

Scenario Description : Historic

Peak Gust Wind Speed (mph) : 129

Regional Statistics

Area (Square Miles)	4,991
Number of Census Tracts	878
Number of People in the Region	3,605,944

General Building Stock

Occupancy	*Building Count*	*Dollar Exposure ($ M)*
Residential	997,684	450,456
Commercial	100,895	141,793
Other	51,989	113,982
Total	1,150,568	706,231

Scenario Results

Number of Buildings Damaged

*FEMA PDA**	*Residential*	*Commercial*	*Other*	*Total*
Affected	250,000	18,000	9,600	280,000
Minor	77,000	10,000	4,800	91,000
Major	8,500	3,100	1,200	13,000
Destroyed	5,300	40	70	5,400
Total	340,000	32,000	16,000	390,000

Shelter Requirements

Displaced Households (# Households)	27,000
Short Term Shelter (# People)	18,000

Economic Loss ($ Millions)

Capital Stock		27,342
Residential Property	20,486	
Commercial Property	3,757	
Other Property	3,099	
Business Interruption (Income)		3,467
Total Direct Economic Loss		30,810

**Hazus damage estimates are presented using FEMA Preliminary Damage Assessment (PDA) categories. These estimates should be used for planning purposes and may not reflect actual observed damages from the PDA process.*

Disclaimer:

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Hazus: Flood Global Risk Report

Region Name: CT_FLD_Fairfield

Flood Scenario: Fairfield_100

Print Date: Monday, April 10, 2023

Disclaimer:
Totals only reflect data for those census tracts/blocks included in the user's study region.

The estimates of social and economic impacts contained in this report were produced using Hazus loss estimation methodology software which is based on current scientific and engineering knowledge. There are uncertainties inherent in any loss estimation technique. Therefore, there may be significant differences between the modeled results contained in this report and the actual social and economic losses following a specific Flood. These results can be improved by using enhanced inventory data and flood hazard information.

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General Description of the Region

Hazus is a regional multi-hazard loss estimation model that was developed by the Federal Emergency Management Agency (FEMA) and the National Institute of Building Sciences (NIBS). The primary purpose of Hazus is to provide a methodology and software application to develop multi-hazard losses at a regional scale. These loss estimates would be used primarily by local, state and regional officials to plan and stimulate efforts to reduce risks from multi-hazards and to prepare for emergency response and recovery.

The flood loss estimates provided in this report were based on a region that included 1 county(ies) from the following state(s):

- Connecticut

Note:
Appendix A contains a complete listing of the counties contained in the region.

The geographical size of the region is approximately 188 square miles and contains 10,120 census blocks. The region contains over 354 thousand households and has a total population of 957,322 people. The distribution of population by State and County for the study region is provided in Appendix B.

There are an estimated 289,295 buildings in the region with a total building replacement value (excluding contents) of 202,326 million dollars. Approximately 85.38% of the buildings (and 68.30% of the building value) are associated with residential housing.

Building Inventory

General Building Stock

Hazus estimates that there are 289,295 buildings in the region which have an aggregate total replacement value of 202,326 million dollars. Table 1 and Table 2 present the relative distribution of the value with respect to the general occupancies by Study Region and Scenario respectively. Appendix B provides a general distribution of the building value by State and County.

Table 1
Building Exposure by Occupancy Type for the Study Region

Occupancy	Exposure ($1000)	Percent of Total
Residential	138,194,741	68.3%
Commercial	36,508,813	18.0%
Industrial	8,602,125	4.3%
Agricultural	438,238	0.2%
Religion	2,338,182	1.2%
Government	4,079,775	2.0%
Education	12,163,750	6.0%
Total	**202,325,624**	**100%**

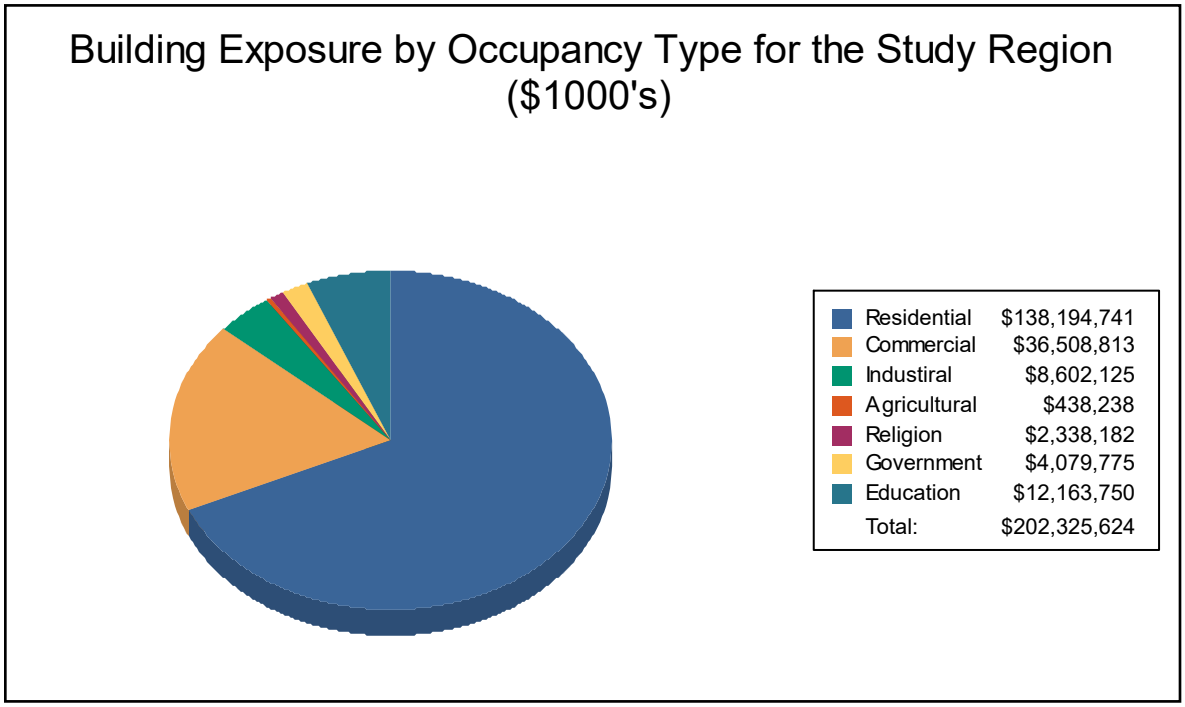
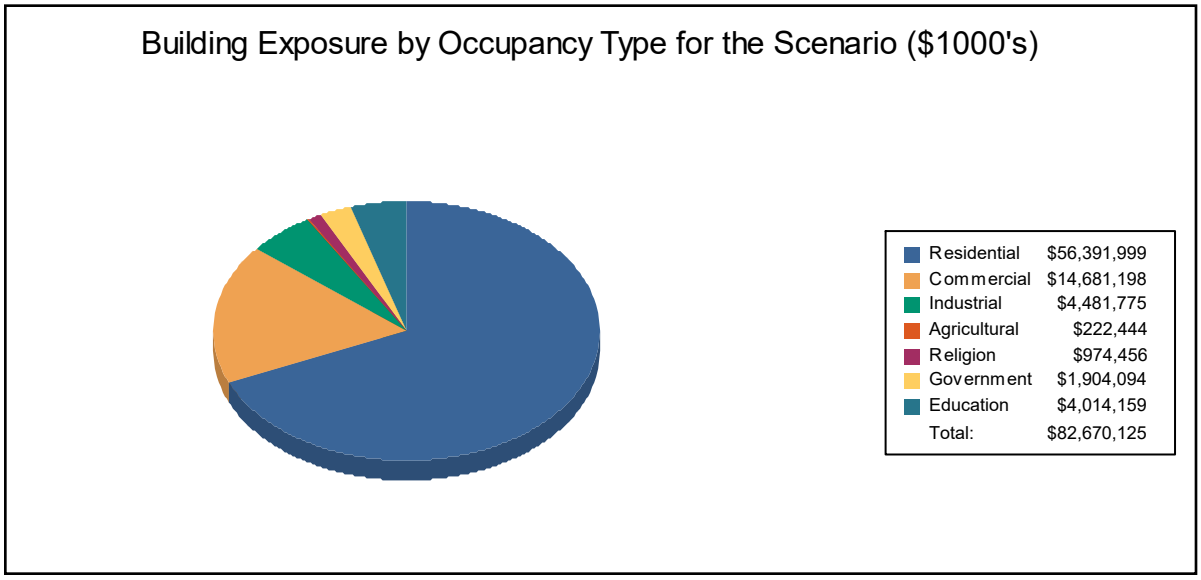


Table 2
Building Exposure by Occupancy Type for the Scenario

Occupancy	Exposure ($1000)	Percent of Total
Residential	56,391,999	68.2%
Commercial	14,681,198	17.8%
Industrial	4,481,775	5.4%
Agricultural	222,444	0.3%
Religion	974,456	1.2%
Government	1,904,094	2.3%
Education	4,014,159	4.9%
Total	**82,670,125**	**100%**



Essential Facility Inventory

For essential facilities, there are 10 hospitals in the region with a total bed capacity of 2,274 beds. There are 320 schools, 112 fire stations, 32 police stations and 23 emergency operation centers.

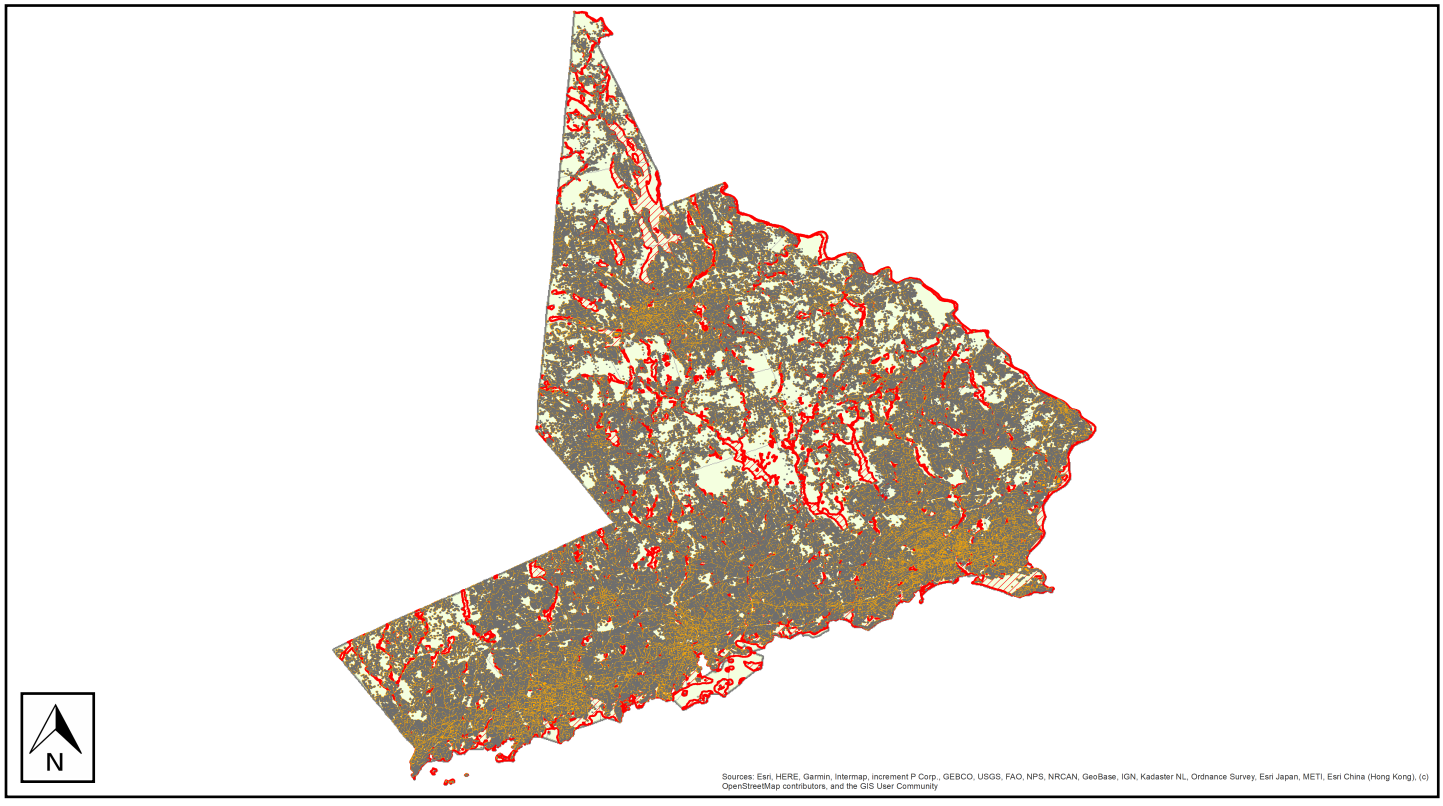
Flood Scenario Parameters

Hazus used the following set of information to define the flood parameters for the flood loss estimate provided in this report.

Study Region Name:	CT_FLD_Fairfield
Scenario Name:	Fairfield_100
Return Period Analyzed:	100
Analysis Options Analyzed:	No What-Ifs

Study Region Overview Map

Illustrating scenario flood extent, as well as exposed essential facilities and total exposure



Building Damage

General Building Stock Damage

Hazus estimates that about 3,156 buildings will be at least moderately damaged. This is over 59% of the total number of buildings in the scenario. There are an estimated 45 buildings that will be completely destroyed. The definition of the 'damage states' is provided in the Hazus Flood Technical Manual. Table 3 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4 summarizes the expected damage by general building type.

Total Economic Loss (1 dot = $300K) Overview Map

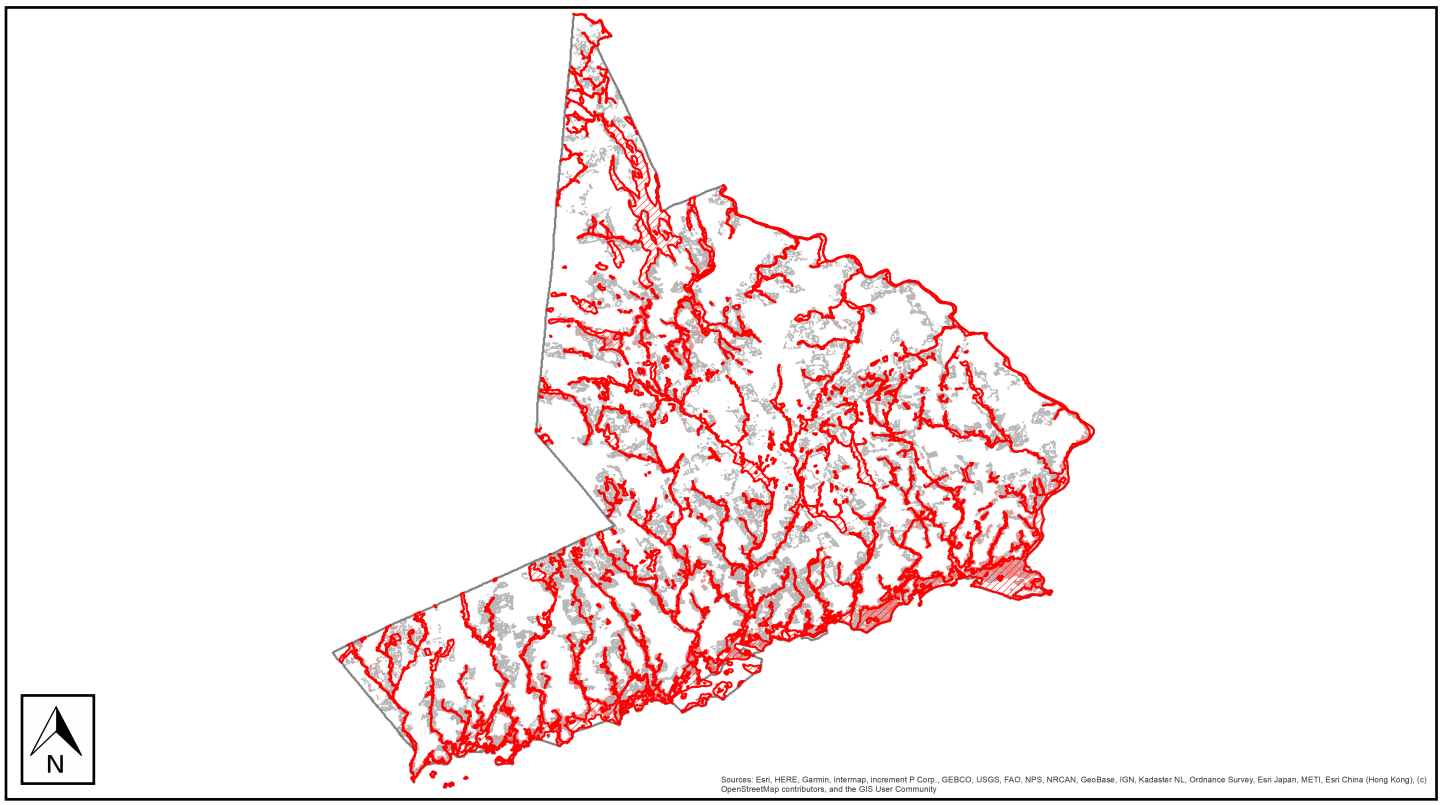


Table 3: Expected Building Damage by Occupancy

	1-10		11-20		21-30		31-40		41-50		>50	
Occupancy	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Agriculture	0	0	0	0	0	0	0	0	0	0	0	0
Commercial	58	49	54	46	2	2	4	3	0	0	0	0
Education	1	100	0	0	0	0	0	0	0	0	0	0
Government	34	57	25	42	1	2	0	0	0	0	0	0
Industrial	22	32	33	49	8	12	4	6	1	1	0	0
Religion	1	14	6	86	0	0	0	0	0	0	0	0
Residential	2,099	41	2,120	41	628	12	167	3	58	1	45	1
Total	**2,215**		**2,238**		**639**		**175**		**59**		**45**	

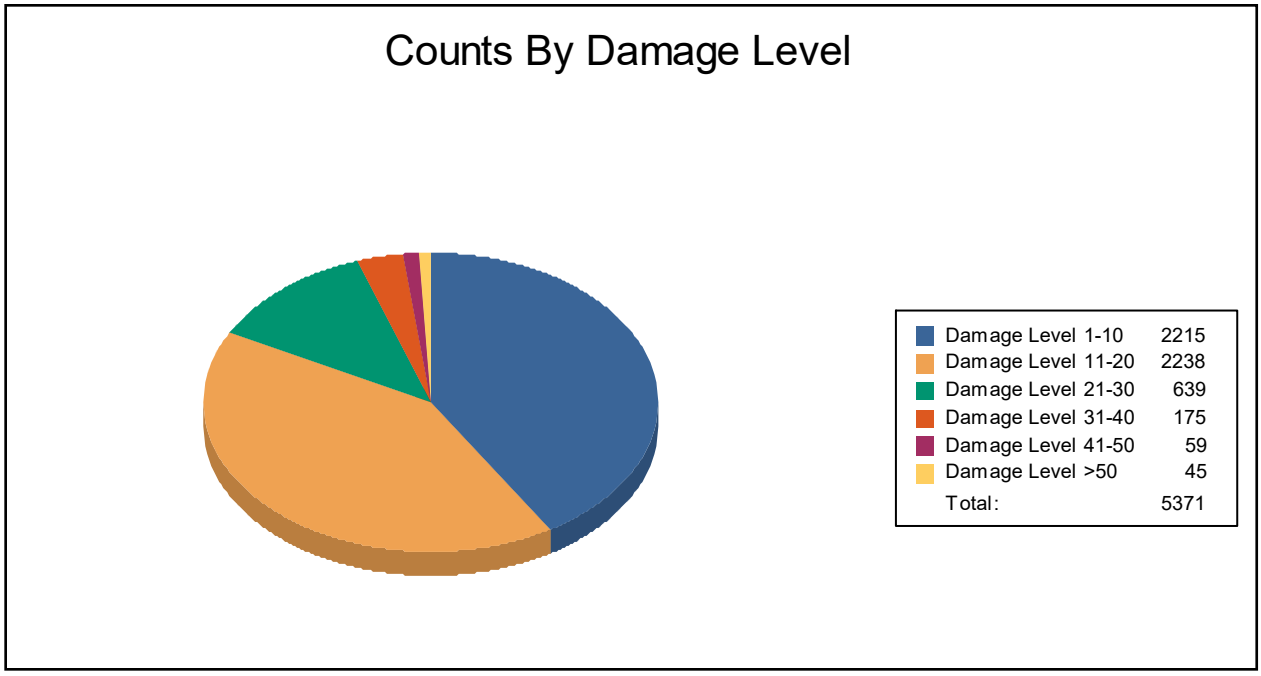




Table 4: Expected Building Damage by Building Type

Building Type	1-10		11-20		21-30		31-40		41-50		>50	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Concrete	2	50	2	50	0	0	0	0	0	0	0	0
ManufHousing	0	0	0	0	0	0	0	0	0	0	0	0
Masonry	64	35	95	52	18	10	2	1	2	1	1	1
Steel	67	48	62	44	6	4	5	4	1	1	0	0
Wood	2,062	41	2,062	41	611	12	167	3	56	1	44	1

Essential Facility Damage

Before the flood analyzed in this scenario, the region had 2,274 hospital beds available for use. On the day of the scenario flood event, the model estimates that 2,274 hospital beds are available in the region.

Table 5: Expected Damage to Essential Facilities

		# Facilities		
Classification	Total	At Least Moderate	At Least Substantial	Loss of Use
Emergency Operation Centers	23	0	0	0
Fire Stations	112	0	0	0
Hospitals	10	0	0	0
Police Stations	32	0	0	0
Schools	320	0	0	0

If this report displays all zeros or is blank, two possibilities can explain this.

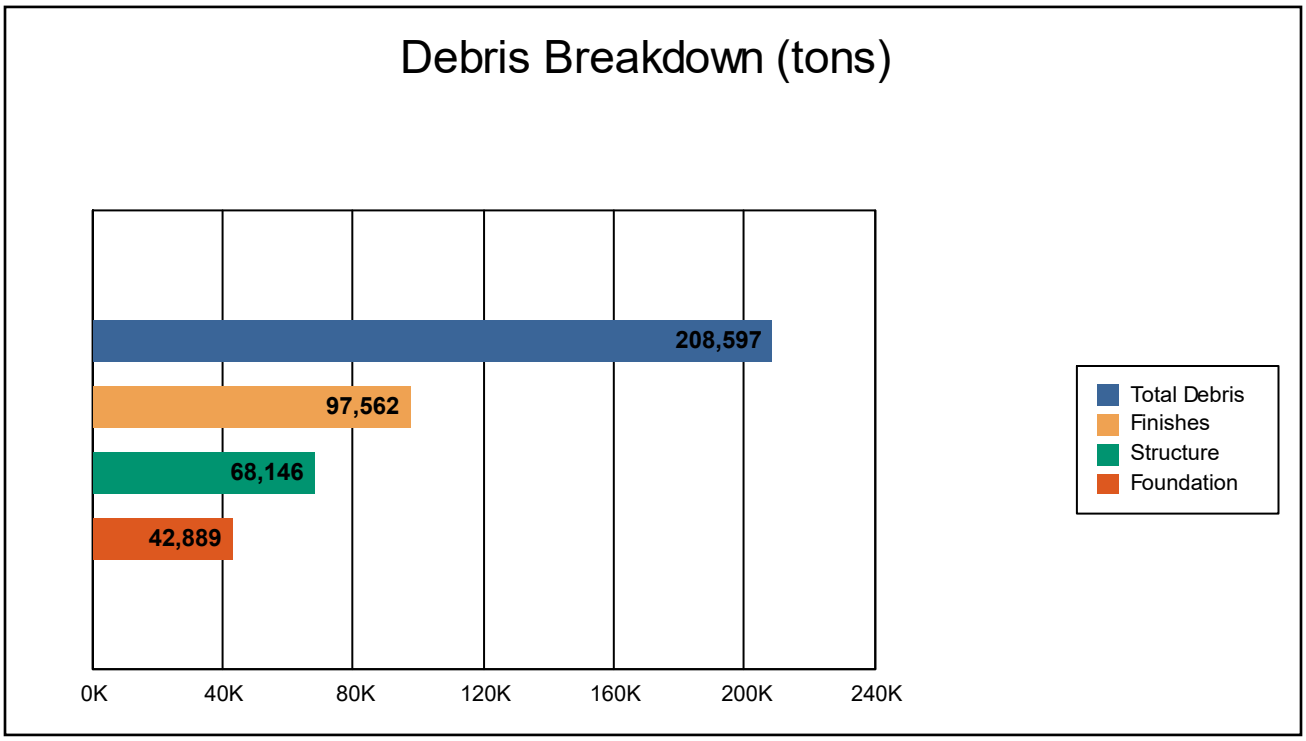
(1) None of your facilities were flooded. This can be checked by mapping the inventory data on the depth grid.

(2) The analysis was not run. This can be tested by checking the run box on the Analysis Menu and seeing if a message box asks you to replace the existing results.

Induced Flood Damage

Debris Generation

Hazus estimates the amount of debris that will be generated by the flood. The model breaks debris into three general categories: 1) Finishes (dry wall, insulation, etc.), 2) Structural (wood, brick, etc.) and 3) Foundations (concrete slab, concrete block, rebar, etc.). This distinction is made because of the different types of material handling equipment required to handle the debris.

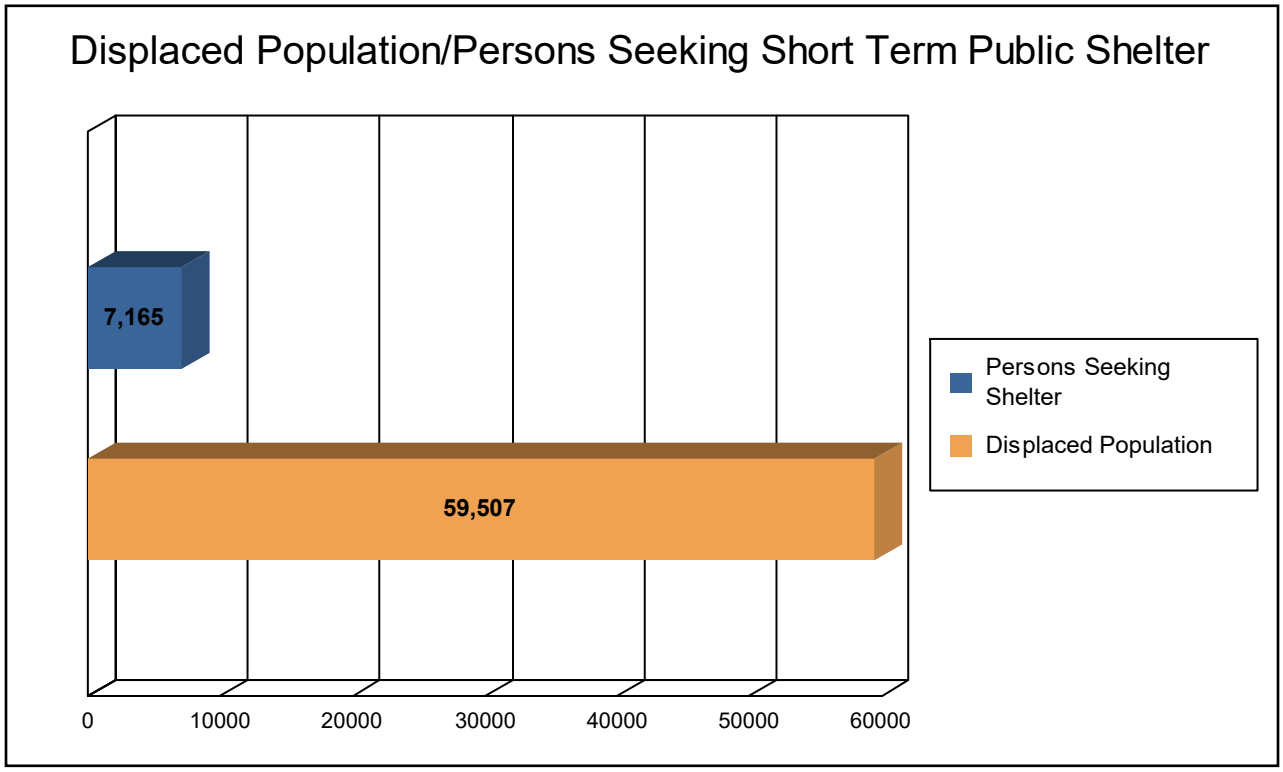


The model estimates that a total of 208,597 tons of debris will be generated. Of the total amount, Finishes comprises 47% of the total, Structure comprises 33% of the total, and Foundation comprises 21%. If the debris tonnage is converted into an estimated number of truckloads, it will require 8344 truckloads (@25 tons/truck) to remove the debris generated by the flood.

Social Impact

Shelter Requirements

Hazus estimates the number of households that are expected to be displaced from their homes due to the flood and the associated potential evacuation. Hazus also estimates those displaced people that will require accommodations in temporary public shelters. The model estimates 19,836 households (or 59,507 of people) will be displaced due to the flood. Displacement includes households evacuated from within or very near to the inundated area. Of these, 7,165 people (out of a total population of 957,322) will seek temporary shelter in public shelters.



Economic Loss

The total economic loss estimated for the flood is 8,443.45 million dollars, which represents 10.21 % of the total replacement value of the scenario buildings.

Building-Related Losses

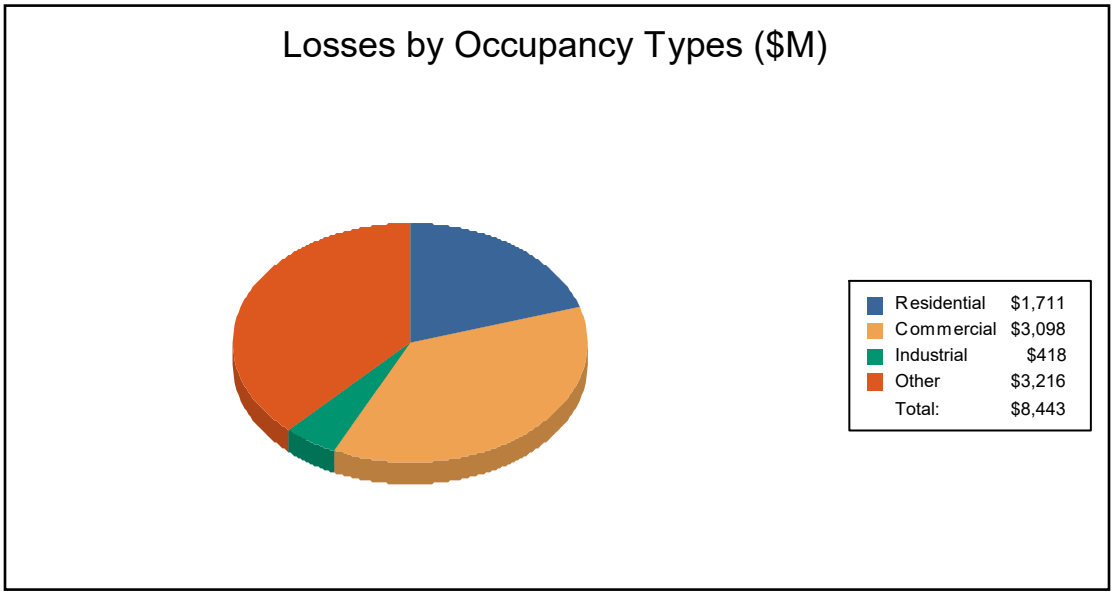
The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the flood. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the flood.

The total building-related losses were 2,908.17 million dollars. 66% of the estimated losses were related to the business interruption of the region. The residential occupancies made up 20.26% of the total loss. Table 6 below provides a summary of the losses associated with the building damage.

Table 6: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Building Loss						
	Building	767.60	216.40	107.86	56.73	1,148.59
	Content	413.40	617.53	245.68	336.64	1,613.26
	Inventory	0.00	104.51	34.03	7.78	146.32
	Subtotal	**1,181.01**	**938.44**	**387.58**	**401.15**	**2,908.17**
Business Interruption						
	Income	14.46	882.02	7.41	199.60	1,103.49
	Relocation	316.43	216.56	9.55	146.71	689.25
	Rental Income	164.93	156.40	1.90	37.64	360.87
	Wage	34.20	904.92	11.56	2,431.00	3,381.67
	Subtotal	**530.02**	**2,159.89**	**30.42**	**2,814.95**	**5,535.28**
ALL	**Total**	**1,711.02**	**3,098.33**	**418.00**	**3,216.10**	**8,443.45**





Appendix A: County Listing for the Region

Connecticut

- Fairfield

Appendix B: Regional Population and Building Value Data

	Population	Building Value (thousands of dollars)		
		Residential	Non-Residential	Total
Connecticut				
Fairfield	957,322	138,194,741	64,130,883	202,325,624
Total	**957,322**	**138,194,741**	**64,130,883**	**202,325,624**
Total Study Region	**957,322**	**138,194,741**	**64,130,883**	**202,325,624**

Hazus: Flood Global Risk Report

Region Name: CT_FLD_Hartford

Flood Scenario: Hartford_100

Print Date: Tuesday, April 11, 2023

Disclaimer:

Totals only reflect data for those census tracts/blocks included in the user's study region.

The estimates of social and economic impacts contained in this report were produced using Hazus loss estimation methodology software which is based on current scientific and engineering knowledge. There are uncertainties inherent in any loss estimation technique. Therefore, there may be significant differences between the modeled results contained in this report and the actual social and economic losses following a specific Flood. These results can be improved by using enhanced inventory data and flood hazard information.

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General Description of the Region

Hazus is a regional multi-hazard loss estimation model that was developed by the Federal Emergency Management Agency (FEMA) and the National Institute of Building Sciences (NIBS). The primary purpose of Hazus is to provide a methodology and software application to develop multi-hazard losses at a regional scale. These loss estimates would be used primarily by local, state and regional officials to plan and stimulate efforts to reduce risks from multi-hazards and to prepare for emergency response and recovery.

The flood loss estimates provided in this report were based on a region that included 1 county(ies) from the following state(s):

- Connecticut

Note:
Appendix A contains a complete listing of the counties contained in the region.

The geographical size of the region is approximately 184 square miles and contains 10,136 census blocks. The region contains over 362 thousand households and has a total population of 898,547 people. The distribution of population by State and County for the study region is provided in Appendix B.

There are an estimated 264,089 buildings in the region with a total building replacement value (excluding contents) of 170,771 million dollars. Approximately 86.88% of the buildings (and 60.52% of the building value) are associated with residential housing.

Building Inventory

General Building Stock

Hazus estimates that there are 264,089 buildings in the region which have an aggregate total replacement value of 170,771 million dollars. Table 1 and Table 2 present the relative distribution of the value with respect to the general occupancies by Study Region and Scenario respectively. Appendix B provides a general distribution of the building value by State and County.

Table 1
Building Exposure by Occupancy Type for the Study Region

Occupancy	Exposure ($1000)	Percent of Total
Residential	103,342,410	60.5%
Commercial	37,797,556	22.1%
Industrial	11,188,167	6.6%
Agricultural	388,772	0.2%
Religion	2,913,557	1.7%
Government	4,918,281	2.9%
Education	10,222,590	6.0%
Total	**170,771,333**	**100%**

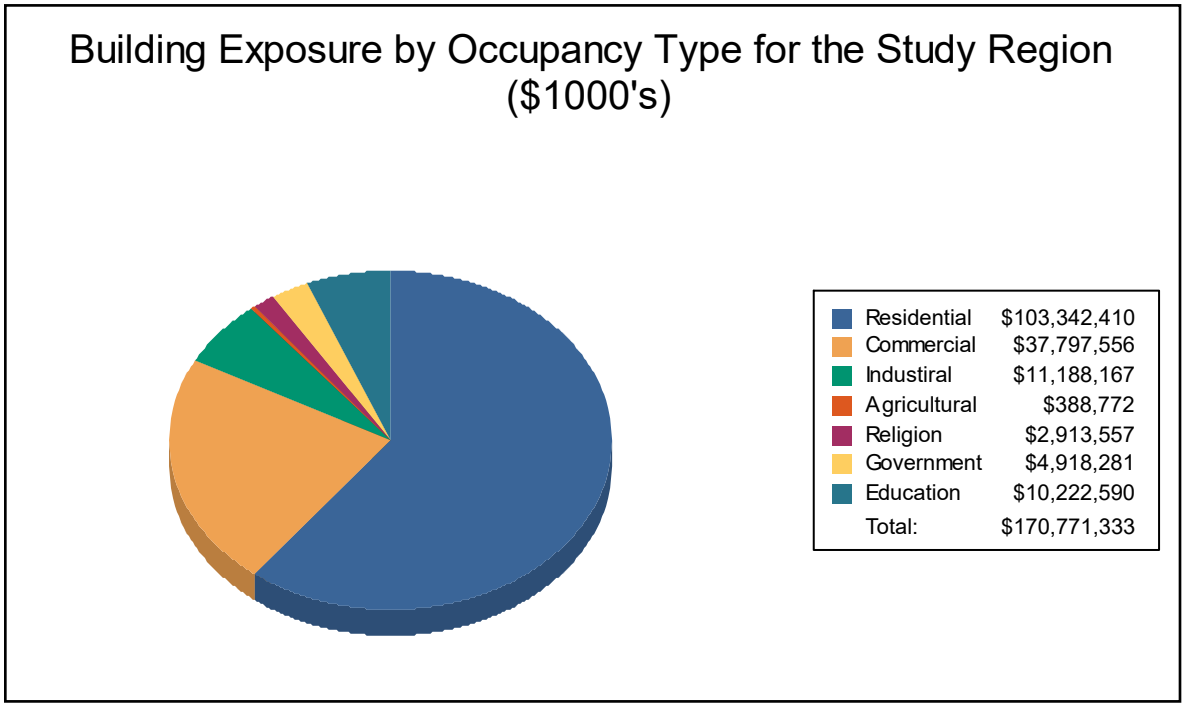
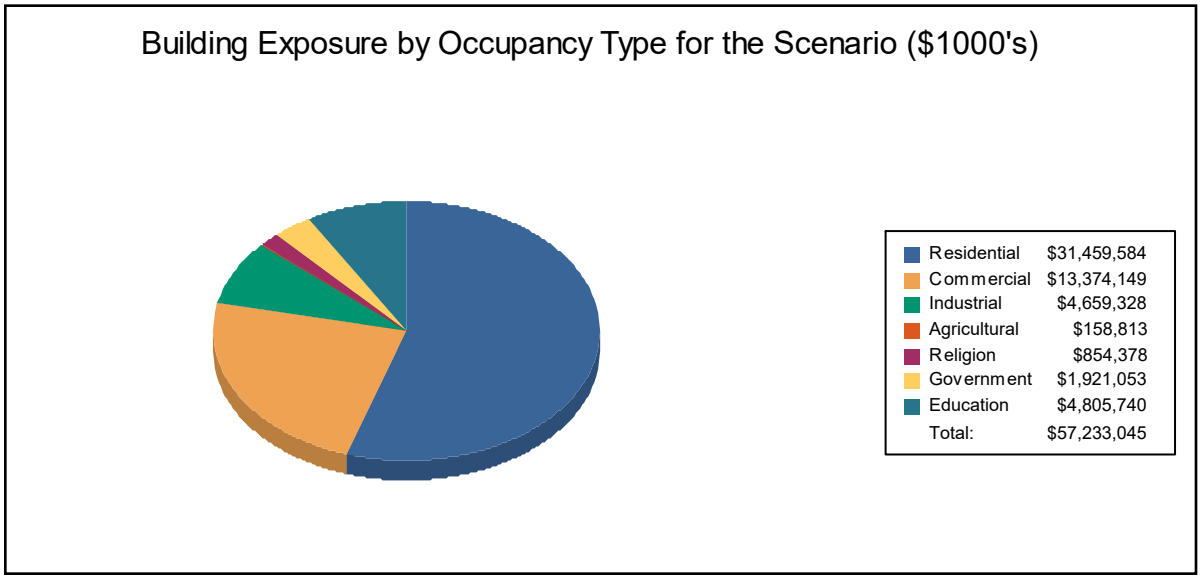


Table 2
Building Exposure by Occupancy Type for the Scenario

Occupancy	Exposure ($1000)	Percent of Total
Residential	31,459,584	55.0%
Commercial	13,374,149	23.4%
Industrial	4,659,328	8.1%
Agricultural	158,813	0.3%
Religion	854,378	1.5%
Government	1,921,053	3.4%
Education	4,805,740	8.4%
Total	**57,233,045**	**100%**



Essential Facility Inventory

For essential facilities, there are 15 hospitals in the region with a total bed capacity of 3,165 beds. There are 342 schools, 125 fire stations, 38 police stations and 29 emergency operation centers.

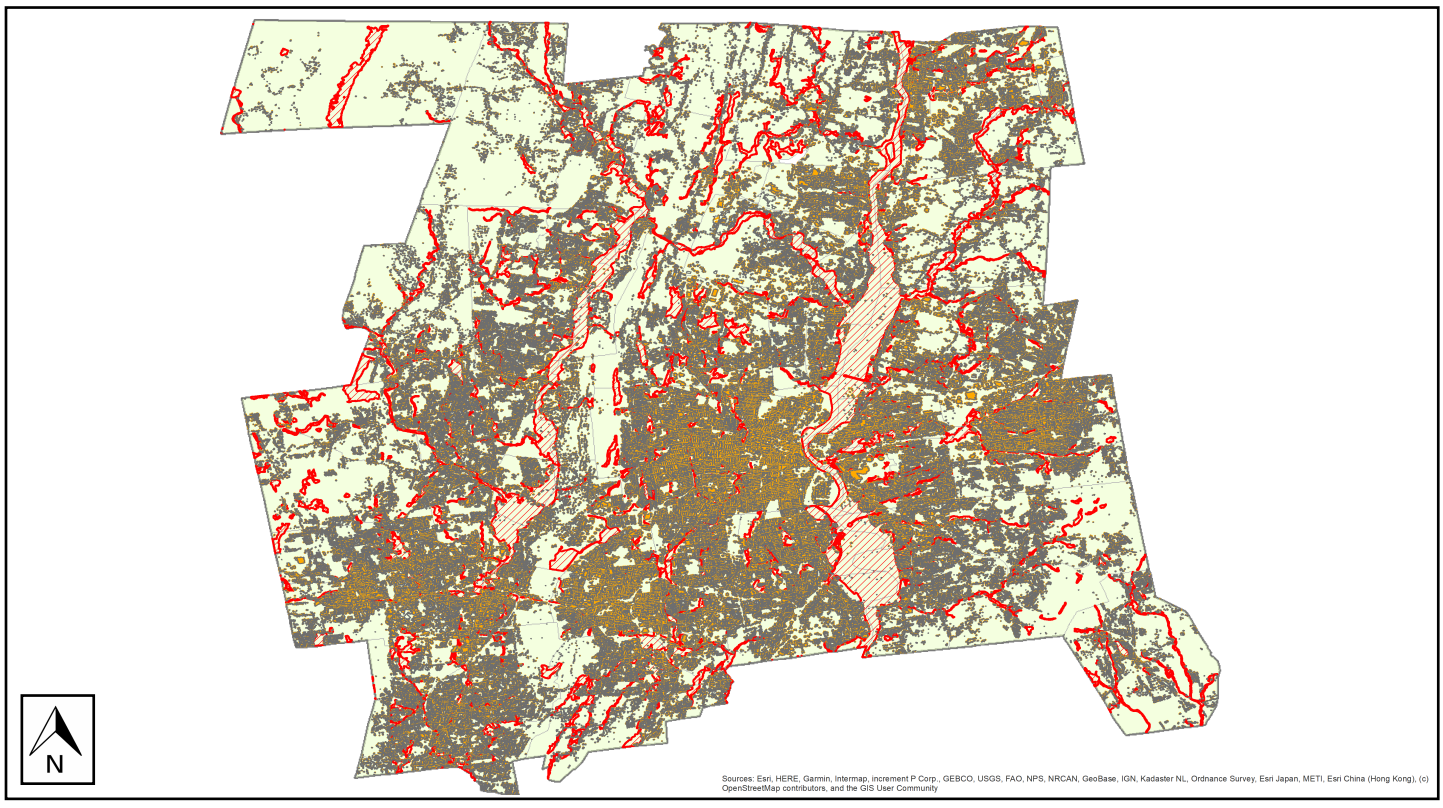
Flood Scenario Parameters

Hazus used the following set of information to define the flood parameters for the flood loss estimate provided in this report.

Study Region Name:	CT_FLD_Hartford
Scenario Name:	Hartford_100
Return Period Analyzed:	100
Analysis Options Analyzed:	No What-Ifs

Study Region Overview Map

Illustrating scenario flood extent, as well as exposed essential facilities and total exposure



Building Damage

General Building Stock Damage

Hazus estimates that about 129 buildings will be at least moderately damaged. This is over 59% of the total number of buildings in the scenario. There are an estimated 2 buildings that will be completely destroyed. The definition of the 'damage states' is provided in the Hazus Flood Technical Manual. Table 3 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4 summarizes the expected damage by general building type.

Total Economic Loss (1 dot = $300K) Overview Map

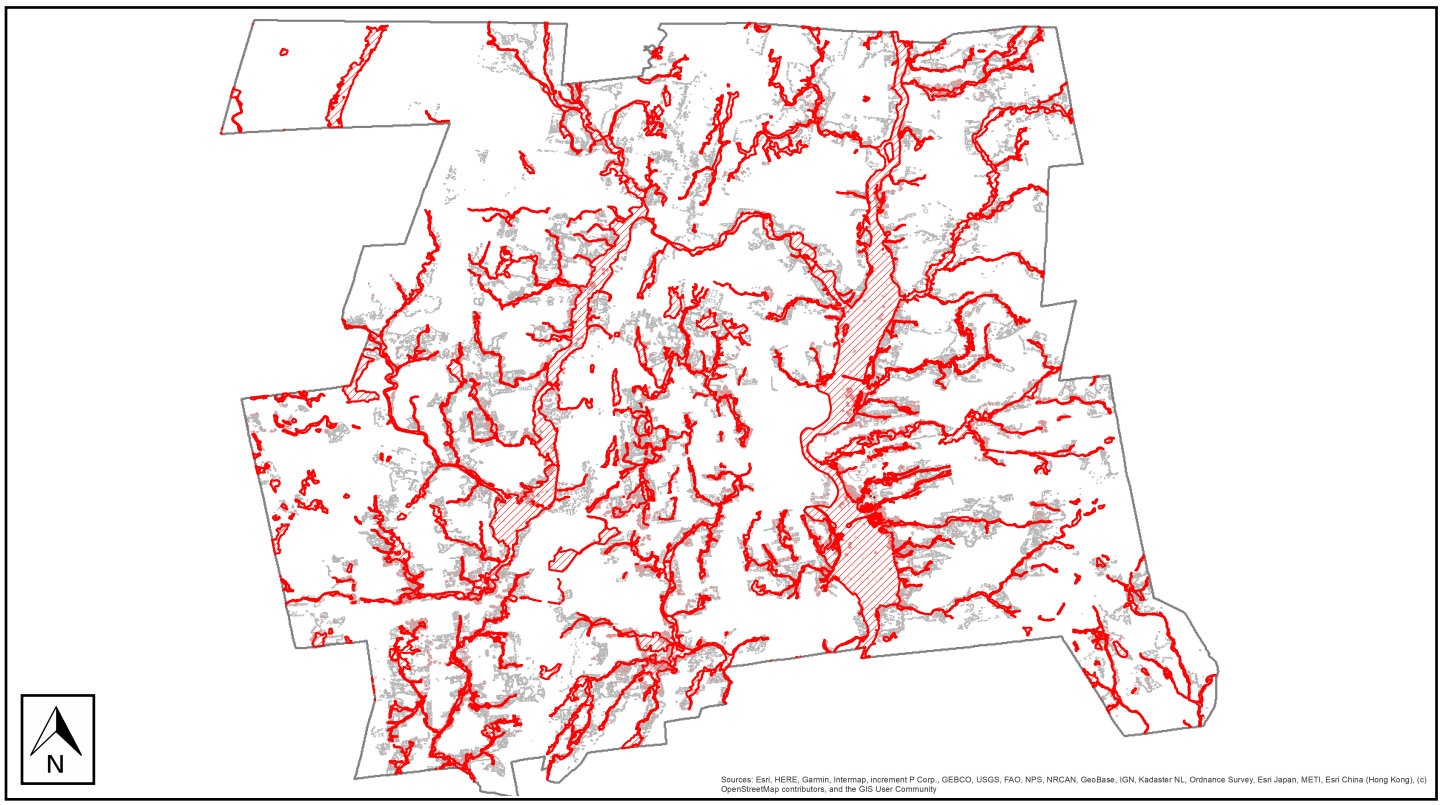


Table 3: Expected Building Damage by Occupancy

	1-10		11-20		21-30		31-40		41-50		>50	
Occupancy	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Agriculture	0	0	0	0	0	0	0	0	0	0	0	0
Commercial	7	70	3	30	0	0	0	0	0	0	0	0
Education	0	0	0	0	0	0	0	0	0	0	0	0
Government	2	67	1	33	0	0	0	0	0	0	0	0
Industrial	0	0	0	0	0	0	0	0	0	0	0	0
Religion	0	0	0	0	0	0	0	0	0	0	0	0
Residential	872	87	99	10	16	2	5	1	3	0	2	0
Total	**881**		**103**		**16**		**5**		**3**		**2**	

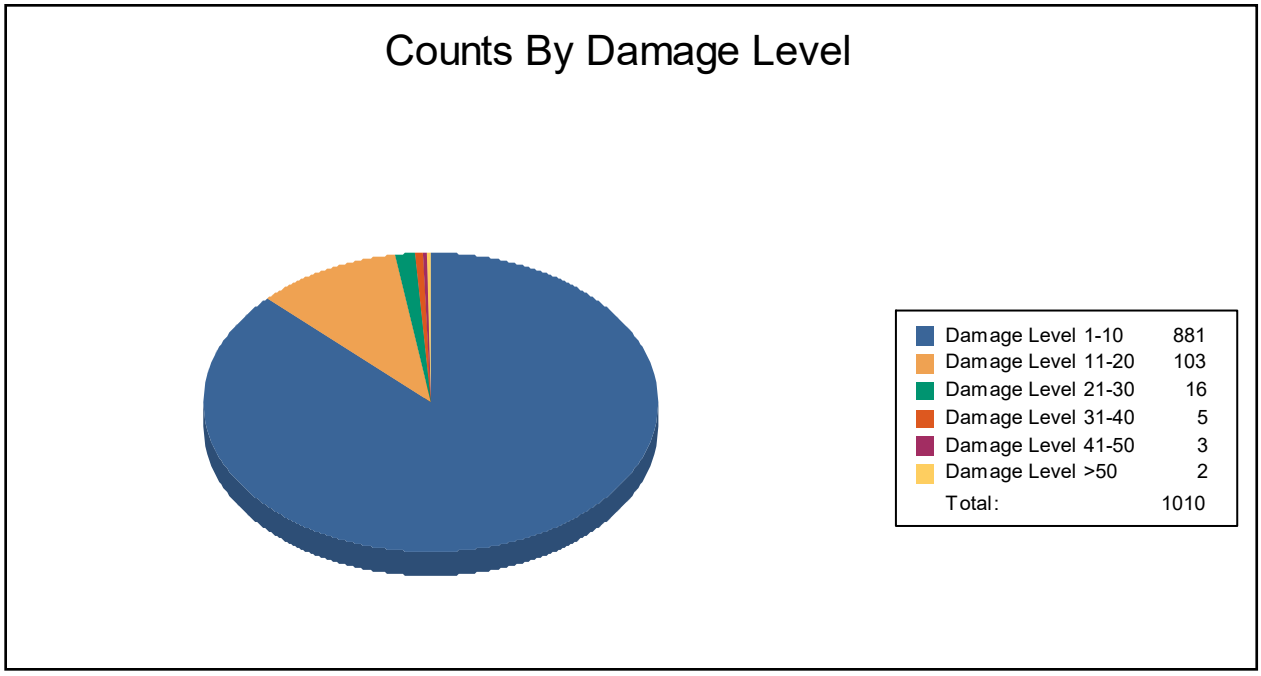


Table 4: Expected Building Damage by Building Type

Building Type	1-10		11-20		21-30		31-40		41-50		>50	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Concrete	0	0	0	0	0	0	0	0	0	0	0	0
ManufHousing	0	0	0	0	0	0	0	0	0	0	0	0
Masonry	6	100	0	0	0	0	0	0	0	0	0	0
Steel	6	75	2	25	0	0	0	0	0	0	0	0
Wood	866	87	99	10	16	2	5	1	3	0	2	0

Essential Facility Damage

Before the flood analyzed in this scenario, the region had 3,165 hospital beds available for use. On the day of the scenario flood event, the model estimates that 3,165 hospital beds are available in the region.

Table 5: Expected Damage to Essential Facilities

		# Facilities		
Classification	Total	At Least Moderate	At Least Substantial	Loss of Use
Emergency Operation Centers	29	0	0	0
Fire Stations	125	0	0	0
Hospitals	15	0	0	0
Police Stations	38	0	0	0
Schools	342	0	0	0

If this report displays all zeros or is blank, two possibilities can explain this.

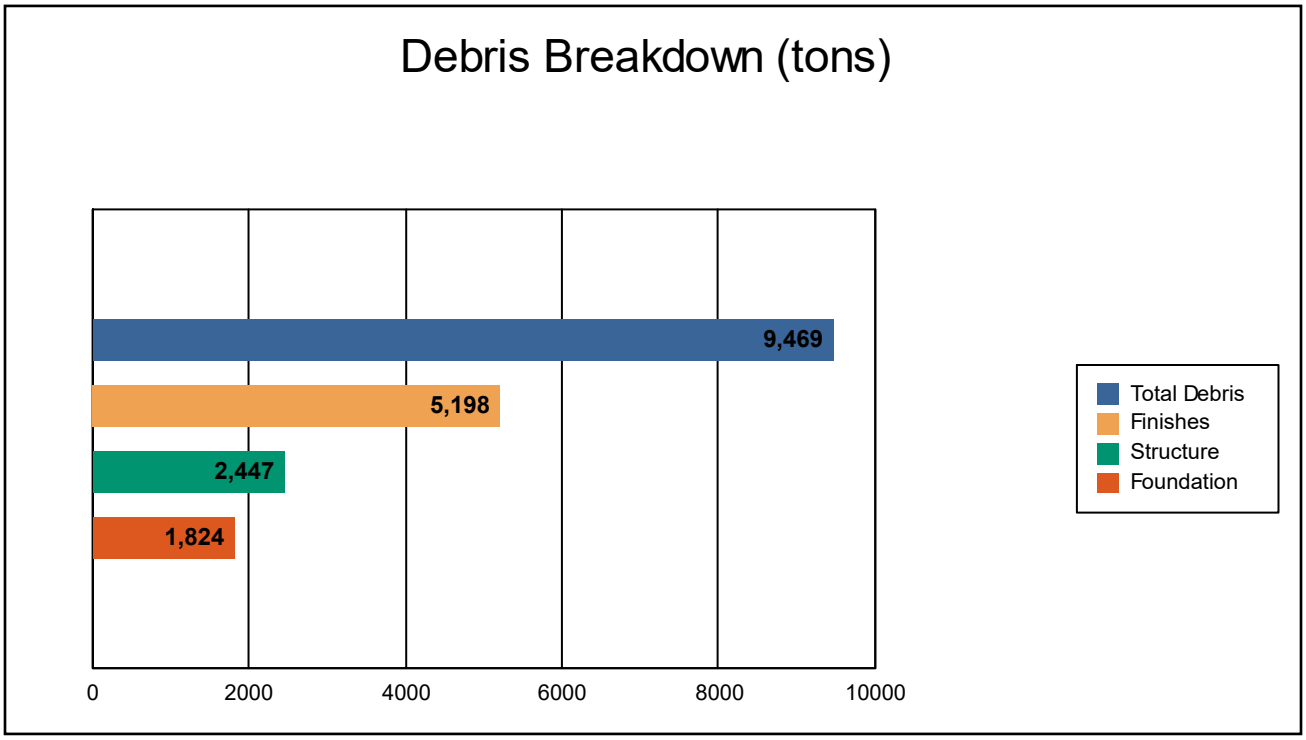
(1) None of your facilities were flooded. This can be checked by mapping the inventory data on the depth grid.

(2) The analysis was not run. This can be tested by checking the run box on the Analysis Menu and seeing if a message box asks you to replace the existing results.

Induced Flood Damage

Debris Generation

Hazus estimates the amount of debris that will be generated by the flood. The model breaks debris into three general categories: 1) Finishes (dry wall, insulation, etc.), 2) Structural (wood, brick, etc.) and 3) Foundations (concrete slab, concrete block, rebar, etc.). This distinction is made because of the different types of material handling equipment required to handle the debris.

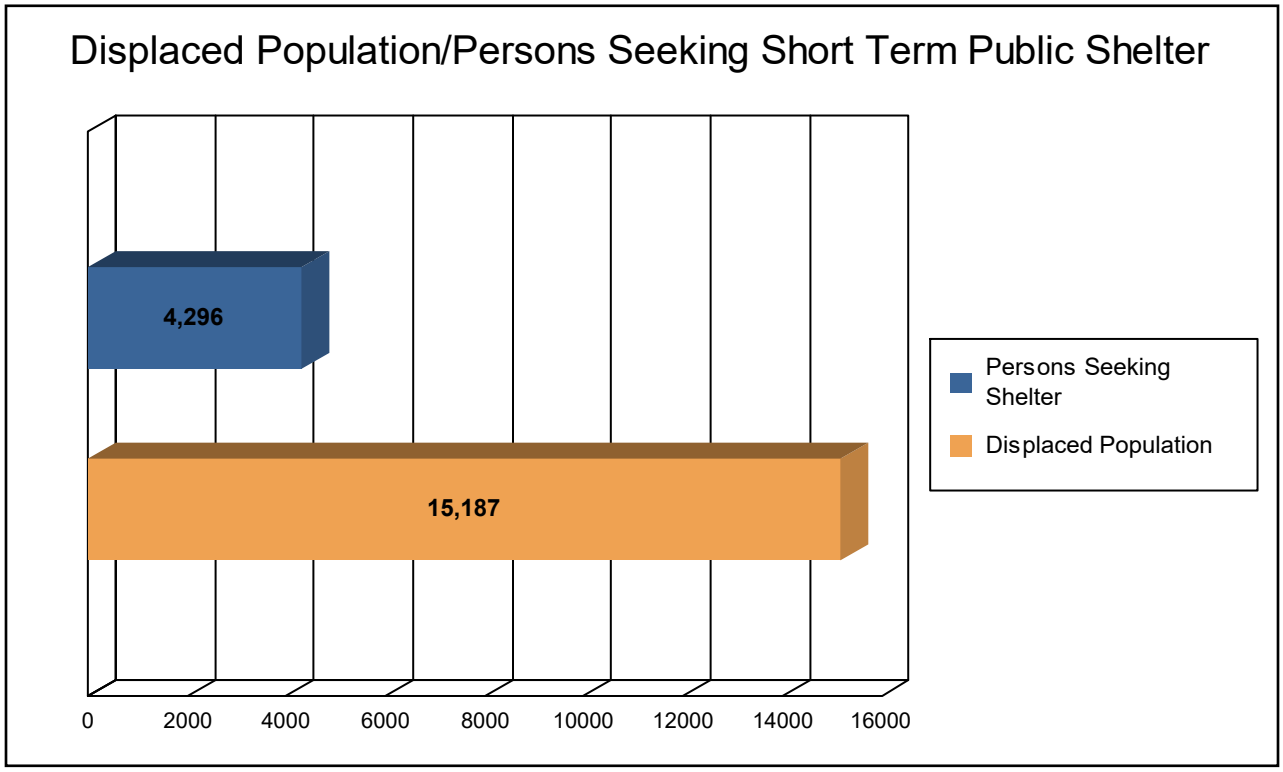


The model estimates that a total of 9,469 tons of debris will be generated. Of the total amount, Finishes comprises 55% of the total, Structure comprises 26% of the total, and Foundation comprises 19%. If the debris tonnage is converted into an estimated number of truckloads, it will require 379 truckloads (@25 tons/truck) to remove the debris generated by the flood.

Social Impact

Shelter Requirements

Hazus estimates the number of households that are expected to be displaced from their homes due to the flood and the associated potential evacuation. Hazus also estimates those displaced people that will require accommodations in temporary public shelters. The model estimates 5,062 households (or 15,187 of people) will be displaced due to the flood. Displacement includes households evacuated from within or very near to the inundated area. Of these, 4,296 people (out of a total population of 898,547) will seek temporary shelter in public shelters.



Economic Loss

The total economic loss estimated for the flood is 1,863.32 million dollars, which represents 3.26 % of the total replacement value of the scenario buildings.

Building-Related Losses

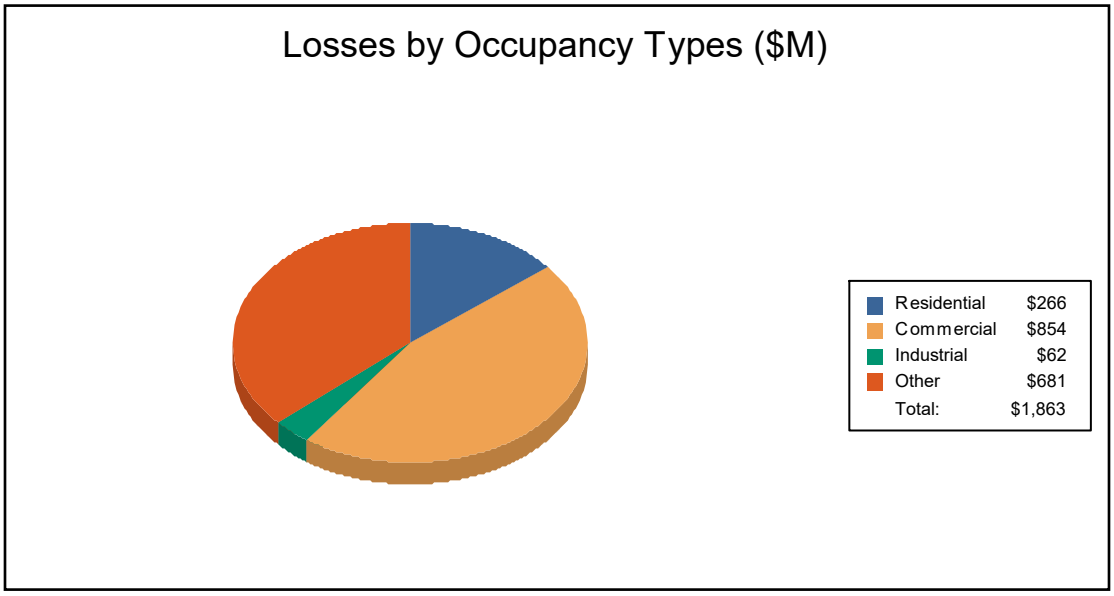
The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the flood. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the flood.

The total building-related losses were 460.78 million dollars. 75% of the estimated losses were related to the business interruption of the region. The residential occupancies made up 14.29% of the total loss. Table 6 below provides a summary of the losses associated with the building damage.

Table 6: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Building Loss						
	Building	104.79	41.99	16.11	9.63	172.53
	Content	45.86	124.14	36.38	56.27	262.64
	Inventory	0.00	19.44	5.14	1.03	25.61
	Subtotal	**150.65**	**185.57**	**57.63**	**66.92**	**460.78**
Business Interruption						
	Income	6.01	276.36	1.13	70.21	353.71
	Relocation	60.09	60.76	1.09	39.48	161.41
	Rental Income	35.22	42.32	0.23	7.55	85.32
	Wage	14.25	288.59	1.98	497.28	802.10
	Subtotal	**115.56**	**668.03**	**4.44**	**614.52**	**1,402.54**
ALL	**Total**	**266.21**	**853.60**	**62.07**	**681.44**	**1,863.32**





Appendix A: County Listing for the Region

Connecticut

- Hartford

Appendix B: Regional Population and Building Value Data

	Population	Building Value (thousands of dollars)		
		Residential	Non-Residential	Total
Connecticut				
Hartford	898,547	103,342,410	67,428,923	170,771,333
Total	**898,547**	**103,342,410**	**67,428,923**	**170,771,333**
Total Study Region	**898,547**	**103,342,410**	**67,428,923**	**170,771,333**

Hazus: Flood Global Risk Report

Region Name:	CT_FLD_Litchfield
Flood Scenario:	Litchfield_100
Print Date:	Monday, April 10, 2023

Disclaimer:
Totals only reflect data for those census tracts/blocks included in the user's study region.

The estimates of social and economic impacts contained in this report were produced using Hazus loss estimation methodology software which is based on current scientific and engineering knowledge. There are uncertainties inherent in any loss estimation technique. Therefore, there may be significant differences between the modeled results contained in this report and the actual social and economic losses following a specific Flood. These results can be improved by using enhanced inventory data and flood hazard information.

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General Description of the Region

Hazus is a regional multi-hazard loss estimation model that was developed by the Federal Emergency Management Agency (FEMA) and the National Institute of Building Sciences (NIBS). The primary purpose of Hazus is to provide a methodology and software application to develop multi-hazard losses at a regional scale. These loss estimates would be used primarily by local, state and regional officials to plan and stimulate efforts to reduce risks from multi-hazards and to prepare for emergency response and recovery.

The flood loss estimates provided in this report were based on a region that included 1 county(ies) from the following state(s):

- Connecticut

Note:
Appendix A contains a complete listing of the counties contained in the region.

The geographical size of the region is approximately 68 square miles and contains 3,969 census blocks. The region contains over 77 thousand households and has a total population of 185,062 people. The distribution of population by State and County for the study region is provided in Appendix B.

There are an estimated 80,760 buildings in the region with a total building replacement value (excluding contents) of 43,122 million dollars. Approximately 86.84% of the buildings (and 66.42% of the building value) are associated with residential housing.

Building Inventory

General Building Stock

Hazus estimates that there are 80,760 buildings in the region which have an aggregate total replacement value of 43,122 million dollars. Table 1 and Table 2 present the relative distribution of the value with respect to the general occupancies by Study Region and Scenario respectively. Appendix B provides a general distribution of the building value by State and County.

Table 1
Building Exposure by Occupancy Type for the Study Region

Occupancy	Exposure ($1000)	Percent of Total
Residential	28,640,303	66.4%
Commercial	7,804,198	18.1%
Industrial	3,206,139	7.4%
Agricultural	148,907	0.3%
Religion	512,470	1.2%
Government	1,015,108	2.4%
Education	1,795,290	4.2%
Total	**43,122,415**	**100%**

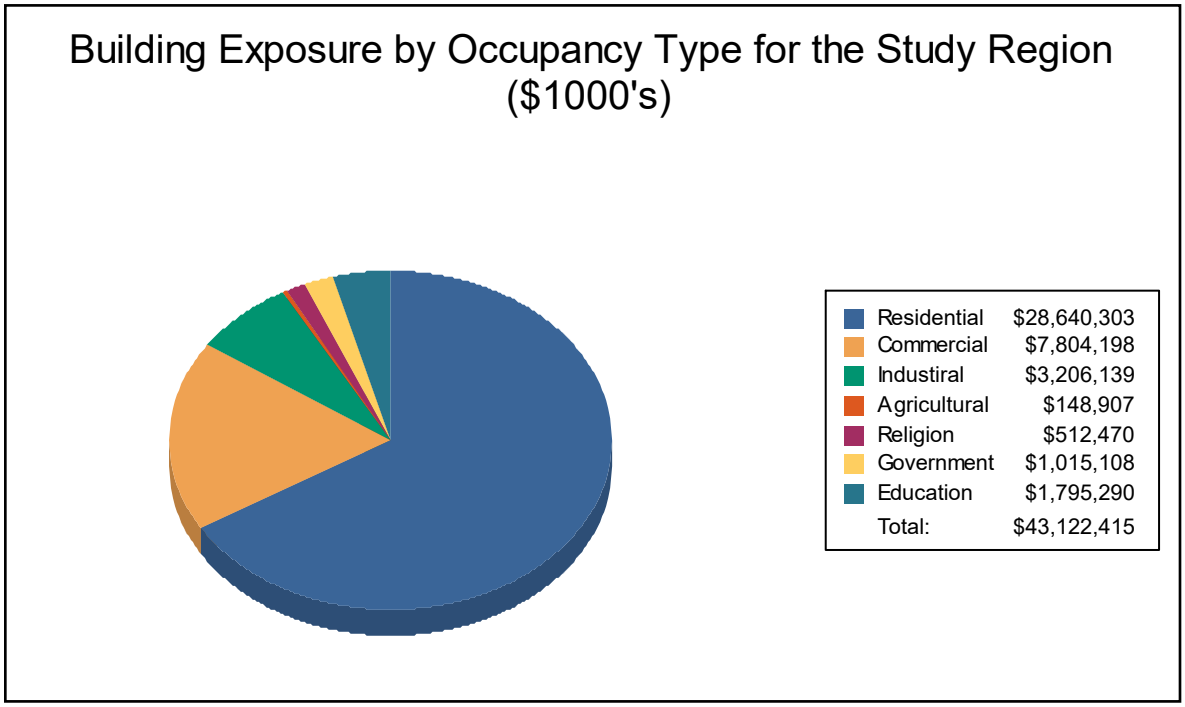
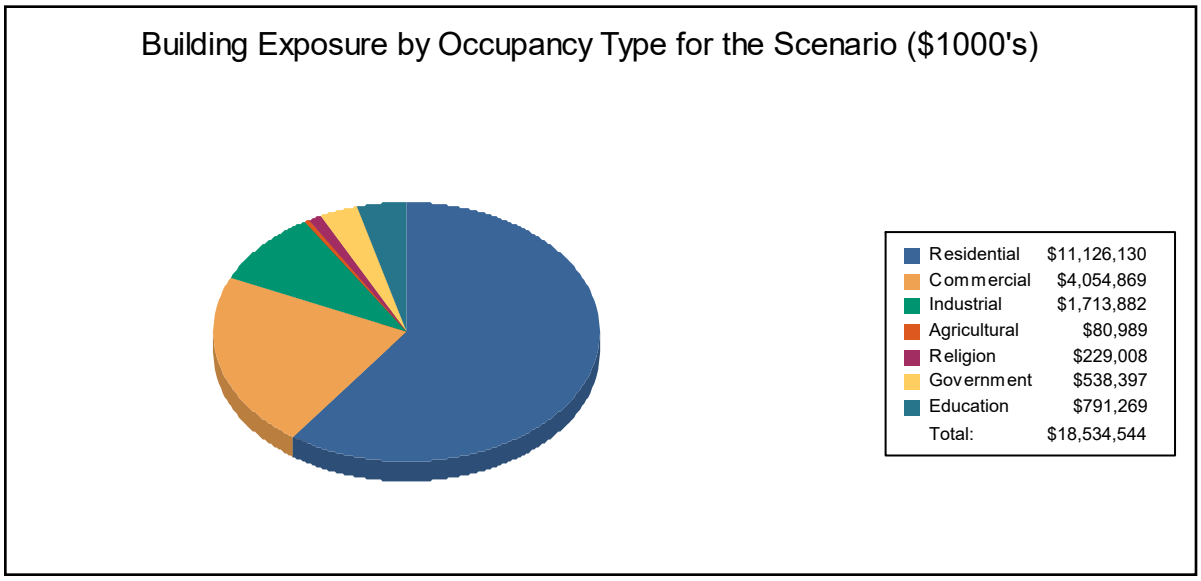


Table 2
Building Exposure by Occupancy Type for the Scenario

Occupancy	Exposure ($1000)	Percent of Total
Residential	11,126,130	60.0%
Commercial	4,054,869	21.9%
Industrial	1,713,882	9.2%
Agricultural	80,989	0.4%
Religion	229,008	1.2%
Government	538,397	2.9%
Education	791,269	4.3%
Total	**18,534,544**	**100%**



Essential Facility Inventory

For essential facilities, there are 4 hospitals in the region with a total bed capacity of 272 beds.
There are 82 schools, 52 fire stations, 24 police stations and 26 emergency operation centers.

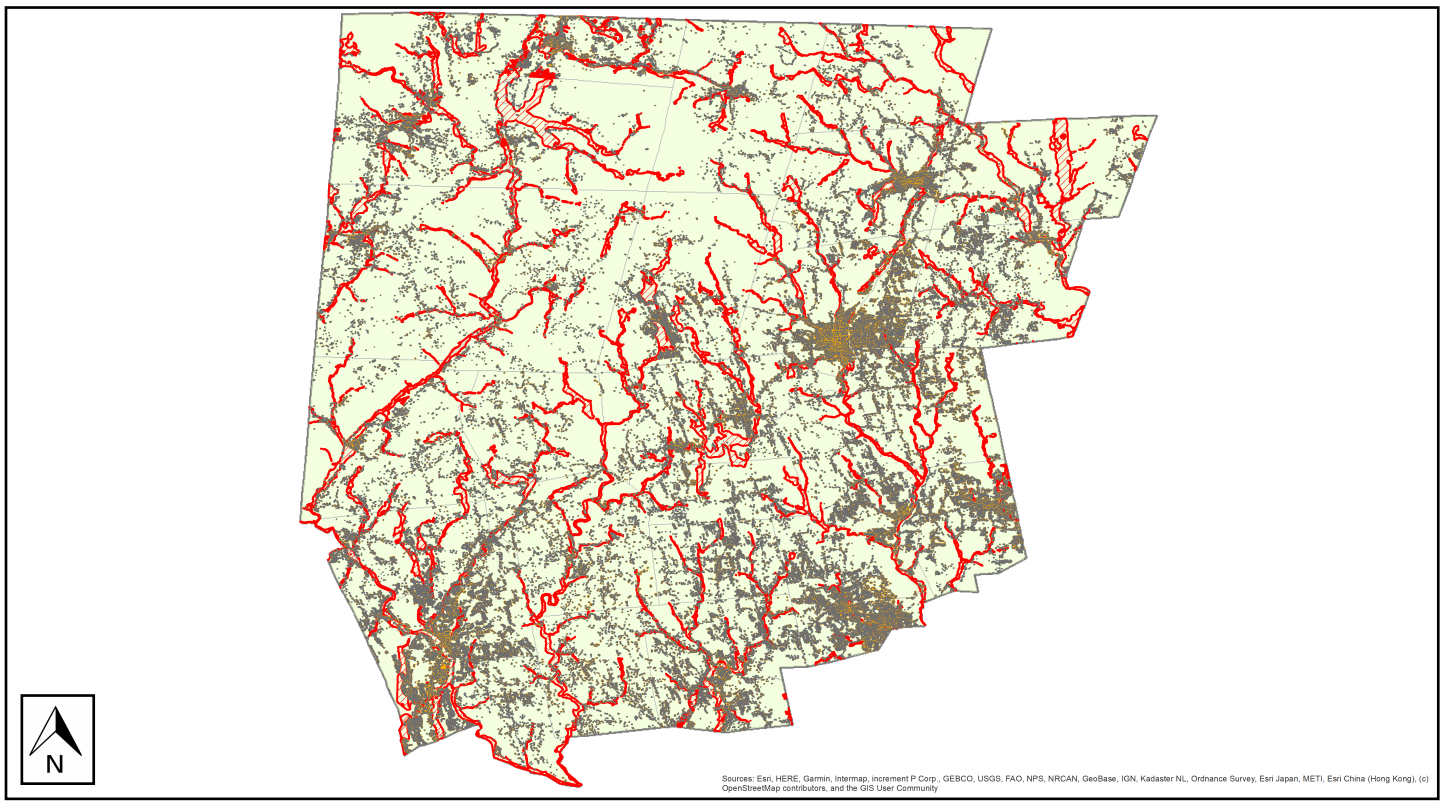
Flood Scenario Parameters

Hazus used the following set of information to define the flood parameters for the flood loss estimate provided in this report.

Study Region Name:	CT_FLD_Litchfield
Scenario Name:	Litchfield_100
Return Period Analyzed:	100
Analysis Options Analyzed:	No What-Ifs

Study Region Overview Map

Illustrating scenario flood extent, as well as exposed essential facilities and total exposure



Building Damage

General Building Stock Damage

Hazus estimates that about 710 buildings will be at least moderately damaged. This is over 73% of the total number of buildings in the scenario. There are an estimated 137 buildings that will be completely destroyed. The definition of the 'damage states' is provided in the Hazus Flood Technical Manual. Table 3 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4 summarizes the expected damage by general building type.

Total Economic Loss (1 dot = $300K) Overview Map

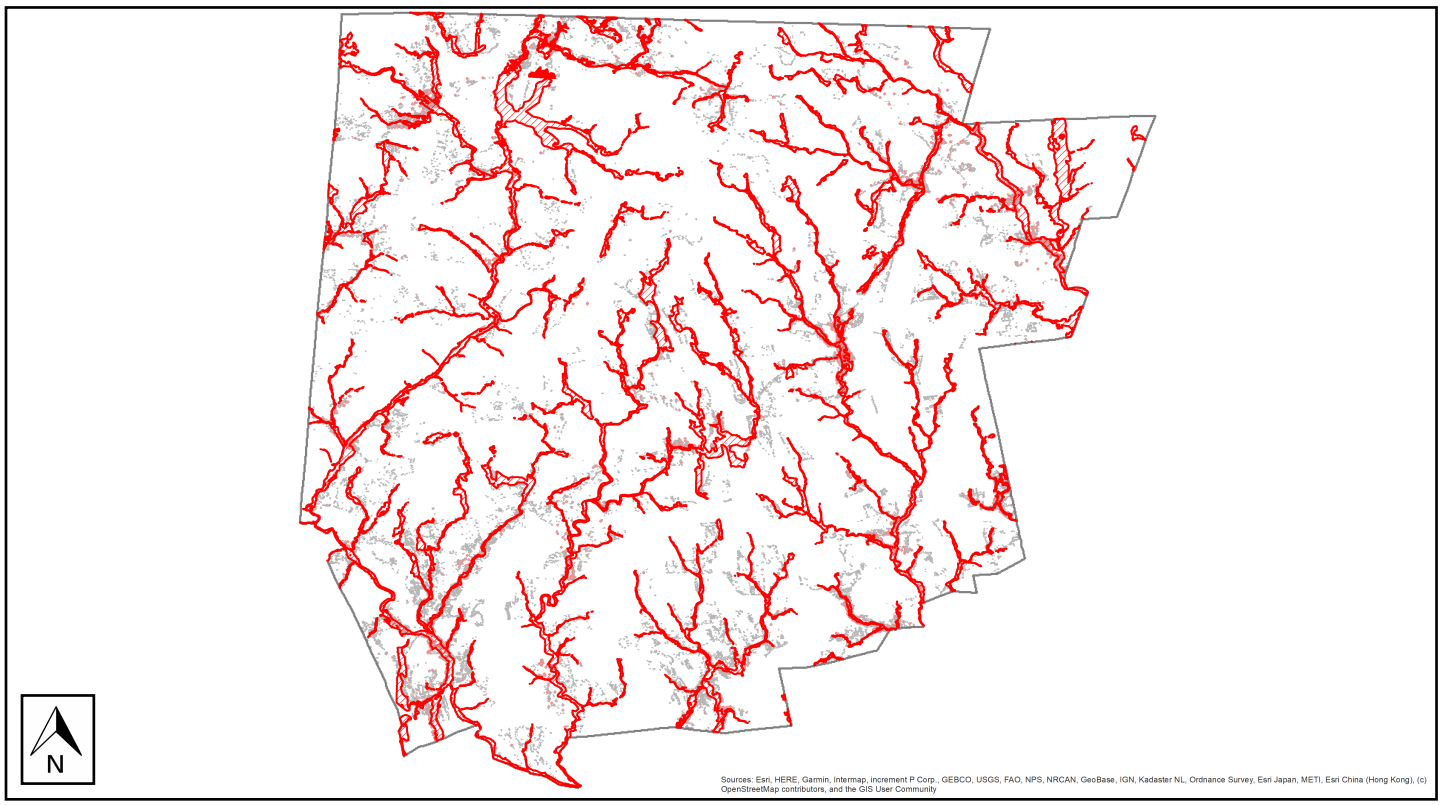


Table 3: Expected Building Damage by Occupancy

	1-10		11-20		21-30		31-40		41-50		>50	
Occupancy	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Agriculture	0	0	0	0	0	0	0	0	0	0	0	0
Commercial	18	16	59	52	12	11	16	14	6	5	3	3
Education	0	0	0	0	0	0	0	0	0	0	0	0
Government	3	30	5	50	0	0	0	0	0	0	2	20
Industrial	1	6	9	50	3	17	3	17	0	0	2	11
Religion	0	0	2	100	0	0	0	0	0	0	0	0
Residential	226	28	281	35	116	14	33	4	28	3	130	16
Total	**248**		**356**		**131**		**52**		**34**		**137**	

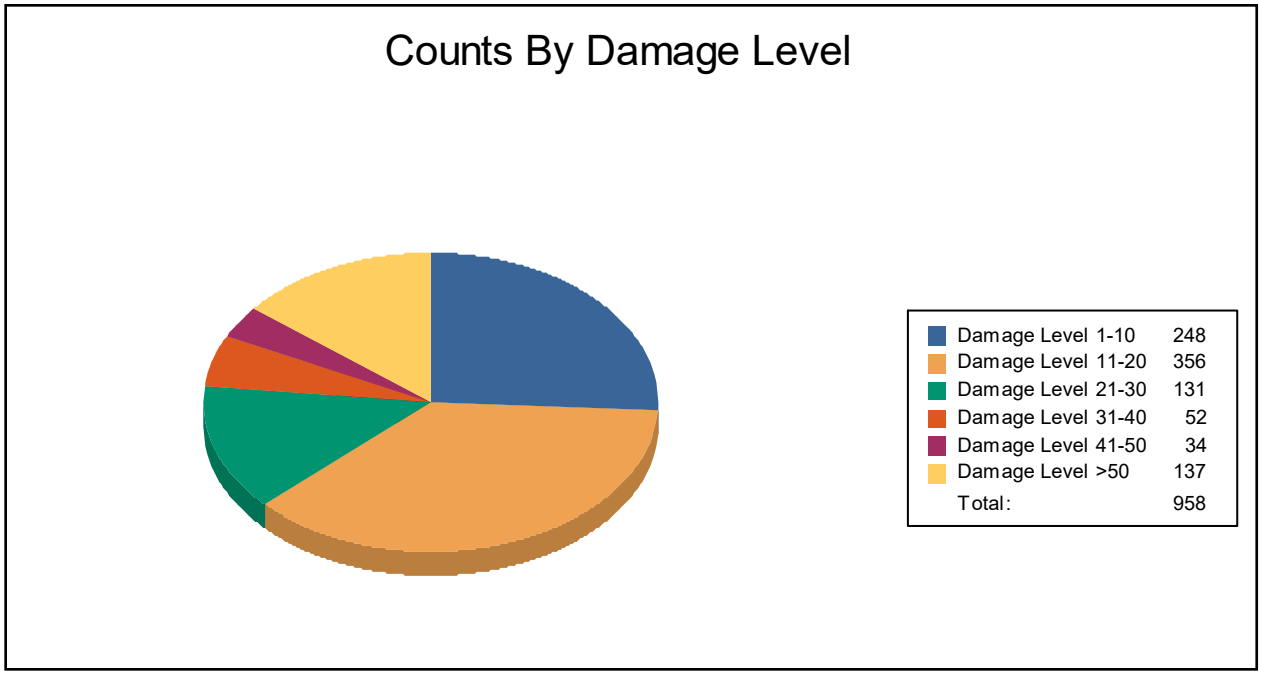


Table 4: Expected Building Damage by Building Type

Building Type	1-10		11-20		21-30		31-40		41-50		>50	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Concrete	0	0	0	0	0	0	0	0	0	0	0	0
ManufHousing	0	0	0	0	0	0	0	0	0	0	15	100
Masonry	24	26	47	51	12	13	5	5	2	2	2	2
Steel	14	17	40	48	9	11	11	13	3	4	7	8
Wood	205	27	261	35	108	14	31	4	28	4	113	15

Essential Facility Damage

Before the flood analyzed in this scenario, the region had 272 hospital beds available for use. On the day of the scenario flood event, the model estimates that 272 hospital beds are available in the region.

Table 5: Expected Damage to Essential Facilities

		# Facilities		
Classification	Total	At Least Moderate	At Least Substantial	Loss of Use
Emergency Operation Centers	26	0	0	0
Fire Stations	52	0	0	0
Hospitals	4	0	0	0
Police Stations	24	0	0	0
Schools	82	0	0	0

If this report displays all zeros or is blank, two possibilities can explain this.

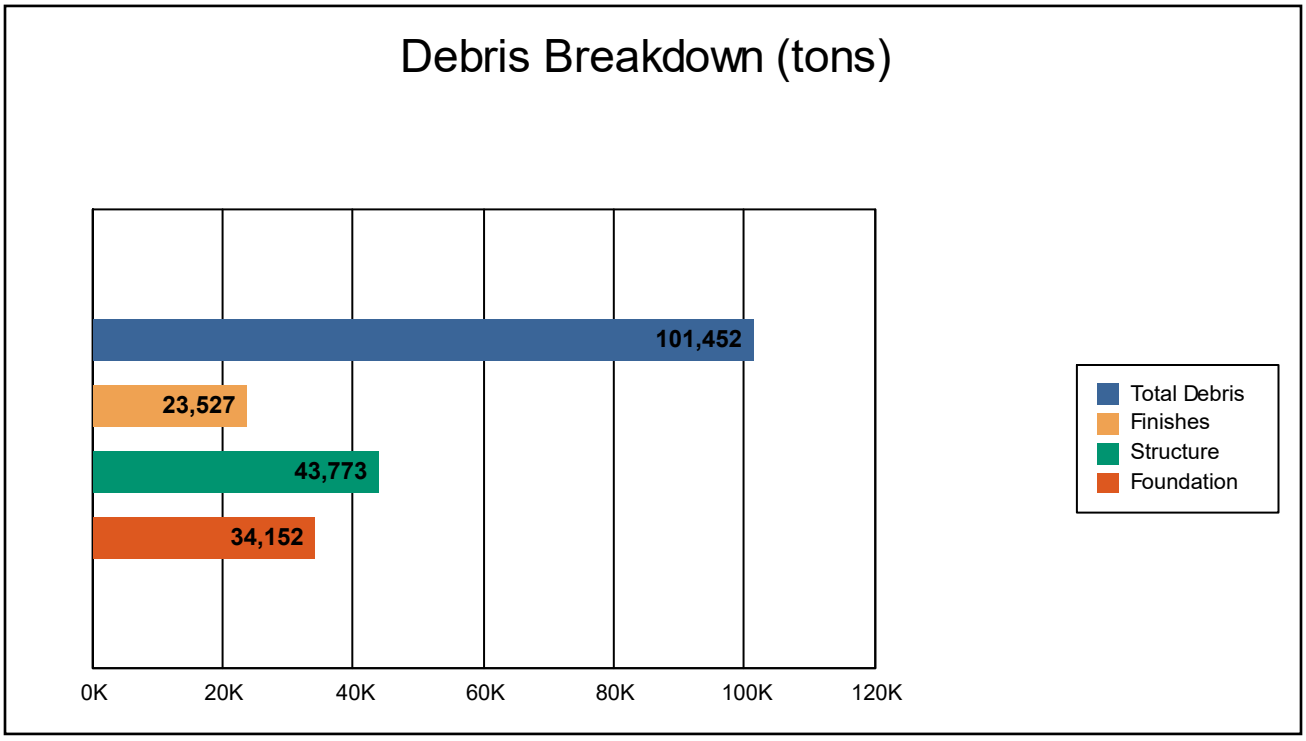
(1) None of your facilities were flooded. This can be checked by mapping the inventory data on the depth grid.

(2) The analysis was not run. This can be tested by checking the run box on the Analysis Menu and seeing if a message box asks you to replace the existing results.

Induced Flood Damage

Debris Generation

Hazus estimates the amount of debris that will be generated by the flood. The model breaks debris into three general categories: 1) Finishes (dry wall, insulation, etc.), 2) Structural (wood, brick, etc.) and 3) Foundations (concrete slab, concrete block, rebar, etc.). This distinction is made because of the different types of material handling equipment required to handle the debris.

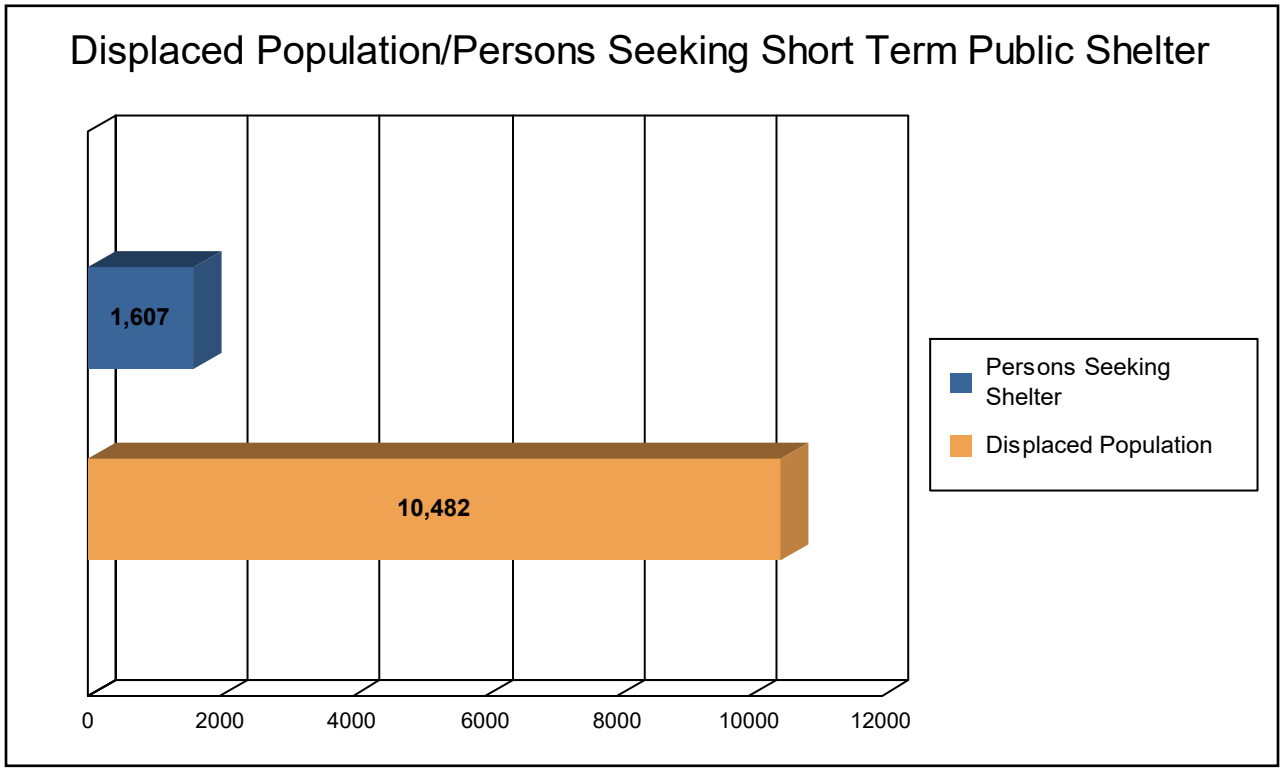


The model estimates that a total of 101,452 tons of debris will be generated. Of the total amount, Finishes comprises 23% of the total, Structure comprises 43% of the total, and Foundation comprises 34%. If the debris tonnage is converted into an estimated number of truckloads, it will require 4059 truckloads (@25 tons/truck) to remove the debris generated by the flood.

Social Impact

Shelter Requirements

Hazus estimates the number of households that are expected to be displaced from their homes due to the flood and the associated potential evacuation. Hazus also estimates those displaced people that will require accommodations in temporary public shelters. The model estimates 3,494 households (or 10,482 of people) will be displaced due to the flood. Displacement includes households evacuated from within or very near to the inundated area. Of these, 1,607 people (out of a total population of 185,062) will seek temporary shelter in public shelters.



Economic Loss

The total economic loss estimated for the flood is 3,667.45 million dollars, which represents 19.79 % of the total replacement value of the scenario buildings.

Building-Related Losses

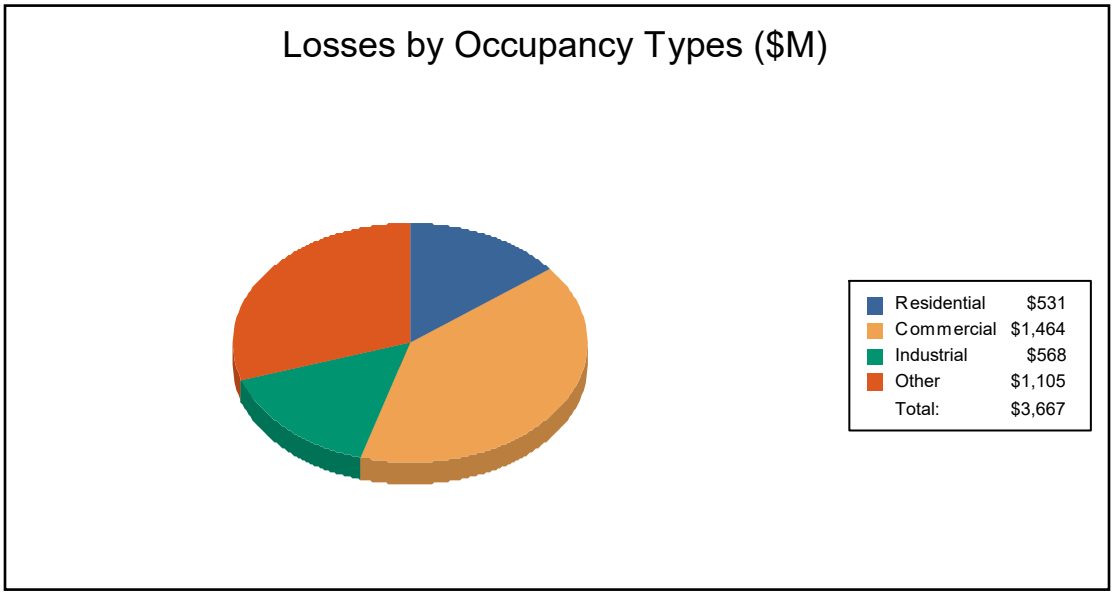
The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the flood. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the flood.

The total building-related losses were 2,059.30 million dollars. 44% of the estimated losses were related to the business interruption of the region. The residential occupancies made up 14.48% of the total loss. Table 6 below provides a summary of the losses associated with the building damage.

Table 6: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Building Loss						
	Building	289.31	196.35	148.64	54.31	688.61
	Content	146.89	496.38	350.05	212.62	1,205.94
	Inventory	0.00	111.96	44.71	8.08	164.76
	Subtotal	**436.20**	**804.70**	**543.39**	**275.02**	**2,059.30**
Business Interruption						
	Income	2.21	244.75	6.37	57.01	310.33
	Relocation	53.13	72.38	7.01	34.09	166.61
	Rental Income	34.19	53.08	1.69	6.73	95.69
	Wage	5.24	289.02	9.22	732.03	1,035.52
	Subtotal	**94.77**	**659.23**	**24.29**	**829.86**	**1,608.15**
ALL	**Total**	**530.97**	**1,463.93**	**567.68**	**1,104.87**	**3,667.45**





Appendix A: County Listing for the Region

Connecticut

- Litchfield

Appendix B: Regional Population and Building Value Data

	Population	Building Value (thousands of dollars)		
		Residential	Non-Residential	Total
Connecticut				
Litchfield	185,062	28,640,303	14,482,112	43,122,415
Total	**185,062**	**28,640,303**	**14,482,112**	**43,122,415**
Total Study Region	**185,062**	**28,640,303**	**14,482,112**	**43,122,415**

Hazus: Flood Global Risk Report

Region Name: CT_FLD_Middlesex

Flood Scenario: Middlesex_100

Print Date: Tuesday, April 11, 2023

Disclaimer:

Totals only reflect data for those census tracts/blocks included in the user's study region.

The estimates of social and economic impacts contained in this report were produced using Hazus loss estimation methodology software which is based on current scientific and engineering knowledge. There are uncertainties inherent in any loss estimation technique. Therefore, there may be significant differences between the modeled results contained in this report and the actual social and economic losses following a specific Flood. These results can be improved by using enhanced inventory data and flood hazard information.

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General Description of the Region

Hazus is a regional multi-hazard loss estimation model that was developed by the Federal Emergency Management Agency (FEMA) and the National Institute of Building Sciences (NIBS). The primary purpose of Hazus is to provide a methodology and software application to develop multi-hazard losses at a regional scale. These loss estimates would be used primarily by local, state and regional officials to plan and stimulate efforts to reduce risks from multi-hazards and to prepare for emergency response and recovery.

The flood loss estimates provided in this report were based on a region that included 1 county(ies) from the following state(s):

- Connecticut

Note:
Appendix A contains a complete listing of the counties contained in the region.

The geographical size of the region is approximately 51 square miles and contains 2,515 census blocks. The region contains over 69 thousand households and has a total population of 164,179 people. The distribution of population by State and County for the study region is provided in Appendix B.

There are an estimated 62,821 buildings in the region with a total building replacement value (excluding contents) of 33,001 million dollars. Approximately 87.58% of the buildings (and 66.75% of the building value) are associated with residential housing.

Building Inventory

General Building Stock

Hazus estimates that there are 62,821 buildings in the region which have an aggregate total replacement value of 33,001 million dollars. Table 1 and Table 2 present the relative distribution of the value with respect to the general occupancies by Study Region and Scenario respectively. Appendix B provides a general distribution of the building value by State and County.

Table 1
Building Exposure by Occupancy Type for the Study Region

Occupancy	Exposure ($1000)	Percent of Total
Residential	22,029,748	66.8%
Commercial	6,262,032	19.0%
Industrial	1,818,391	5.5%
Agricultural	98,796	0.3%
Religion	325,936	1.0%
Government	765,064	2.3%
Education	1,701,052	5.2%
Total	**33,001,019**	**100%**

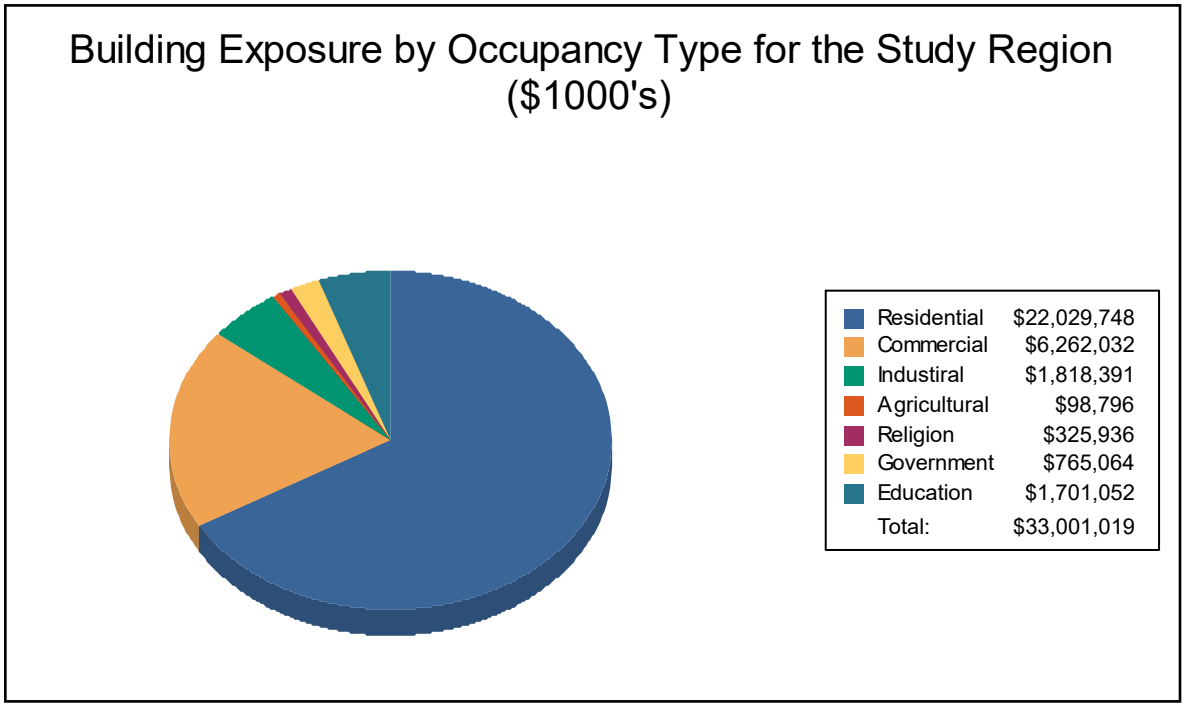
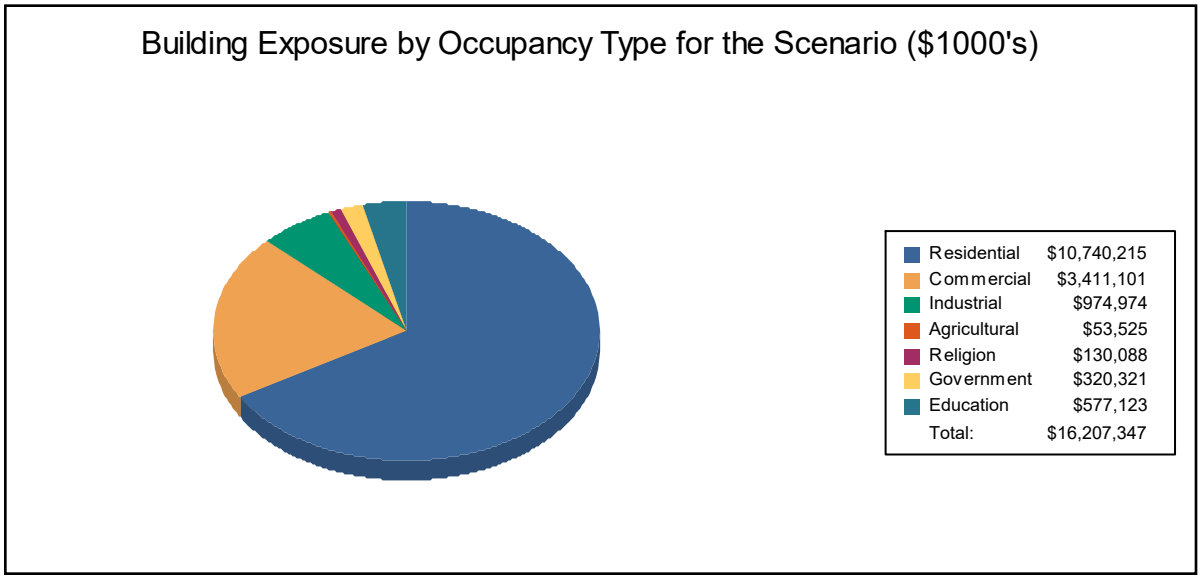


Table 2
Building Exposure by Occupancy Type for the Scenario

Occupancy	Exposure ($1000)	Percent of Total
Residential	10,740,215	66.3%
Commercial	3,411,101	21.0%
Industrial	974,974	6.0%
Agricultural	53,525	0.3%
Religion	130,088	0.8%
Government	320,321	2.0%
Education	577,123	3.6%
Total	**16,207,347**	**100%**



Essential Facility Inventory

For essential facilities, there are 2 hospitals in the region with a total bed capacity of 444 beds.
There are 65 schools, 36 fire stations, 17 police stations and 15 emergency operation centers.

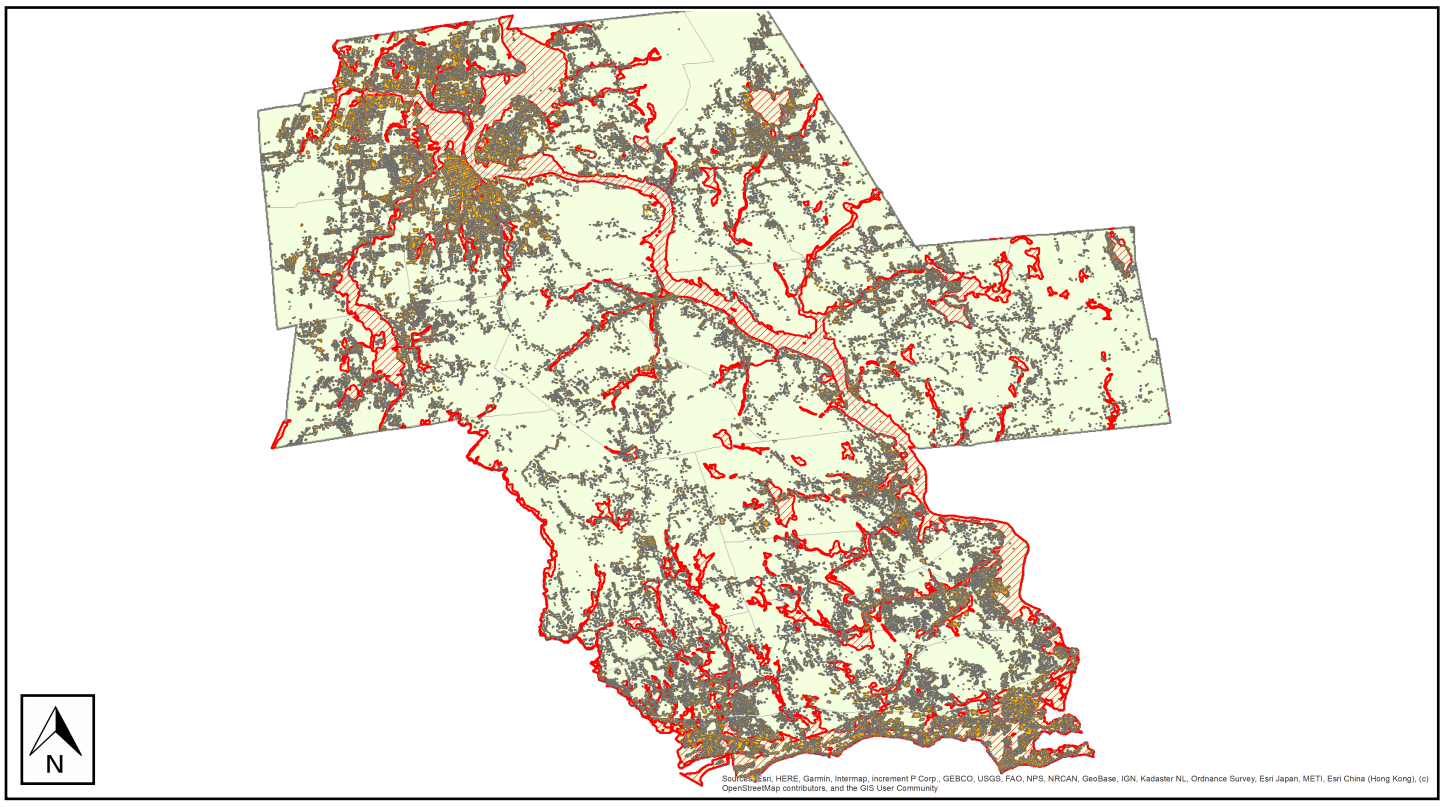
Flood Scenario Parameters

Hazus used the following set of information to define the flood parameters for the flood loss estimate provided in this report.

Study Region Name:	CT_FLD_Middlesex
Scenario Name:	Middlesex_100
Return Period Analyzed:	100
Analysis Options Analyzed:	No What-Ifs

Study Region Overview Map

Illustrating scenario flood extent, as well as exposed essential facilities and total exposure



Building Damage

General Building Stock Damage

Hazus estimates that about 1,128 buildings will be at least moderately damaged. This is over 57% of the total number of buildings in the scenario. There are an estimated 33 buildings that will be completely destroyed. The definition of the 'damage states' is provided in the Hazus Flood Technical Manual. Table 3 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4 summarizes the expected damage by general building type.

Total Economic Loss (1 dot = $300K) Overview Map

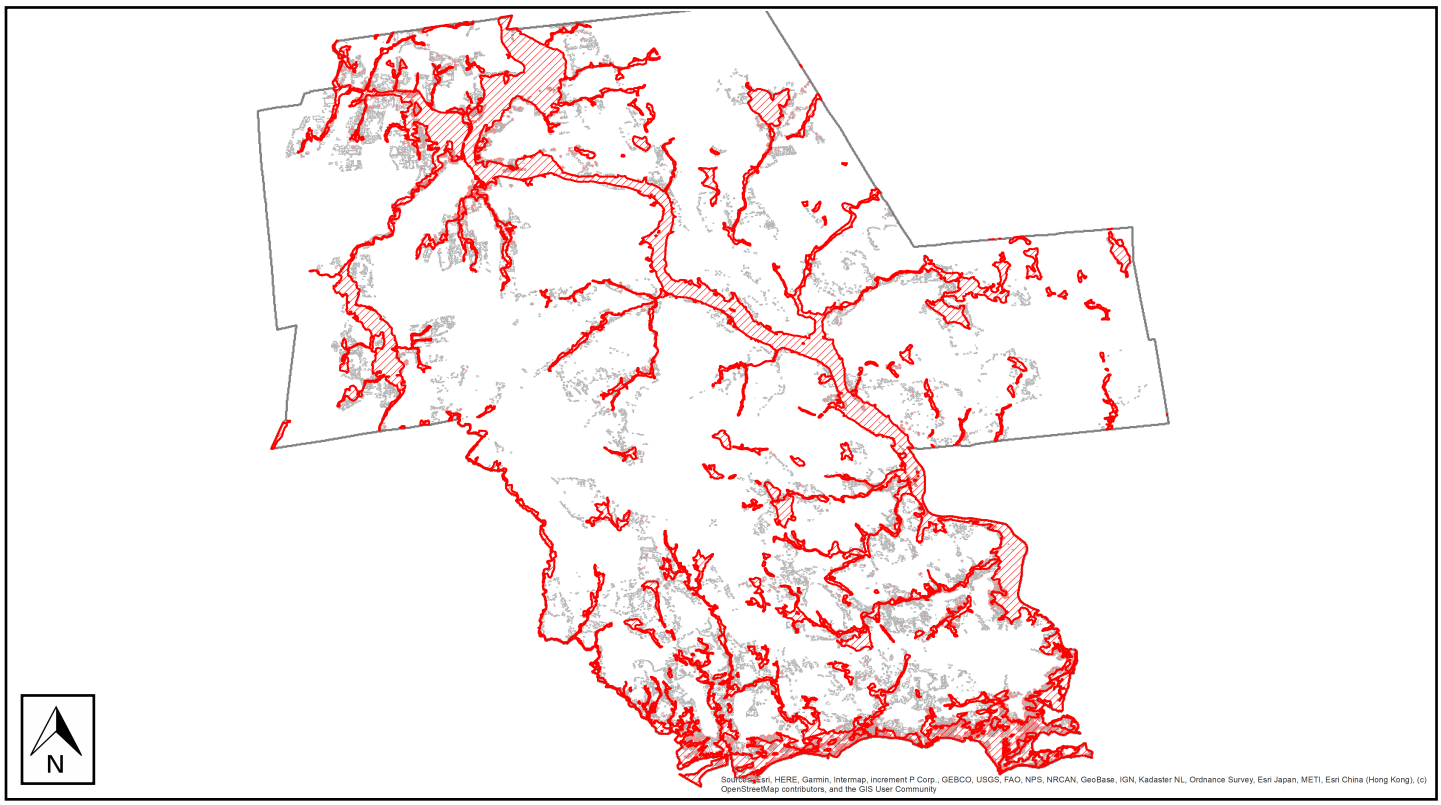


Table 3: Expected Building Damage by Occupancy

	1-10		11-20		21-30		31-40		41-50		>50	
Occupancy	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Agriculture	0	0	0	0	0	0	0	0	0	0	0	0
Commercial	17	59	12	41	0	0	0	0	0	0	0	0
Education	0	0	0	0	0	0	0	0	0	0	0	0
Government	1	50	1	50	0	0	0	0	0	0	0	0
Industrial	0	0	0	0	0	0	0	0	0	0	0	0
Religion	0	0	0	0	0	0	0	0	0	0	0	0
Residential	376	25	702	47	257	17	87	6	36	2	33	2
Total	**394**		**715**		**257**		**87**		**36**		**33**	

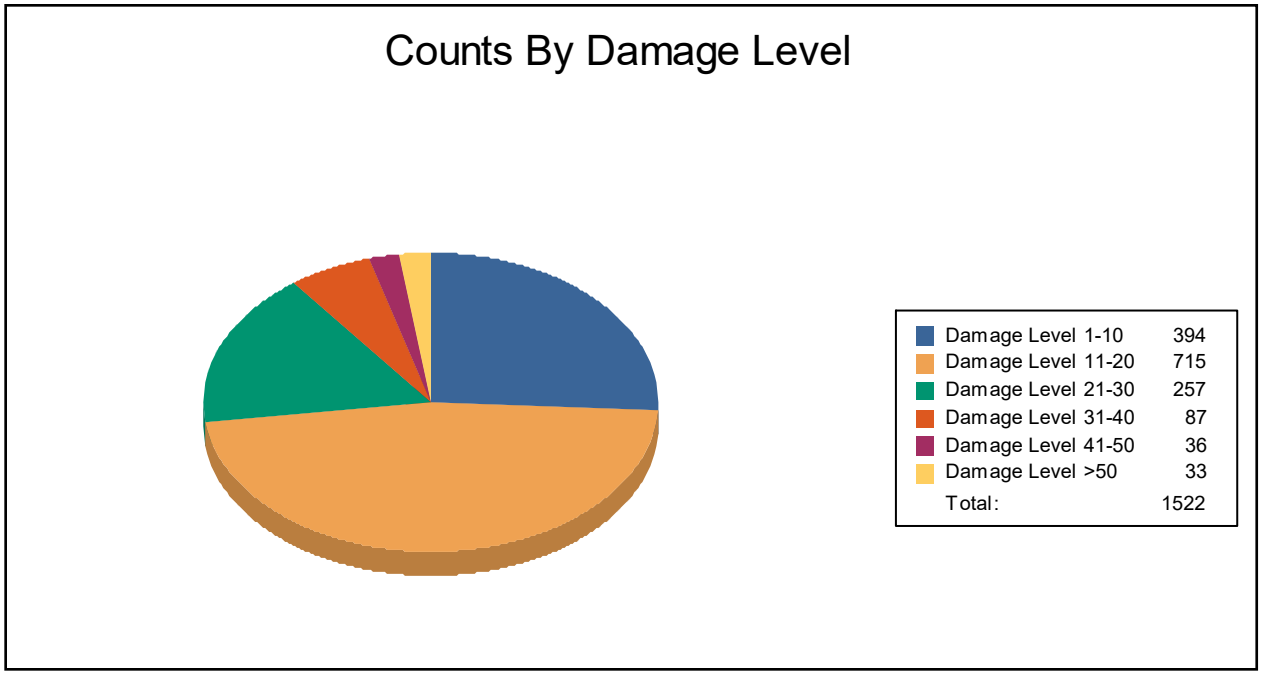


Table 4: Expected Building Damage by Building Type

Building Type	1-10		11-20		21-30		31-40		41-50		>50	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Concrete	0	0	0	0	0	0	0	0	0	0	0	0
ManufHousing	0	0	0	0	0	0	0	0	0	0	0	0
Masonry	8	27	17	57	5	17	0	0	0	0	0	0
Steel	12	63	7	37	0	0	0	0	0	0	0	0
Wood	373	25	689	47	252	17	87	6	36	2	33	2

Essential Facility Damage

Before the flood analyzed in this scenario, the region had 444 hospital beds available for use. On the day of the scenario flood event, the model estimates that 444 hospital beds are available in the region.

Table 5: Expected Damage to Essential Facilities

		# Facilities		
Classification	Total	At Least Moderate	At Least Substantial	Loss of Use
Emergency Operation Centers	15	0	0	0
Fire Stations	36	0	0	0
Hospitals	2	0	0	0
Police Stations	17	0	0	0
Schools	65	0	0	0

If this report displays all zeros or is blank, two possibilities can explain this.

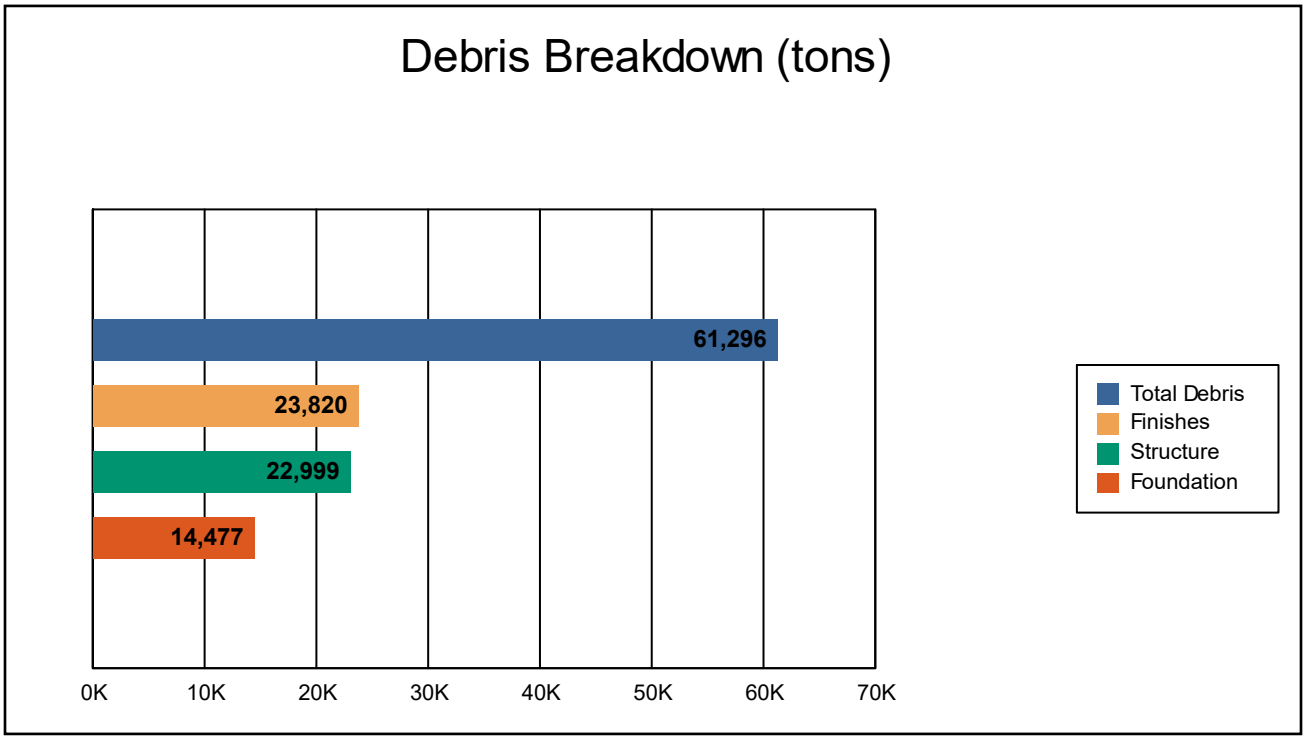
(1) None of your facilities were flooded. This can be checked by mapping the inventory data on the depth grid.

(2) The analysis was not run. This can be tested by checking the run box on the Analysis Menu and seeing if a message box asks you to replace the existing results.

Induced Flood Damage

Debris Generation

Hazus estimates the amount of debris that will be generated by the flood. The model breaks debris into three general categories: 1) Finishes (dry wall, insulation, etc.), 2) Structural (wood, brick, etc.) and 3) Foundations (concrete slab, concrete block, rebar, etc.). This distinction is made because of the different types of material handling equipment required to handle the debris.

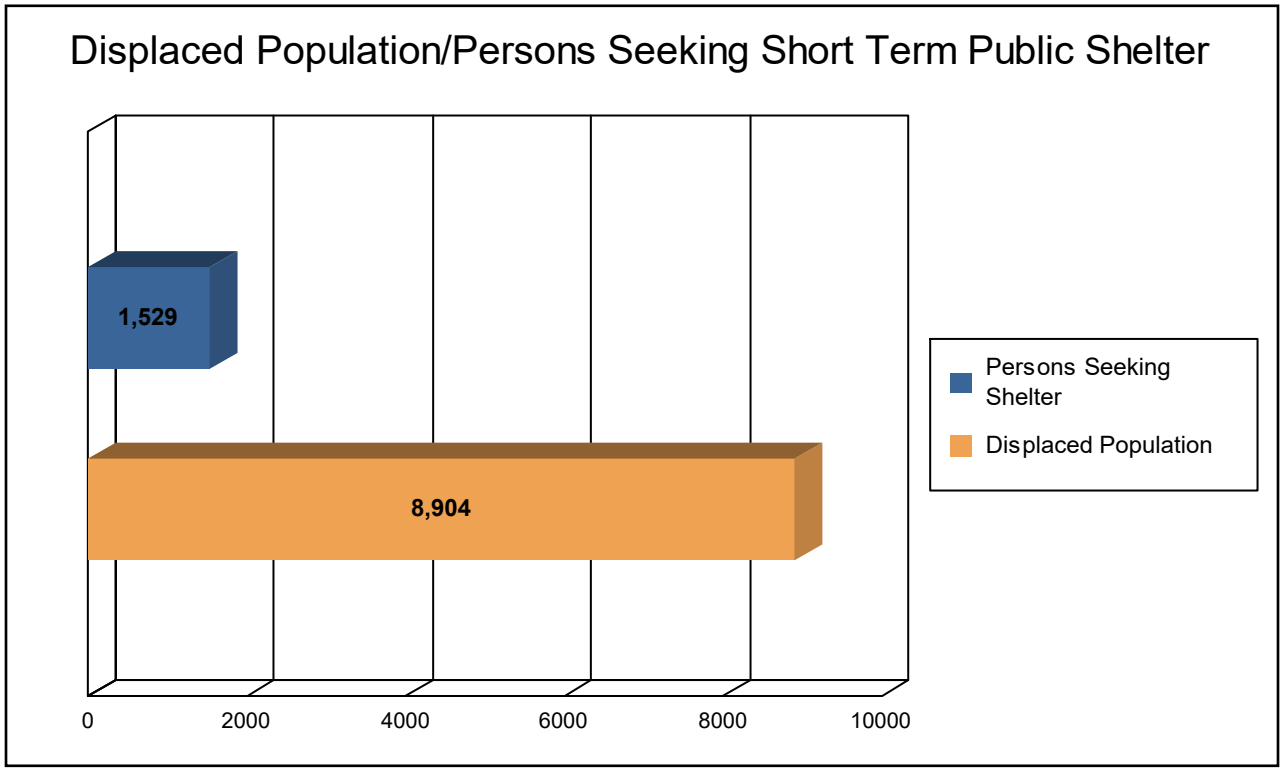


The model estimates that a total of 61,296 tons of debris will be generated. Of the total amount, Finishes comprises 39% of the total, Structure comprises 38% of the total, and Foundation comprises 24%. If the debris tonnage is converted into an estimated number of truckloads, it will require 2452 truckloads (@25 tons/truck) to remove the debris generated by the flood.

Social Impact

Shelter Requirements

Hazus estimates the number of households that are expected to be displaced from their homes due to the flood and the associated potential evacuation. Hazus also estimates those displaced people that will require accommodations in temporary public shelters. The model estimates 2,968 households (or 8,904 of people) will be displaced due to the flood. Displacement includes households evacuated from within or very near to the inundated area. Of these, 1,529 people (out of a total population of 164,179) will seek temporary shelter in public shelters.



Economic Loss

The total economic loss estimated for the flood is 1,188.26 million dollars, which represents 7.33 % of the total replacement value of the scenario buildings.

Building-Related Losses

The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the flood. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the flood.

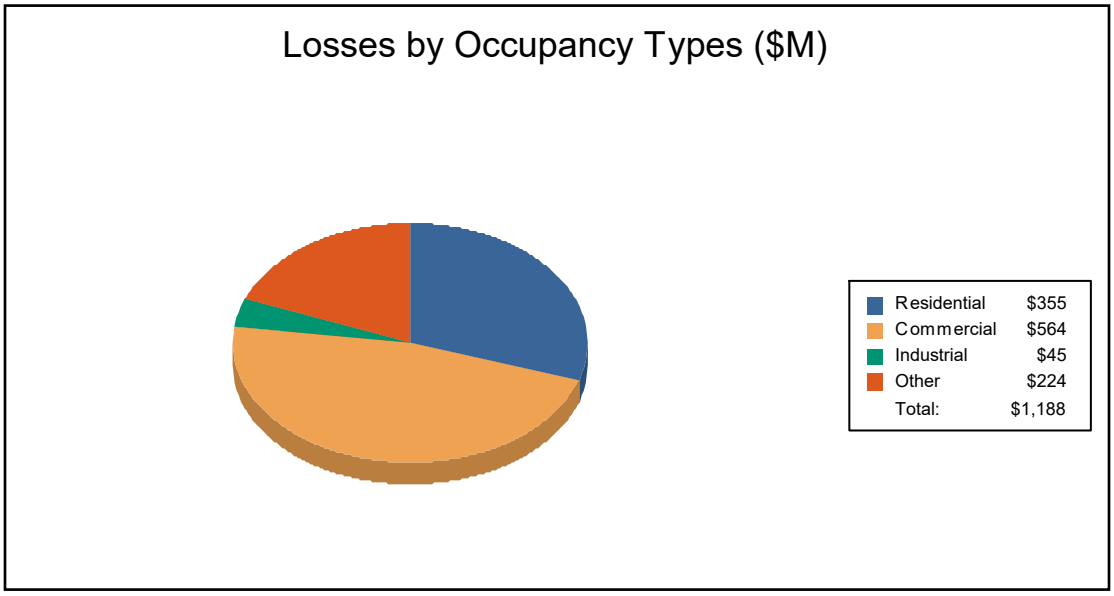
The total building-related losses were 550.16 million dollars. 54% of the estimated losses were related to the business interruption of the region. The residential occupancies made up 29.88% of the total loss. Table 6 below provides a summary of the losses associated with the building damage.



Table 6: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Building Loss						
	Building	163.91	46.83	11.87	5.51	228.12
	Content	93.09	139.40	26.65	30.35	289.49
	Inventory	0.00	28.07	3.75	0.72	32.55
	Subtotal	**257.00**	**214.30**	**42.26**	**36.59**	**550.16**
Business Interruption						
	Income	2.02	142.20	0.68	19.20	164.10
	Relocation	65.68	34.54	0.79	11.48	112.49
	Rental Income	25.51	24.85	0.13	1.99	52.48
	Wage	4.81	148.25	1.19	154.78	309.03
	Subtotal	**98.01**	**349.85**	**2.79**	**187.46**	**638.11**
ALL	**Total**	**355.02**	**564.15**	**45.06**	**224.04**	**1,188.26**





Appendix A: County Listing for the Region

Connecticut

- Middlesex

Appendix B: Regional Population and Building Value Data

	Population	Building Value (thousands of dollars)		
		Residential	Non-Residential	Total
Connecticut				
Middlesex	164,179	22,029,748	10,971,271	33,001,019
Total	**164,179**	**22,029,748**	**10,971,271**	**33,001,019**
Total Study Region	**164,179**	**22,029,748**	**10,971,271**	**33,001,019**

Hazus: Flood Global Risk Report

Region Name: CT_FLD_NewHaven

Flood Scenario: NewHaven_100

Print Date: Monday, April 10, 2023

Disclaimer:

Totals only reflect data for those census tracts/blocks included in the user's study region.

The estimates of social and economic impacts contained in this report were produced using Hazus loss estimation methodology software which is based on current scientific and engineering knowledge. There are uncertainties inherent in any loss estimation technique. Therefore, there may be significant differences between the modeled results contained in this report and the actual social and economic losses following a specific Flood. These results can be improved by using enhanced inventory data and flood hazard information.

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General Description of the Region

Hazus is a regional multi-hazard loss estimation model that was developed by the Federal Emergency Management Agency (FEMA) and the National Institute of Building Sciences (NIBS). The primary purpose of Hazus is to provide a methodology and software application to develop multi-hazard losses at a regional scale. These loss estimates would be used primarily by local, state and regional officials to plan and stimulate efforts to reduce risks from multi-hazards and to prepare for emergency response and recovery.

The flood loss estimates provided in this report were based on a region that included 1 county(ies) from the following state(s):

- Connecticut

Note:
Appendix A contains a complete listing of the counties contained in the region.

The geographical size of the region is approximately 164 square miles and contains 9,728 census blocks. The region contains over 343 thousand households and has a total population of 864,495 people. The distribution of population by State and County for the study region is provided in Appendix B.

There are an estimated 267,508 buildings in the region with a total building replacement value (excluding contents) of 154,036 million dollars. Approximately 86.65% of the buildings (and 60.30% of the building value) are associated with residential housing.

Building Inventory

General Building Stock

Hazus estimates that there are 267,508 buildings in the region which have an aggregate total replacement value of 154,036 million dollars. Table 1 and Table 2 present the relative distribution of the value with respect to the general occupancies by Study Region and Scenario respectively. Appendix B provides a general distribution of the building value by State and County.

Table 1
Building Exposure by Occupancy Type for the Study Region

Occupancy	Exposure ($1000)	Percent of Total
Residential	92,884,699	60.3%
Commercial	33,239,915	21.6%
Industrial	10,317,314	6.7%
Agricultural	351,205	0.2%
Religion	2,116,183	1.4%
Government	4,123,747	2.7%
Education	11,003,292	7.1%
Total	**154,036,355**	**100%**

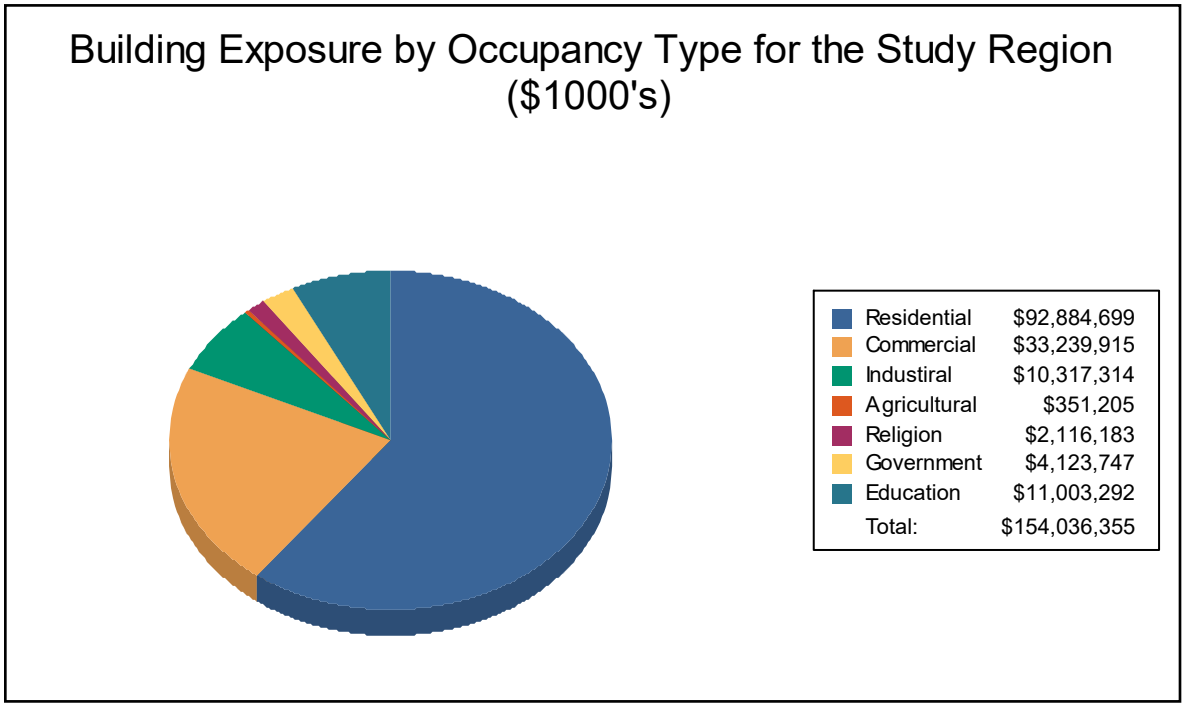
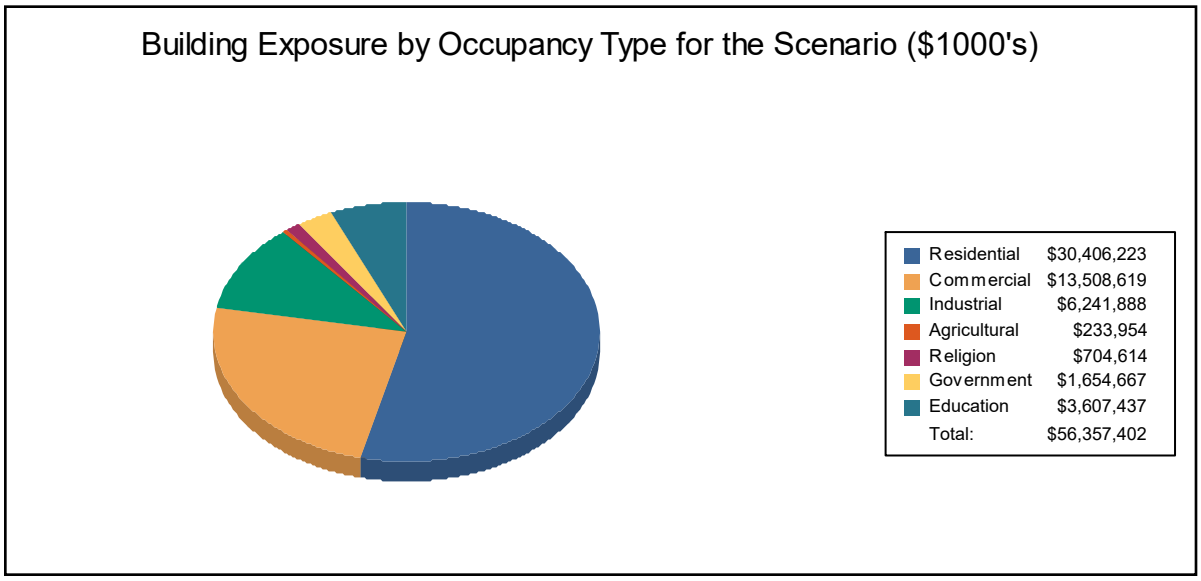


Table 2
Building Exposure by Occupancy Type for the Scenario

Occupancy	Exposure ($1000)	Percent of Total
Residential	30,406,223	54.0%
Commercial	13,508,619	24.0%
Industrial	6,241,888	11.1%
Agricultural	233,954	0.4%
Religion	704,614	1.3%
Government	1,654,667	2.9%
Education	3,607,437	6.4%
Total	**56,357,402**	**100%**



Essential Facility Inventory

For essential facilities, there are 13 hospitals in the region with a total bed capacity of 3,398 beds. There are 328 schools, 110 fire stations, 38 police stations and 29 emergency operation centers.

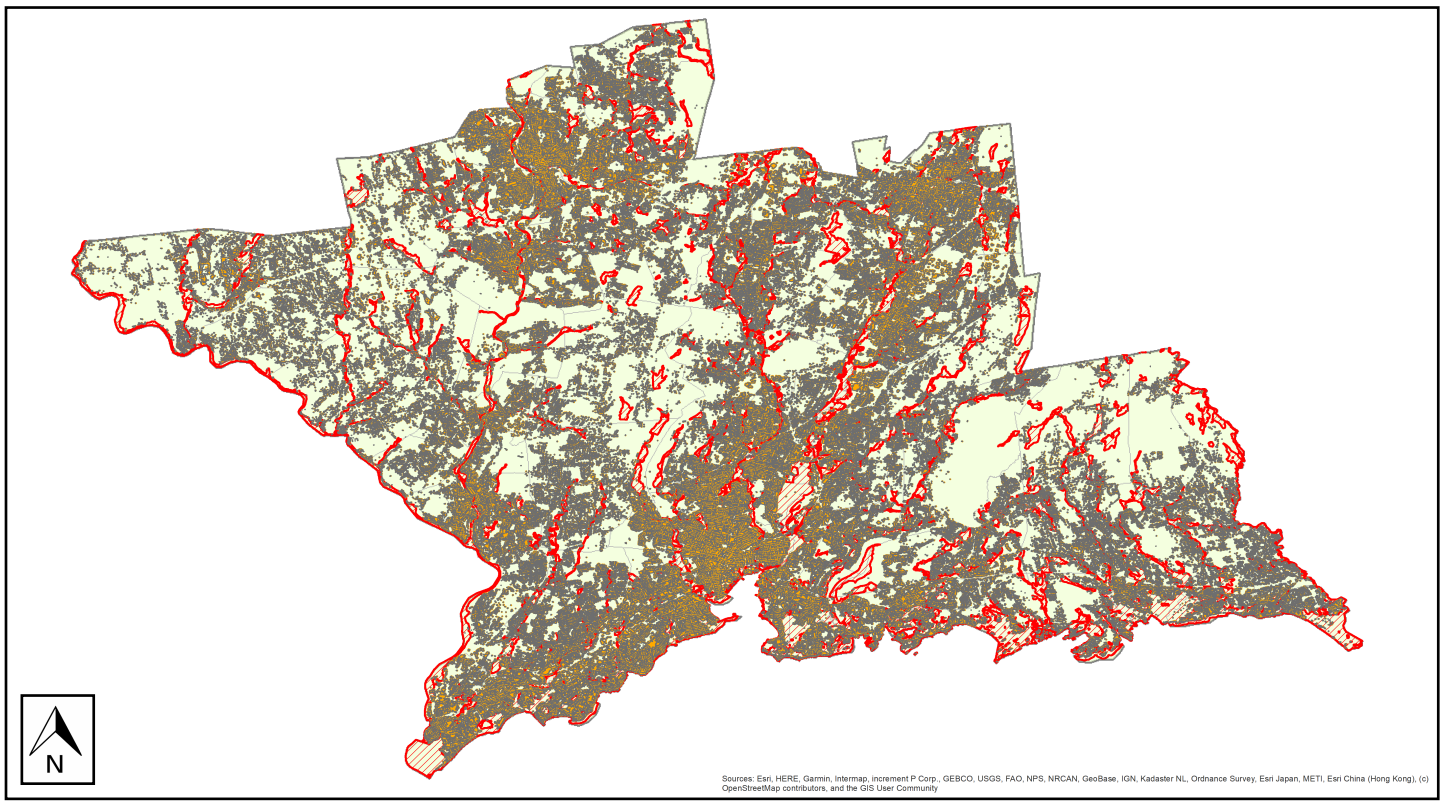
Flood Scenario Parameters

Hazus used the following set of information to define the flood parameters for the flood loss estimate provided in this report.

Study Region Name:	CT_FLD_NewHaven
Scenario Name:	NewHaven_100
Return Period Analyzed:	100
Analysis Options Analyzed:	No What-Ifs

Study Region Overview Map

Illustrating scenario flood extent, as well as exposed essential facilities and total exposure



Building Damage

General Building Stock Damage

Hazus estimates that about 1,514 buildings will be at least moderately damaged. This is over 55% of the total number of buildings in the scenario. There are an estimated 15 buildings that will be completely destroyed. The definition of the 'damage states' is provided in the Hazus Flood Technical Manual. Table 3 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4 summarizes the expected damage by general building type.

Total Economic Loss (1 dot = $300K) Overview Map

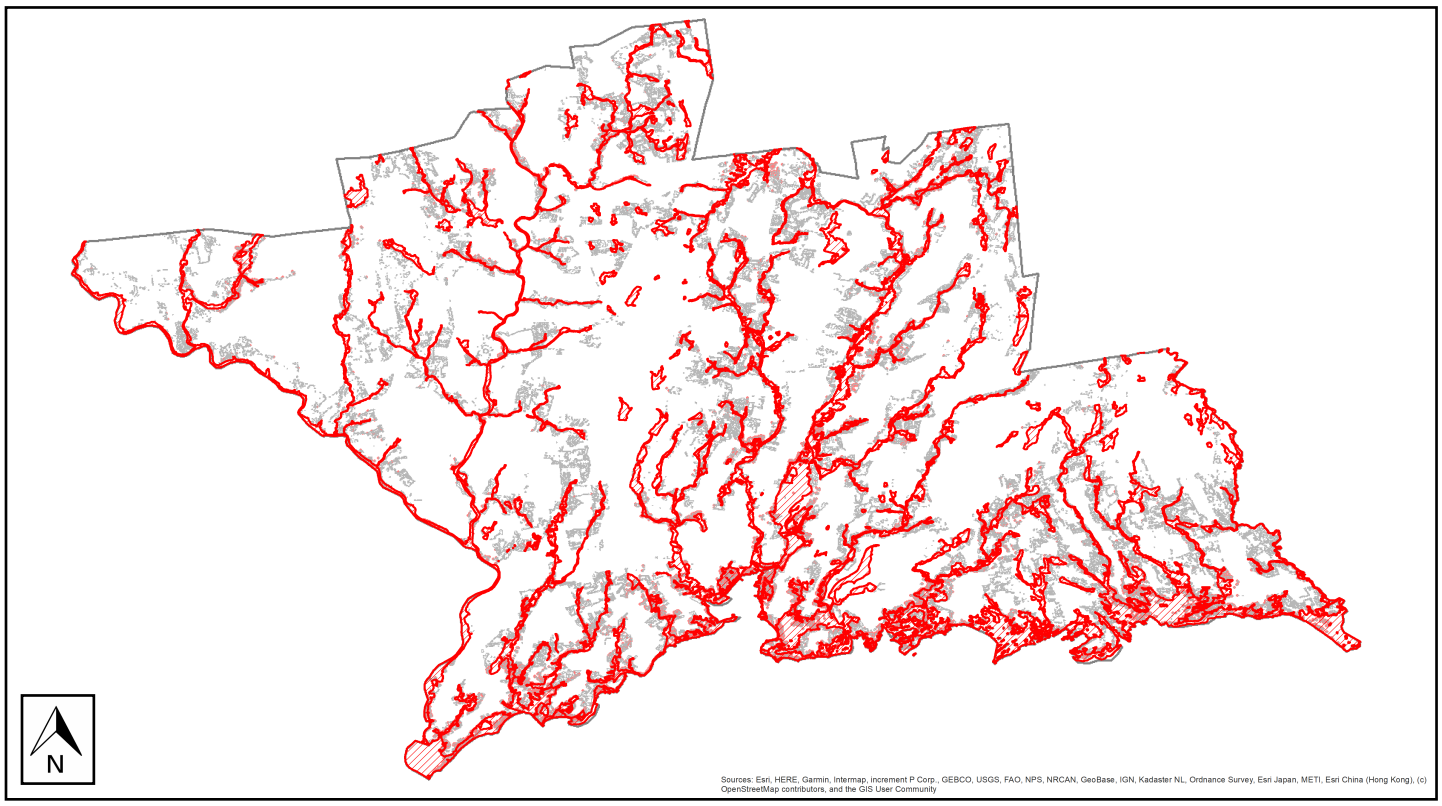


Table 3: Expected Building Damage by Occupancy

	1-10		11-20		21-30		31-40		41-50		>50	
Occupancy	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Agriculture	0	0	0	0	0	0	0	0	0	0	0	0
Commercial	46	70	17	26	1	2	0	0	1	2	1	2
Education	0	0	0	0	0	0	0	0	0	0	0	0
Government	15	79	4	21	0	0	0	0	0	0	0	0
Industrial	18	60	9	30	1	3	2	7	0	0	0	0
Religion	0	0	0	0	0	0	0	0	0	0	0	0
Residential	1,278	46	1,136	41	215	8	83	3	30	1	14	1
Total	**1,357**		**1,166**		**217**		**85**		**31**		**15**	

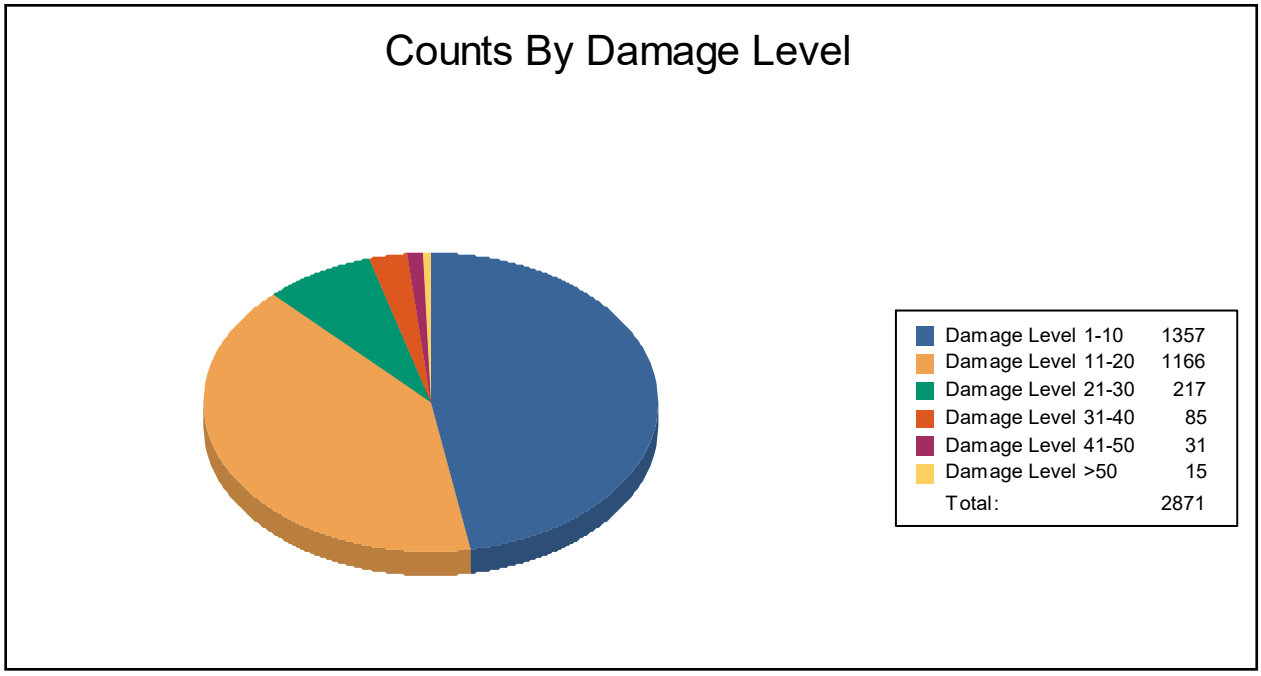




Table 4: Expected Building Damage by Building Type

Building Type	1-10		11-20		21-30		31-40		41-50		>50	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Concrete	5	83	1	17	0	0	0	0	0	0	0	0
ManufHousing	0	0	0	0	0	0	0	0	0	0	0	0
Masonry	41	53	34	44	3	4	0	0	0	0	0	0
Steel	44	68	17	26	1	2	2	3	0	0	1	2
Wood	1,261	46	1,114	41	213	8	83	3	30	1	14	1

Essential Facility Damage

Before the flood analyzed in this scenario, the region had 3,398 hospital beds available for use. On the day of the scenario flood event, the model estimates that 3,398 hospital beds are available in the region.

Table 5: Expected Damage to Essential Facilities

		# Facilities		
Classification	Total	At Least Moderate	At Least Substantial	Loss of Use
Emergency Operation Centers	29	0	0	0
Fire Stations	110	0	0	0
Hospitals	13	0	0	0
Police Stations	38	0	0	0
Schools	328	0	0	0

If this report displays all zeros or is blank, two possibilities can explain this.

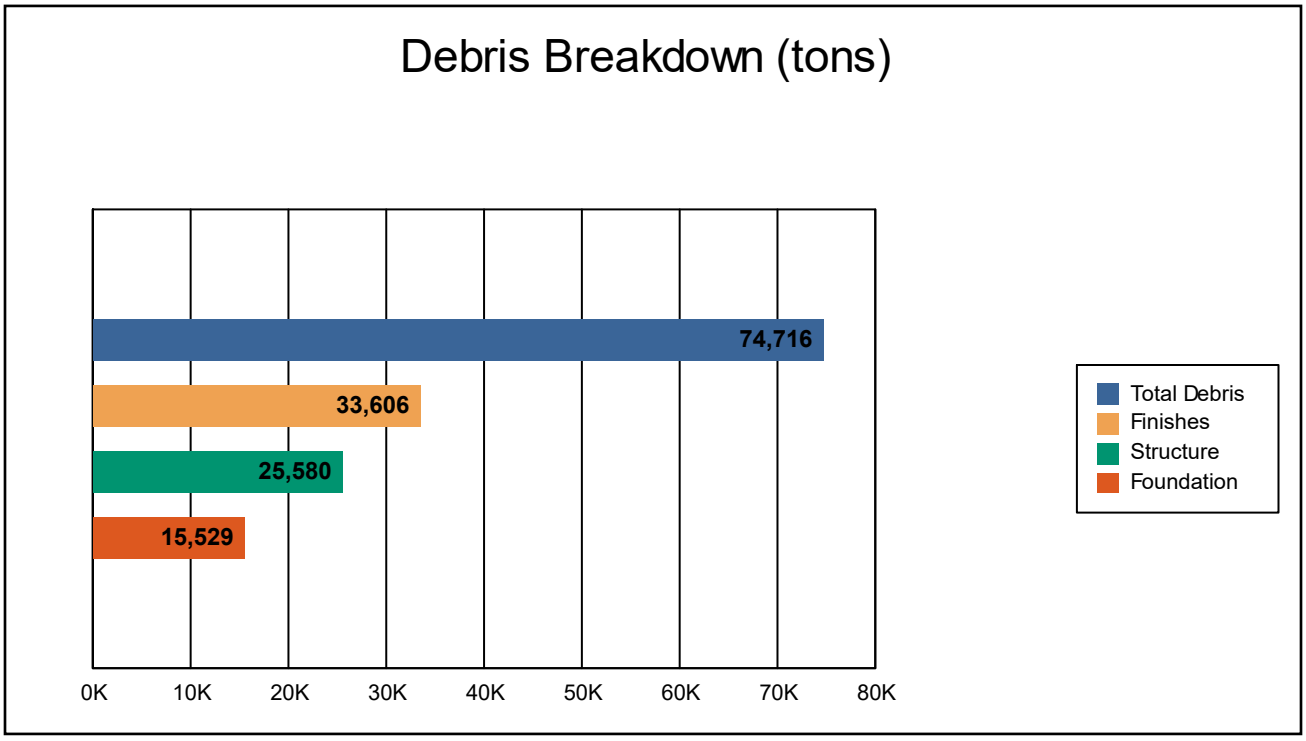
(1) None of your facilities were flooded. This can be checked by mapping the inventory data on the depth grid.

(2) The analysis was not run. This can be tested by checking the run box on the Analysis Menu and seeing if a message box asks you to replace the existing results.

Induced Flood Damage

Debris Generation

Hazus estimates the amount of debris that will be generated by the flood. The model breaks debris into three general categories: 1) Finishes (dry wall, insulation, etc.), 2) Structural (wood, brick, etc.) and 3) Foundations (concrete slab, concrete block, rebar, etc.). This distinction is made because of the different types of material handling equipment required to handle the debris.

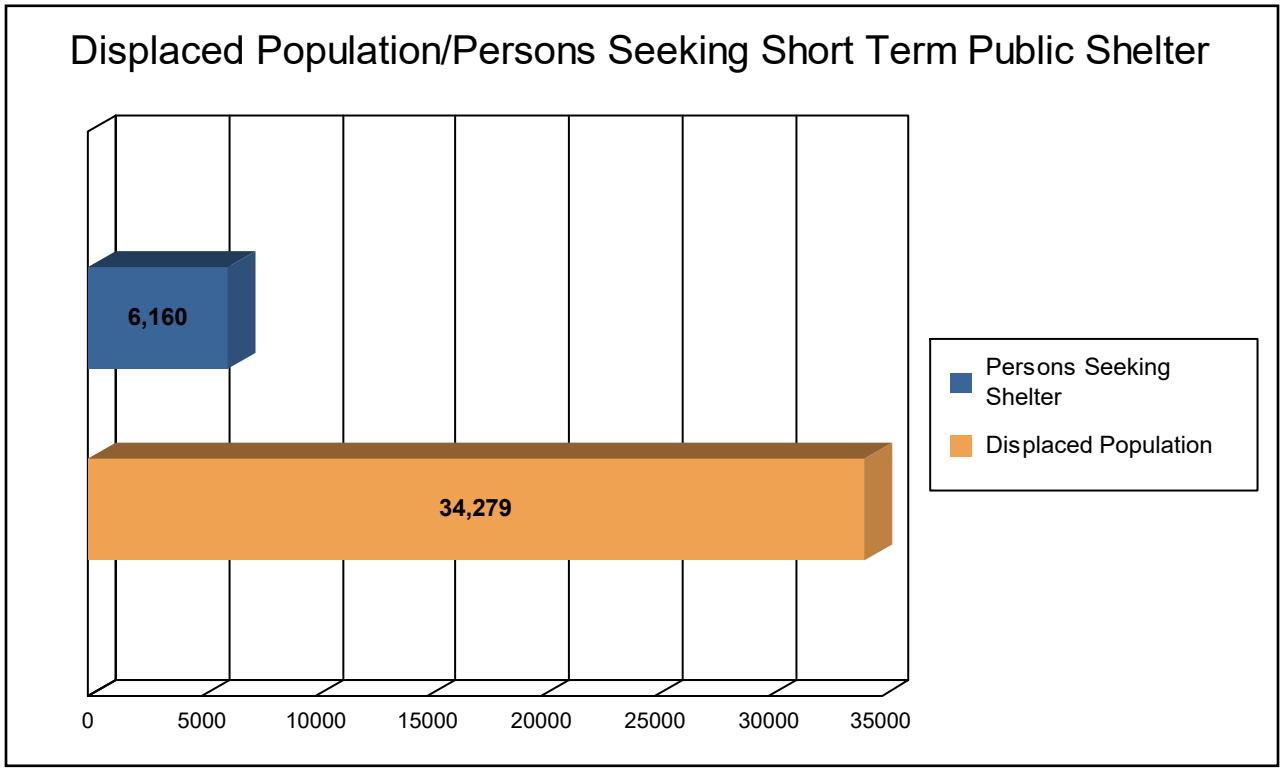


The model estimates that a total of 74,716 tons of debris will be generated. Of the total amount, Finishes comprises 45% of the total, Structure comprises 34% of the total, and Foundation comprises 21%. If the debris tonnage is converted into an estimated number of truckloads, it will require 2989 truckloads (@25 tons/truck) to remove the debris generated by the flood.

Social Impact

Shelter Requirements

Hazus estimates the number of households that are expected to be displaced from their homes due to the flood and the associated potential evacuation. Hazus also estimates those displaced people that will require accommodations in temporary public shelters. The model estimates 11,426 households (or 34,279 of people) will be displaced due to the flood. Displacement includes households evacuated from within or very near to the inundated area. Of these, 6,160 people (out of a total population of 864,495) will seek temporary shelter in public shelters.



Economic Loss

The total economic loss estimated for the flood is 3,843.75 million dollars, which represents 6.82 % of the total replacement value of the scenario buildings.

Building-Related Losses

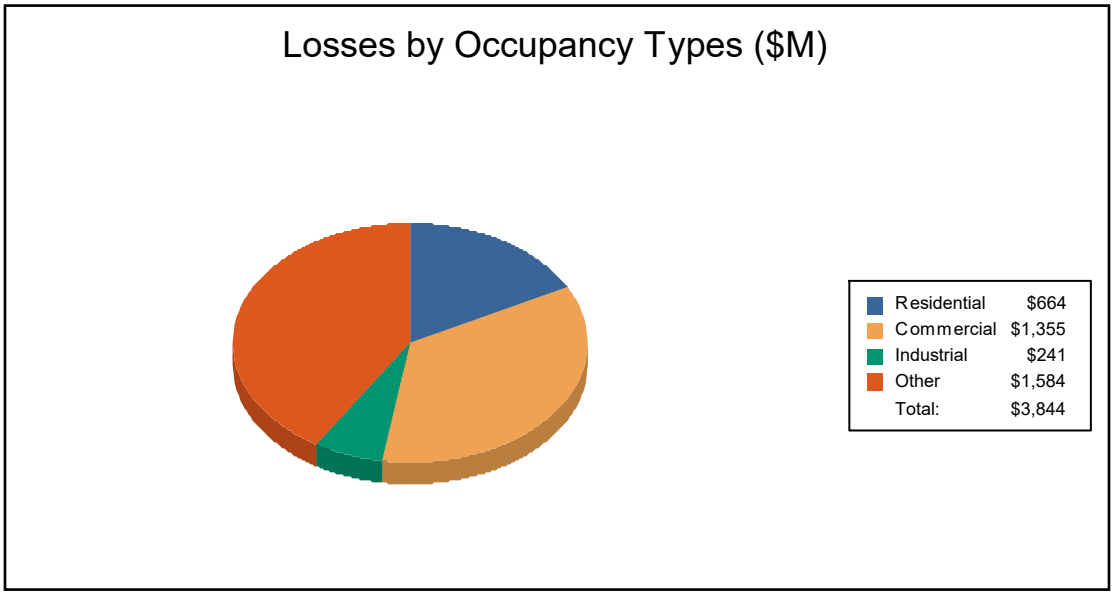
The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the flood. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the flood.

The total building-related losses were 1,194.12 million dollars. 69% of the estimated losses were related to the business interruption of the region. The residential occupancies made up 17.29% of the total loss. Table 6 below provides a summary of the losses associated with the building damage.

Table 6: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Building Loss						
	Building	269.92	81.63	57.67	24.99	434.20
	Content	148.86	256.61	136.64	149.34	691.45
	Inventory	0.00	44.24	20.86	3.37	68.47
	Subtotal	**418.77**	**382.48**	**215.17**	**177.70**	**1,194.12**
Business Interruption						
	Income	8.36	393.70	6.63	101.71	510.40
	Relocation	143.10	92.71	6.98	73.43	316.22
	Rental Income	74.44	66.19	1.99	14.59	157.22
	Wage	19.79	419.48	10.33	1,216.20	1,665.79
	Subtotal	**245.70**	**972.07**	**25.93**	**1,405.93**	**2,649.63**
ALL	**Total**	**664.47**	**1,354.56**	**241.09**	**1,583.63**	**3,843.75**





Appendix A: County Listing for the Region

Connecticut

- New Haven

Appendix B: Regional Population and Building Value Data

	Population	Building Value (thousands of dollars)		
		Residential	Non-Residential	Total
Connecticut				
New Haven	864,495	92,884,699	61,151,656	154,036,355
Total	**864,495**	**92,884,699**	**61,151,656**	**154,036,355**
Total Study Region	**864,495**	**92,884,699**	**61,151,656**	**154,036,355**

Hazus: Flood Global Risk Report

Region Name: CT_FLD_NewLondon

Flood Scenario: NewLondon_100

Print Date: Tuesday, April 11, 2023

Disclaimer:

Totals only reflect data for those census tracts/blocks included in the user's study region.

The estimates of social and economic impacts contained in this report were produced using Hazus loss estimation methodology software which is based on current scientific and engineering knowledge. There are uncertainties inherent in any loss estimation technique. Therefore, there may be significant differences between the modeled results contained in this report and the actual social and economic losses following a specific Flood. These results can be improved by using enhanced inventory data and flood hazard information.

FEMA

RiskMAP
Increasing Resilience Together

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General Description of the Region

Hazus is a regional multi-hazard loss estimation model that was developed by the Federal Emergency Management Agency (FEMA) and the National Institute of Building Sciences (NIBS). The primary purpose of Hazus is to provide a methodology and software application to develop multi-hazard losses at a regional scale. These loss estimates would be used primarily by local, state and regional officials to plan and stimulate efforts to reduce risks from multi-hazards and to prepare for emergency response and recovery.

The flood loss estimates provided in this report were based on a region that included 1 county(ies) from the following state(s):

- Connecticut

Note:
Appendix A contains a complete listing of the counties contained in the region.

The geographical size of the region is approximately 79 square miles and contains 4,394 census blocks. The region contains over 110 thousand households and has a total population of 268,434 people. The distribution of population by State and County for the study region is provided in Appendix B.

There are an estimated 92,777 buildings in the region with a total building replacement value (excluding contents) of 51,620 million dollars. Approximately 87.81% of the buildings (and 63.66% of the building value) are associated with residential housing.

Building Inventory

General Building Stock

Hazus estimates that there are 92,777 buildings in the region which have an aggregate total replacement value of 51,620 million dollars. Table 1 and Table 2 present the relative distribution of the value with respect to the general occupancies by Study Region and Scenario respectively. Appendix B provides a general distribution of the building value by State and County.

Table 1
Building Exposure by Occupancy Type for the Study Region

Occupancy	Exposure ($1000)	Percent of Total
Residential	32,861,791	63.7%
Commercial	11,370,658	22.0%
Industrial	1,847,184	3.6%
Agricultural	114,946	0.2%
Religion	593,563	1.1%
Government	2,091,095	4.1%
Education	2,740,618	5.3%
Total	**51,619,855**	**100%**

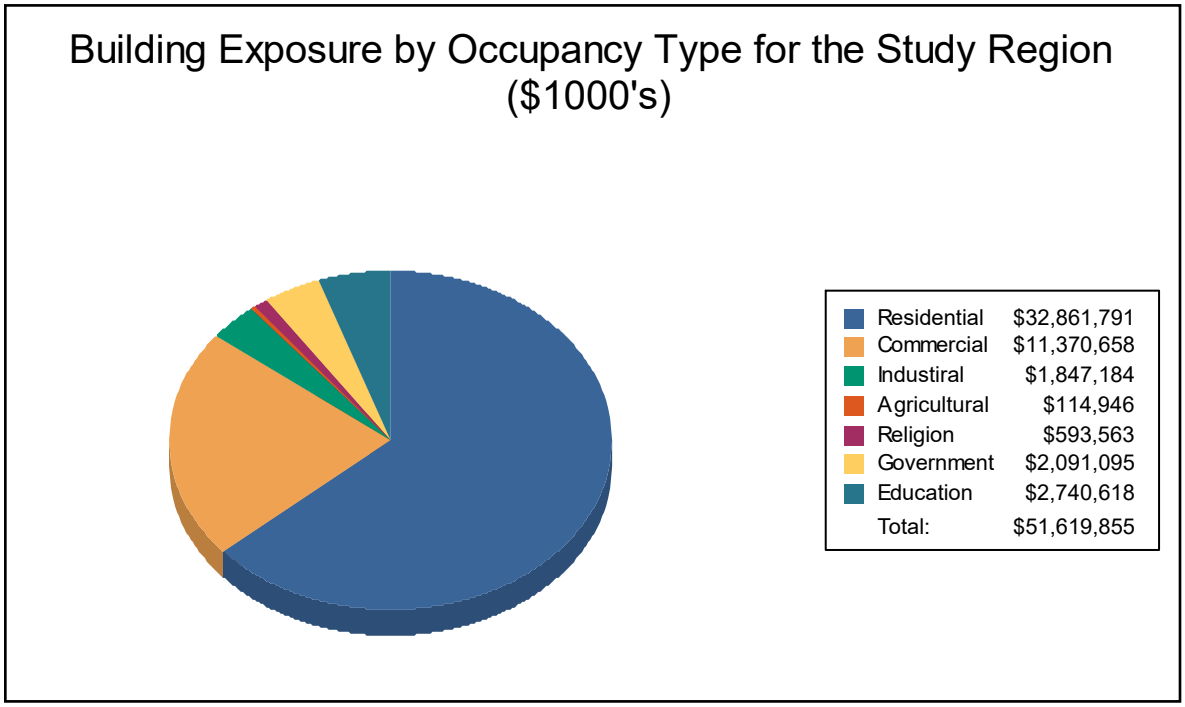
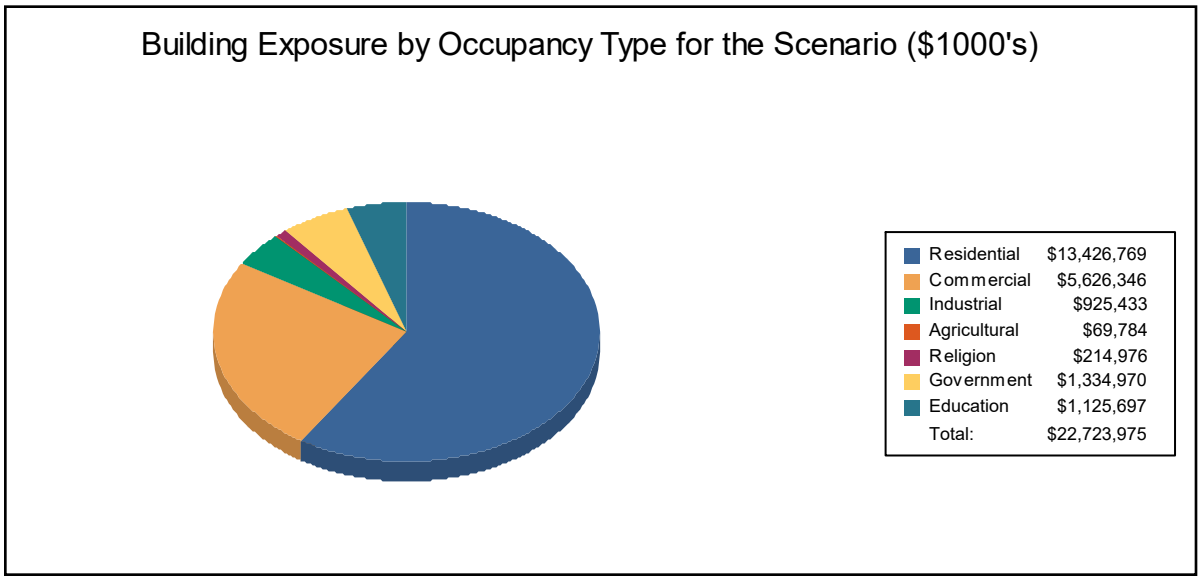


Table 2
Building Exposure by Occupancy Type for the Scenario

Occupancy	Exposure ($1000)	Percent of Total
Residential	13,426,769	59.1%
Commercial	5,626,346	24.8%
Industrial	925,433	4.1%
Agricultural	69,784	0.3%
Religion	214,976	0.9%
Government	1,334,970	5.9%
Education	1,125,697	5.0%
Total	**22,723,975**	**100%**



Essential Facility Inventory

For essential facilities, there are 4 hospitals in the region with a total bed capacity of 465 beds.
There are 110 schools, 64 fire stations, 28 police stations and 24 emergency operation centers.

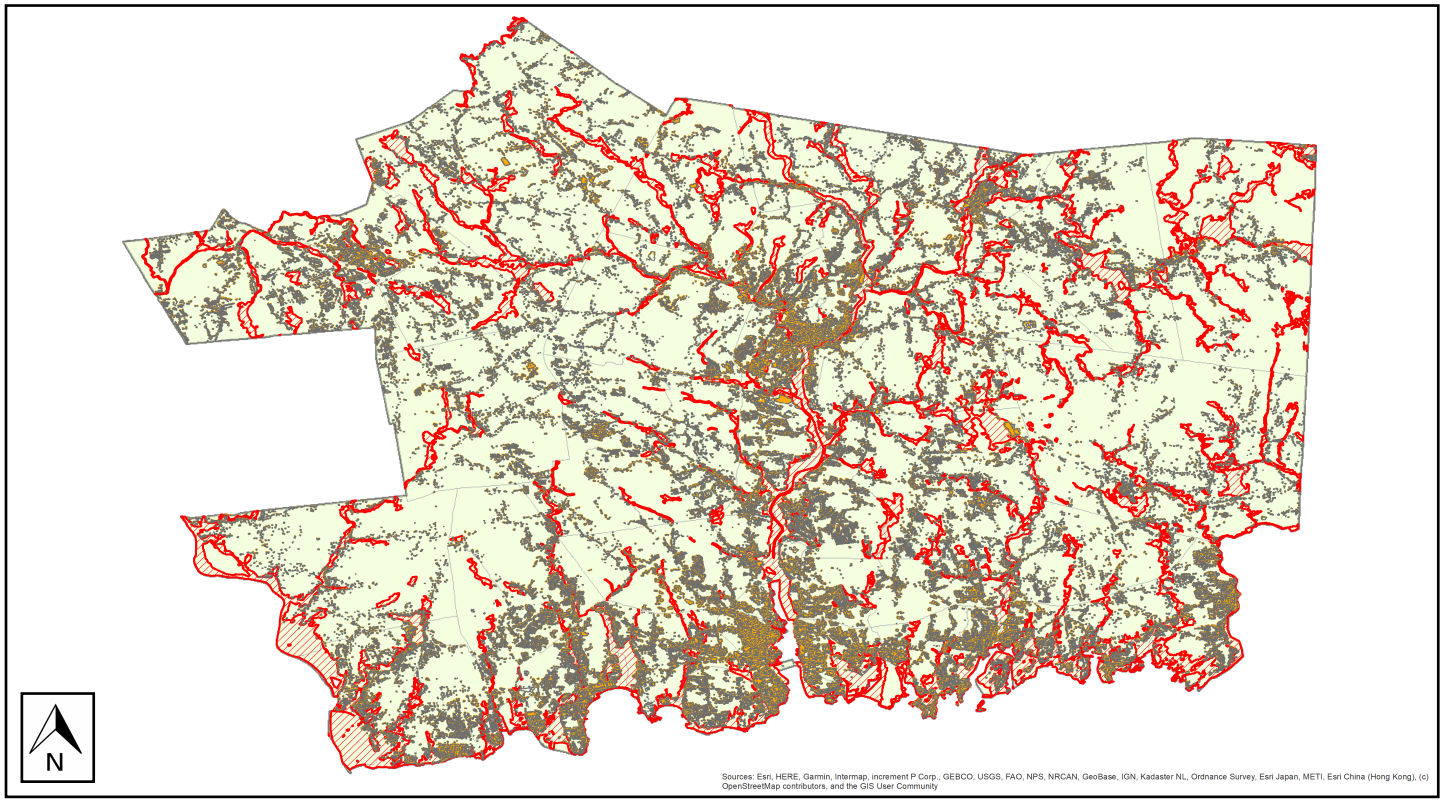
Flood Scenario Parameters

Hazus used the following set of information to define the flood parameters for the flood loss estimate provided in this report.

Study Region Name:	CT_FLD_NewLondon
Scenario Name:	NewLondon_100
Return Period Analyzed:	100
Analysis Options Analyzed:	No What-Ifs

Study Region Overview Map

Illustrating scenario flood extent, as well as exposed essential facilities and total exposure



Building Damage

General Building Stock Damage

Hazus estimates that about 931 buildings will be at least moderately damaged. This is over 59% of the total number of buildings in the scenario. There are an estimated 25 buildings that will be completely destroyed. The definition of the 'damage states' is provided in the Hazus Flood Technical Manual. Table 3 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4 summarizes the expected damage by general building type.

Total Economic Loss (1 dot = $300K) Overview Map

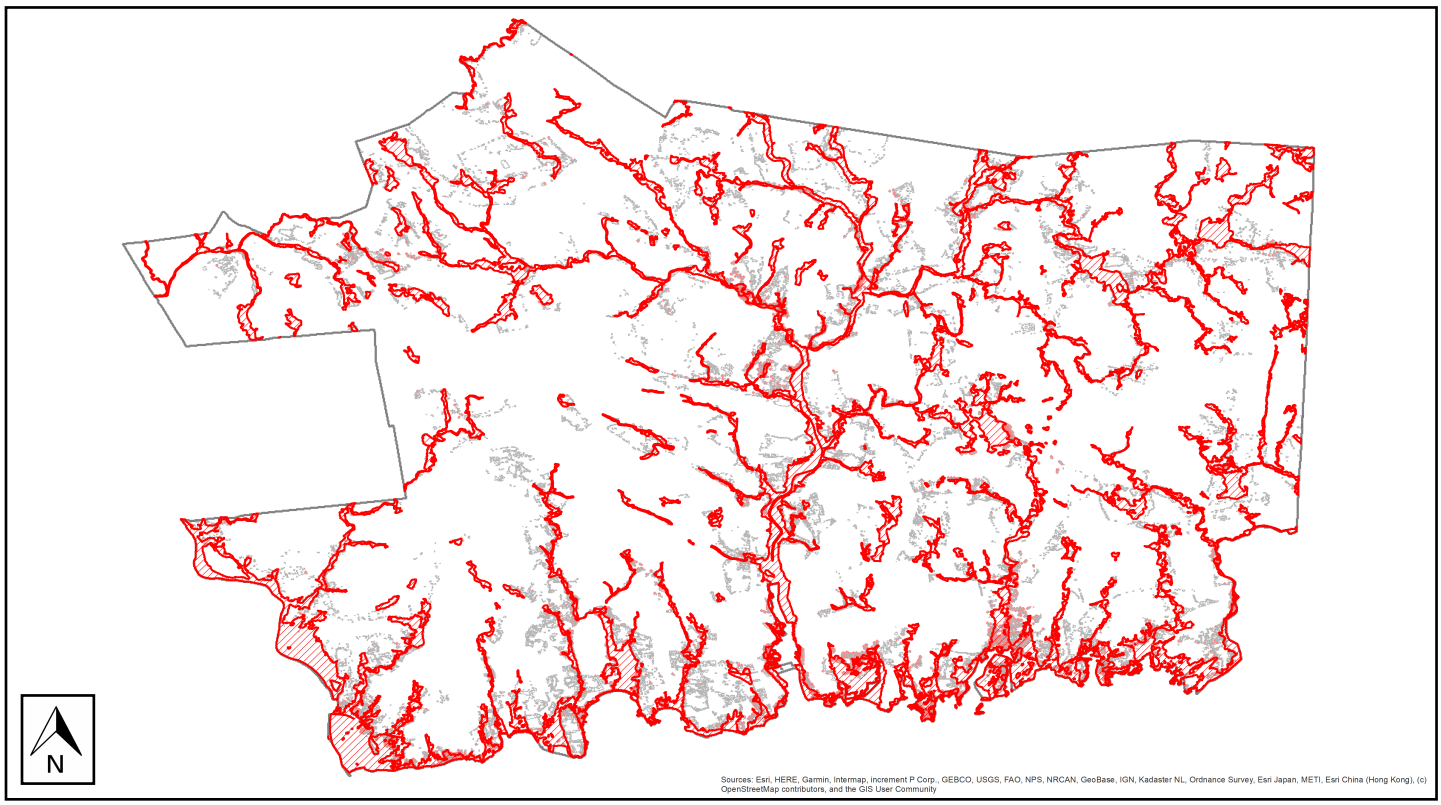


Table 3: Expected Building Damage by Occupancy

	1-10		11-20		21-30		31-40		41-50		>50	
Occupancy	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Agriculture	0	0	0	0	0	0	0	0	0	0	0	0
Commercial	7	27	18	69	1	4	0	0	0	0	0	0
Education	0	0	0	0	0	0	0	0	0	0	0	0
Government	1	50	1	50	0	0	0	0	0	0	0	0
Industrial	0	0	1	50	0	0	1	50	0	0	0	0
Religion	0	0	0	0	0	0	0	0	0	0	0	0
Residential	221	20	565	50	215	19	78	7	26	2	25	2
Total	**229**		**585**		**216**		**79**		**26**		**25**	

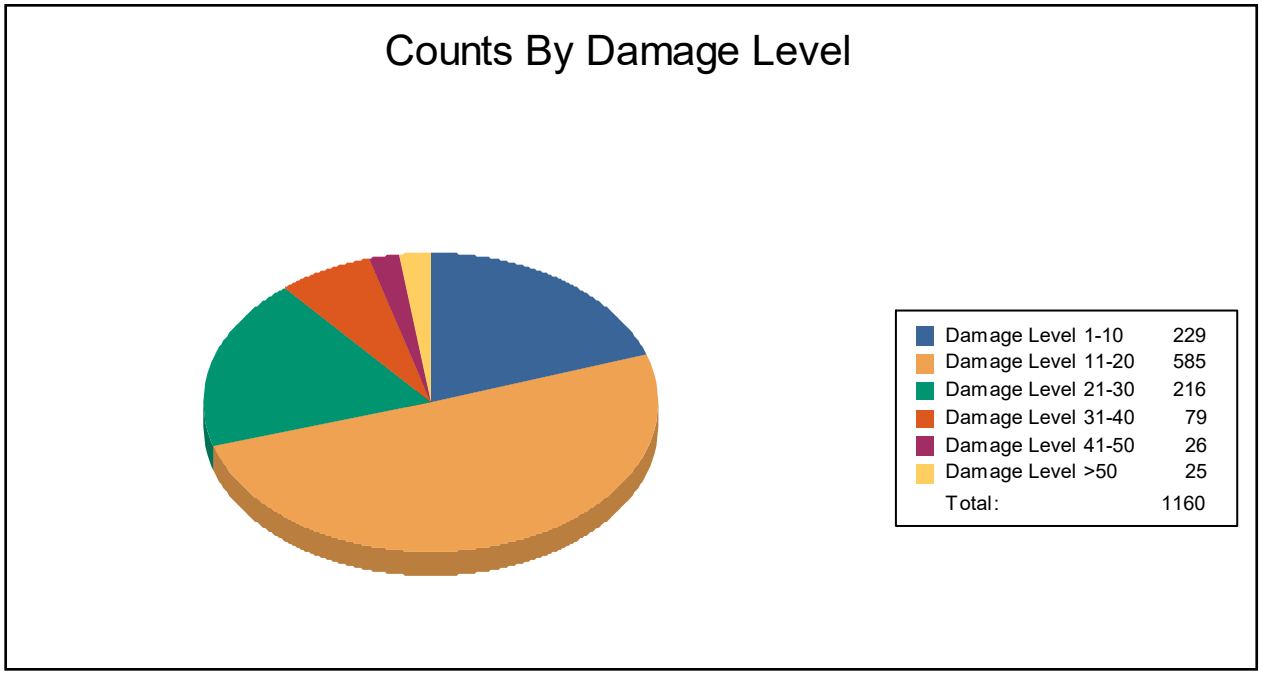




Table 4: Expected Building Damage by Building Type

Building Type	1-10		11-20		21-30		31-40		41-50		>50	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Concrete	0	0	0	0	0	0	0	0	0	0	0	0
ManufHousing	0	0	0	0	0	0	0	0	0	0	0	0
Masonry	6	21	17	59	5	17	0	0	1	3	0	0
Steel	6	35	10	59	0	0	1	6	0	0	0	0
Wood	218	20	554	50	208	19	78	7	25	2	25	2

Essential Facility Damage

Before the flood analyzed in this scenario, the region had 465 hospital beds available for use. On the day of the scenario flood event, the model estimates that 465 hospital beds are available in the region.

Table 5: Expected Damage to Essential Facilities

		# Facilities		
Classification	Total	At Least Moderate	At Least Substantial	Loss of Use
Emergency Operation Centers	24	0	0	0
Fire Stations	64	0	0	0
Hospitals	4	0	0	0
Police Stations	28	0	0	0
Schools	110	0	0	0

If this report displays all zeros or is blank, two possibilities can explain this.

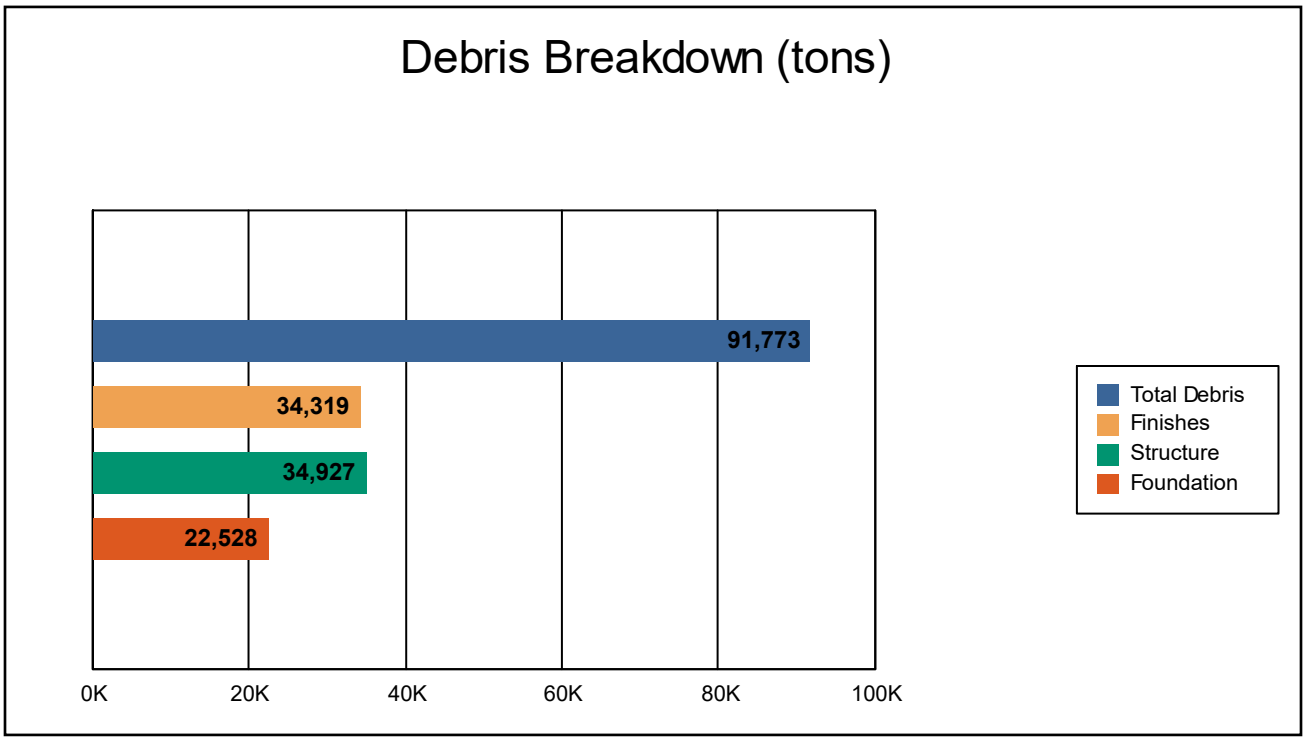
(1) None of your facilities were flooded. This can be checked by mapping the inventory data on the depth grid.

(2) The analysis was not run. This can be tested by checking the run box on the Analysis Menu and seeing if a message box asks you to replace the existing results.

Induced Flood Damage

Debris Generation

Hazus estimates the amount of debris that will be generated by the flood. The model breaks debris into three general categories: 1) Finishes (dry wall, insulation, etc.), 2) Structural (wood, brick, etc.) and 3) Foundations (concrete slab, concrete block, rebar, etc.). This distinction is made because of the different types of material handling equipment required to handle the debris.

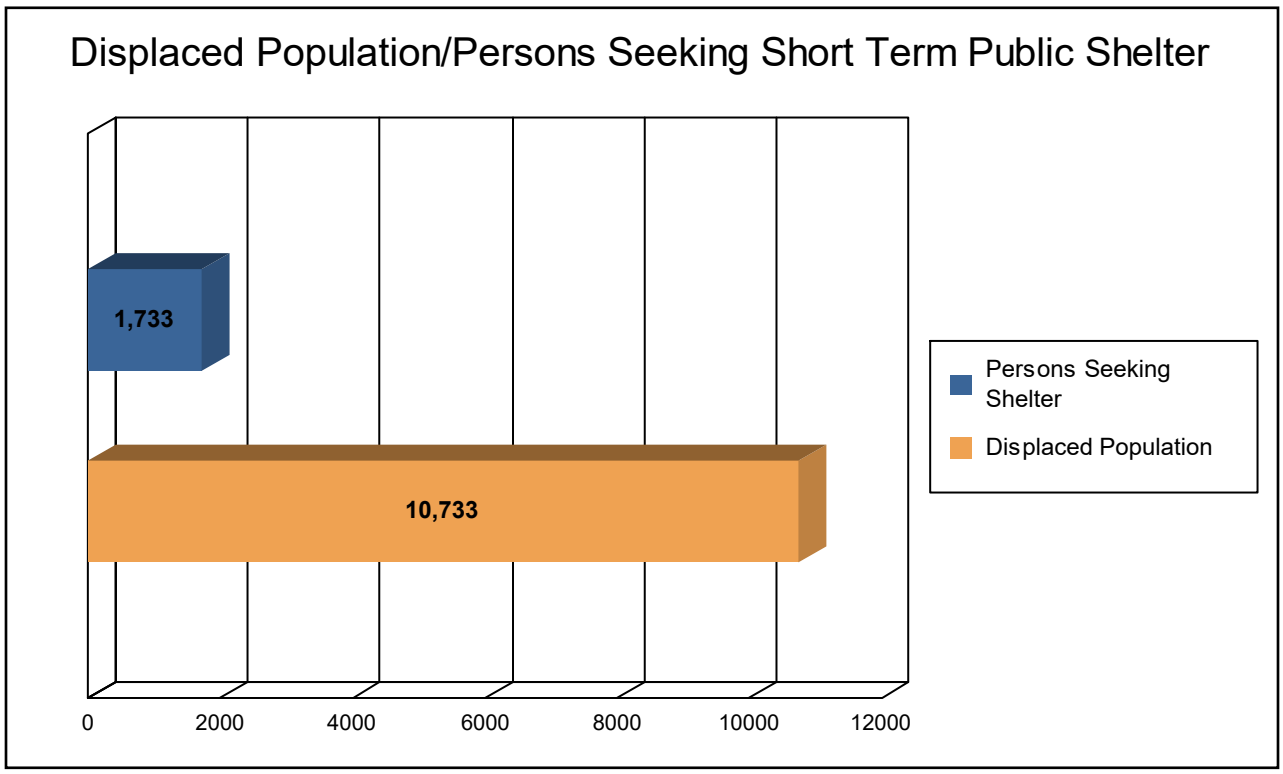


The model estimates that a total of 91,773 tons of debris will be generated. Of the total amount, Finishes comprises 37% of the total, Structure comprises 38% of the total, and Foundation comprises 25%. If the debris tonnage is converted into an estimated number of truckloads, it will require 3671 truckloads (@25 tons/truck) to remove the debris generated by the flood.

Social Impact

Shelter Requirements

Hazus estimates the number of households that are expected to be displaced from their homes due to the flood and the associated potential evacuation. Hazus also estimates those displaced people that will require accommodations in temporary public shelters. The model estimates 3,578 households (or 10,733 of people) will be displaced due to the flood. Displacement includes households evacuated from within or very near to the inundated area. Of these, 1,733 people (out of a total population of 268,434) will seek temporary shelter in public shelters.



Economic Loss

The total economic loss estimated for the flood is 1,838.47 million dollars, which represents 8.09 % of the total replacement value of the scenario buildings.

Building-Related Losses

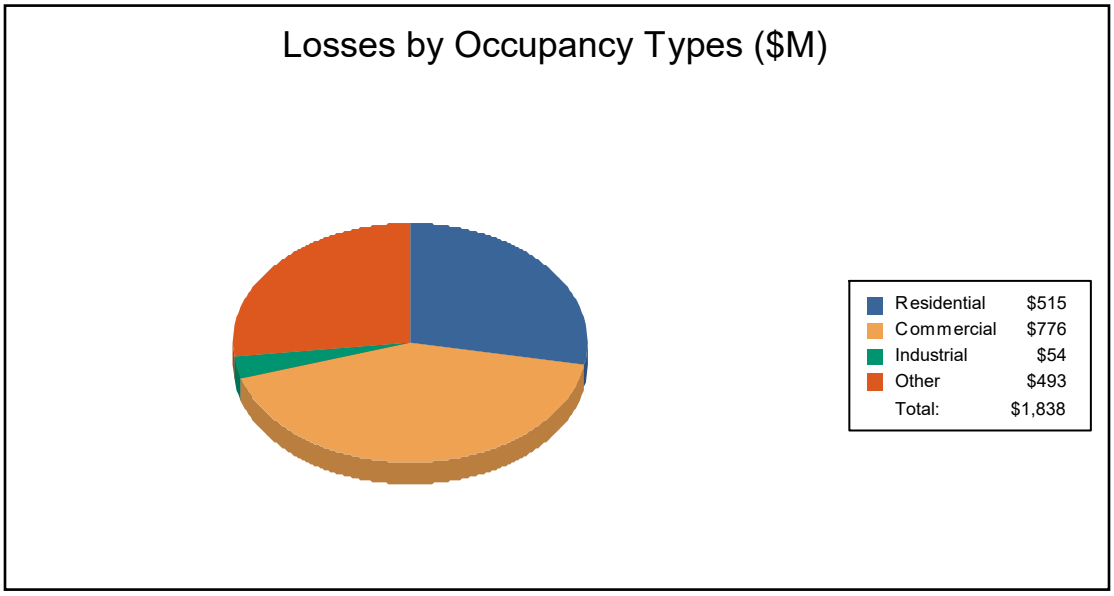
The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the flood. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the flood.

The total building-related losses were 775.21 million dollars. 58% of the estimated losses were related to the business interruption of the region. The residential occupancies made up 28.01% of the total loss. Table 6 below provides a summary of the losses associated with the building damage.

Table 6: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Building Loss						
	Building	229.07	64.05	14.91	10.98	319.01
	Content	141.48	184.65	31.51	63.75	421.39
	Inventory	0.00	27.72	4.45	2.64	34.81
	Subtotal	**370.55**	**276.42**	**50.87**	**77.37**	**775.21**
Business Interruption						
	Income	7.75	207.29	1.00	27.29	243.32
	Relocation	76.50	47.04	0.98	17.07	141.59
	Rental Income	41.83	33.98	0.15	3.38	79.34
	Wage	18.32	211.10	1.47	368.14	599.02
	Subtotal	**144.39**	**499.41**	**3.59**	**415.87**	**1,063.27**
ALL	**Total**	**514.94**	**775.83**	**54.46**	**493.25**	**1,838.47**





Appendix A: County Listing for the Region

Connecticut

- New London

Appendix B: Regional Population and Building Value Data

	Population	Building Value (thousands of dollars)		
		Residential	Non-Residential	Total
Connecticut				
New London	268,434	32,861,791	18,758,064	51,619,855
Total	**268,434**	**32,861,791**	**18,758,064**	**51,619,855**
Total Study Region	**268,434**	**32,861,791**	**18,758,064**	**51,619,855**

Hazus: Flood Global Risk Report

Region Name:	CT_FLD_Tolland
Flood Scenario:	Tolland_100
Print Date:	Monday, April 10, 2023

Disclaimer:
Totals only reflect data for those census tracts/blocks included in the user's study region.

The estimates of social and economic impacts contained in this report were produced using Hazus loss estimation methodology software which is based on current scientific and engineering knowledge. There are uncertainties inherent in any loss estimation technique. Therefore, there may be significant differences between the modeled results contained in this report and the actual social and economic losses following a specific Flood. These results can be improved by using enhanced inventory data and flood hazard information.

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General Description of the Region

Hazus is a regional multi-hazard loss estimation model that was developed by the Federal Emergency Management Agency (FEMA) and the National Institute of Building Sciences (NIBS). The primary purpose of Hazus is to provide a methodology and software application to develop multi-hazard losses at a regional scale. These loss estimates would be used primarily by local, state and regional officials to plan and stimulate efforts to reduce risks from multi-hazards and to prepare for emergency response and recovery.

The flood loss estimates provided in this report were based on a region that included 1 county(ies) from the following state(s):

- Connecticut

Note:
Appendix A contains a complete listing of the counties contained in the region.

The geographical size of the region is approximately 47 square miles and contains 2,234 census blocks. The region contains over 57 thousand households and has a total population of 149,768 people. The distribution of population by State and County for the study region is provided in Appendix B.

There are an estimated 49,779 buildings in the region with a total building replacement value (excluding contents) of 29,283 million dollars. Approximately 89.30% of the buildings (and 66.57% of the building value) are associated with residential housing.

Building Inventory

General Building Stock

Hazus estimates that there are 49,779 buildings in the region which have an aggregate total replacement value of 29,283 million dollars. Table 1 and Table 2 present the relative distribution of the value with respect to the general occupancies by Study Region and Scenario respectively. Appendix B provides a general distribution of the building value by State and County.

Table 1
Building Exposure by Occupancy Type for the Study Region

Occupancy	Exposure ($1000)	Percent of Total
Residential	19,494,697	66.6%
Commercial	4,230,728	14.4%
Industrial	1,039,590	3.6%
Agricultural	60,283	0.2%
Religion	220,543	0.8%
Government	850,141	2.9%
Education	3,387,144	11.6%
Total	**29,283,126**	**100%**

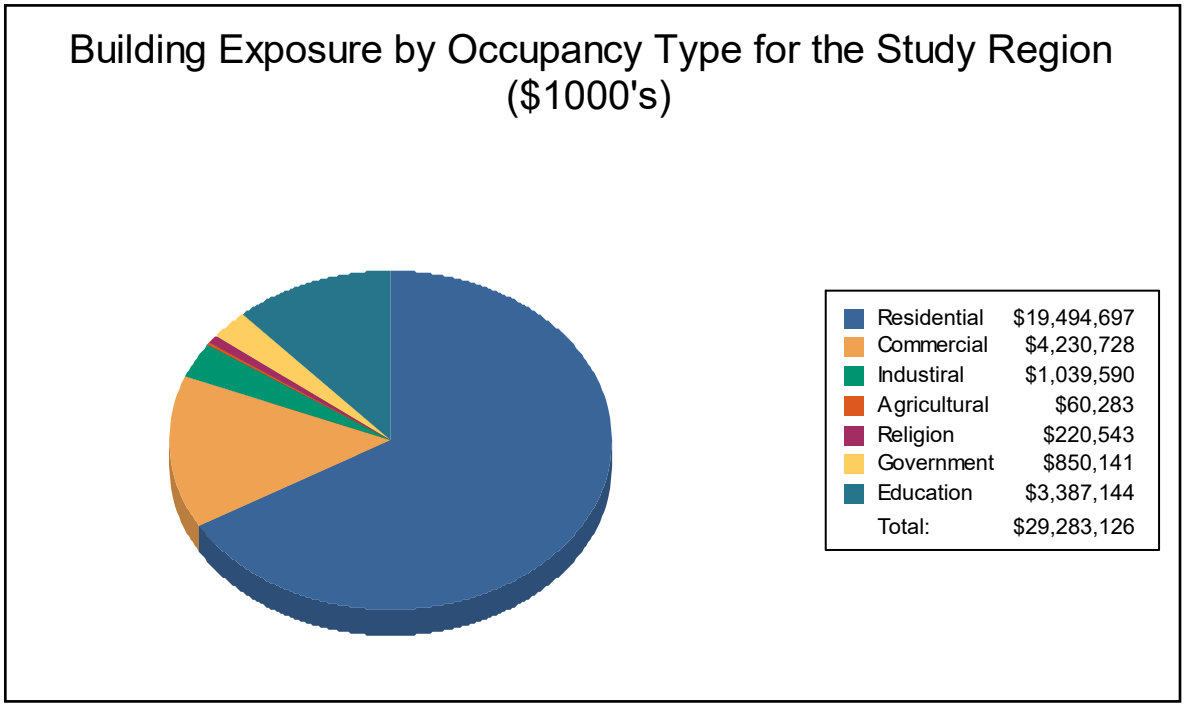
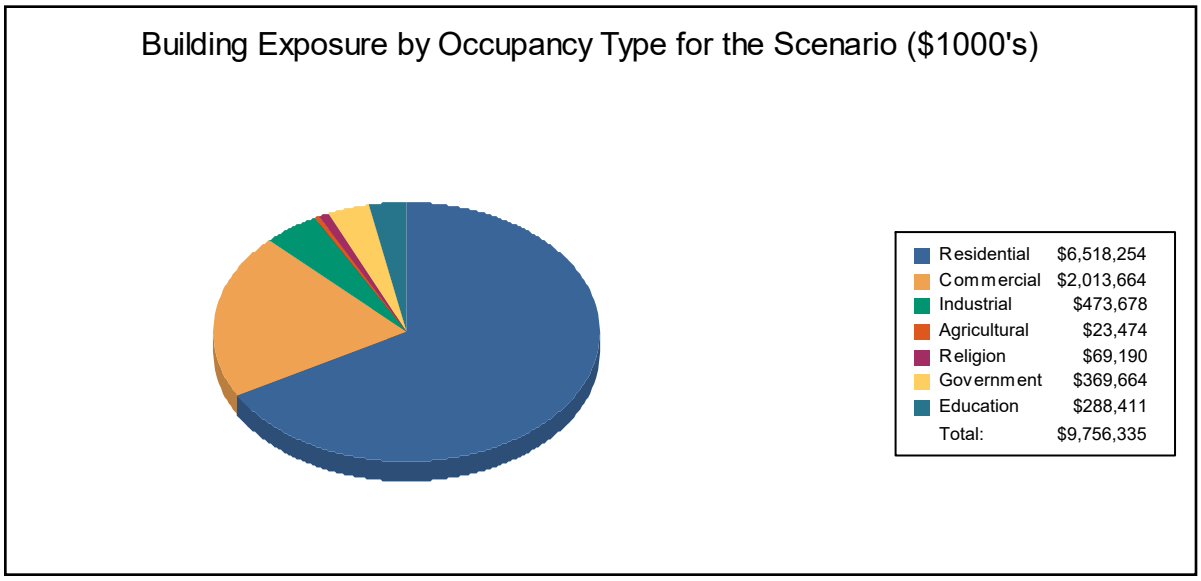


Table 2
Building Exposure by Occupancy Type for the Scenario

Occupancy	Exposure ($1000)	Percent of Total
Residential	6,518,254	66.8%
Commercial	2,013,664	20.6%
Industrial	473,678	4.9%
Agricultural	23,474	0.2%
Religion	69,190	0.7%
Government	369,664	3.8%
Education	288,411	3.0%
Total	**9,756,335**	**100%**



Essential Facility Inventory

For essential facilities, there are 3 hospitals in the region with a total bed capacity of 231 beds.
There are 48 schools, 33 fire stations, 10 police stations and 13 emergency operation centers.

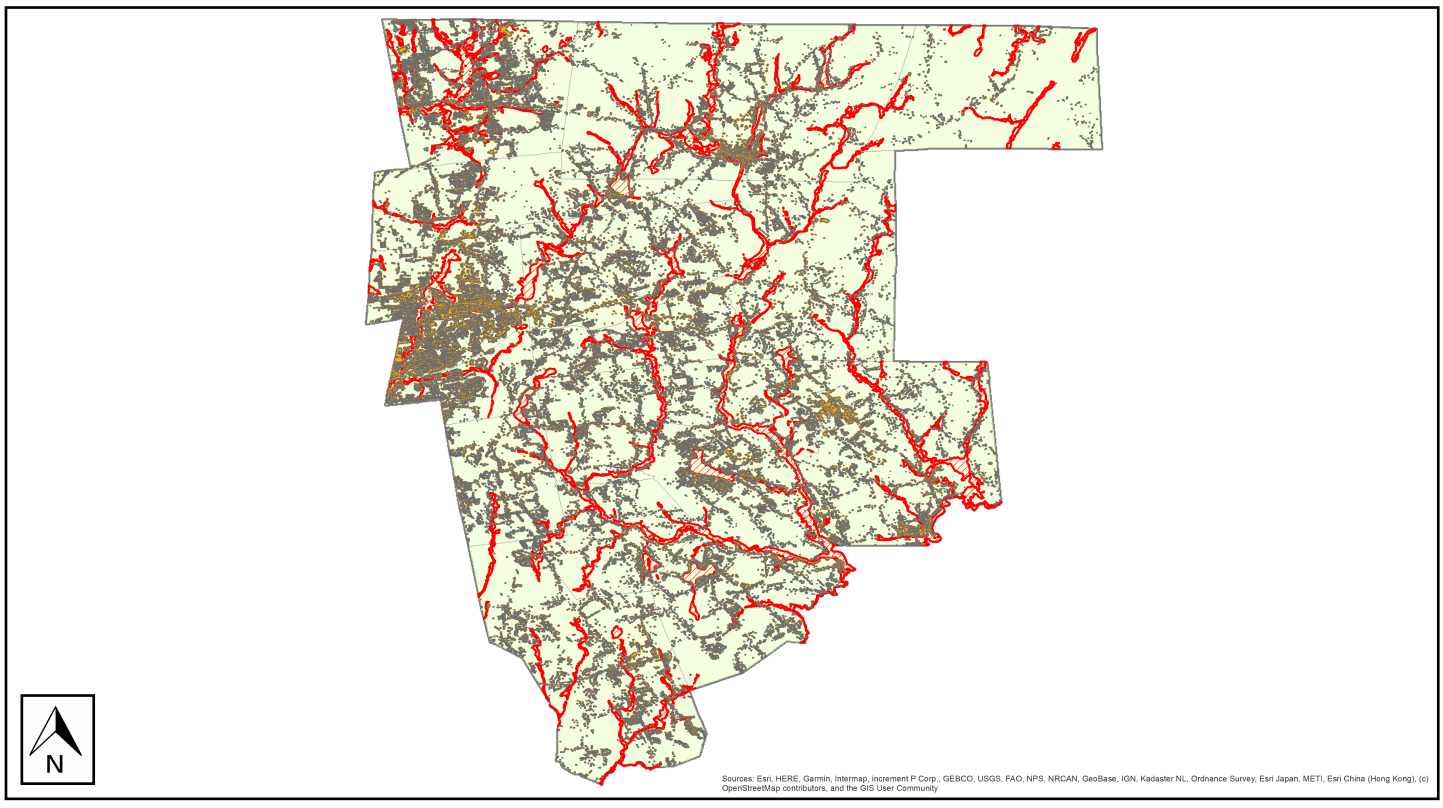
Flood Scenario Parameters

Hazus used the following set of information to define the flood parameters for the flood loss estimate provided in this report.

Study Region Name:	CT_FLD_Tolland
Scenario Name:	Tolland_100
Return Period Analyzed:	100
Analysis Options Analyzed:	No What-Ifs

Study Region Overview Map

Illustrating scenario flood extent, as well as exposed essential facilities and total exposure



Building Damage

General Building Stock Damage

Hazus estimates that about 71 buildings will be at least moderately damaged. This is over 88% of the total number of buildings in the scenario. There are an estimated 1 buildings that will be completely destroyed. The definition of the 'damage states' is provided in the Hazus Flood Technical Manual. Table 3 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4 summarizes the expected damage by general building type.

Total Economic Loss (1 dot = $300K) Overview Map

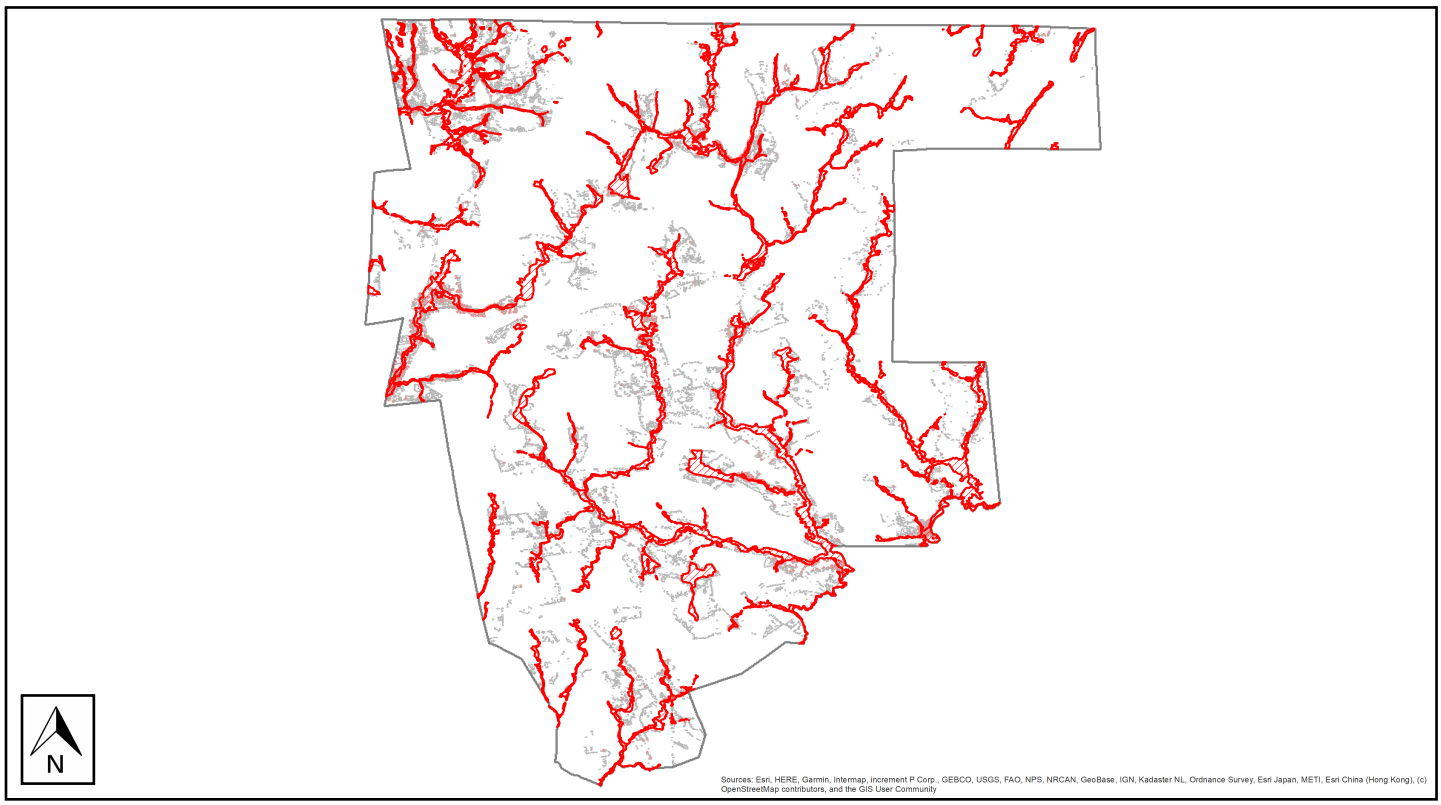


Table 3: Expected Building Damage by Occupancy

	1-10		11-20		21-30		31-40		41-50		>50	
Occupancy	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Agriculture	0	0	0	0	0	0	0	0	0	0	0	0
Commercial	1	8	7	54	5	38	0	0	0	0	0	0
Education	0	0	0	0	0	0	0	0	0	0	0	0
Government	1	100	0	0	0	0	0	0	0	0	0	0
Industrial	0	0	0	0	0	0	0	0	0	0	0	0
Religion	0	0	0	0	0	0	0	0	0	0	0	0
Residential	62	51	33	27	14	12	9	7	2	2	1	1
Total	**64**		**40**		**19**		**9**		**2**		**1**	

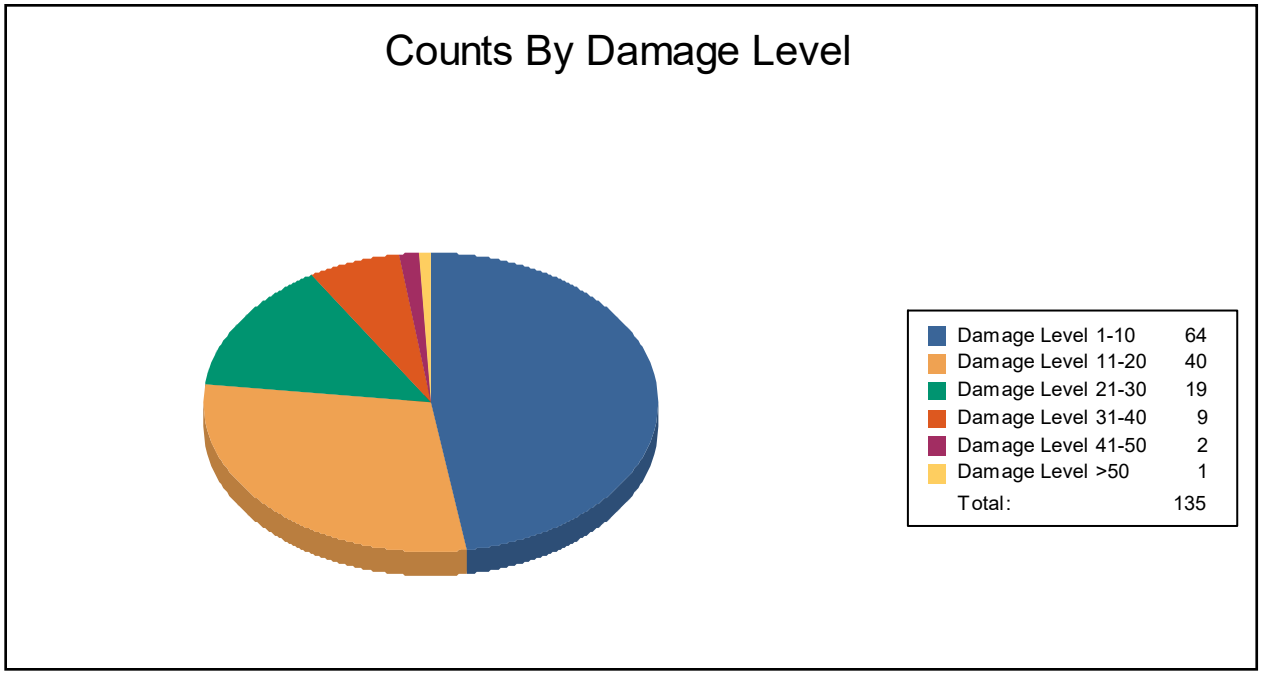




Table 4: Expected Building Damage by Building Type

Building Type	1-10		11-20		21-30		31-40		41-50		>50	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Concrete	0	0	0	0	0	0	0	0	0	0	0	0
ManufHousing	0	0	0	0	0	0	0	0	0	0	0	0
Masonry	1	25	2	50	1	25	0	0	0	0	0	0
Steel	1	11	4	44	4	44	0	0	0	0	0	0
Wood	62	51	34	28	14	11	9	7	2	2	1	1

Essential Facility Damage

Before the flood analyzed in this scenario, the region had 231 hospital beds available for use. On the day of the scenario flood event, the model estimates that 231 hospital beds are available in the region.

Table 5: Expected Damage to Essential Facilities

		# Facilities		
Classification	Total	At Least Moderate	At Least Substantial	Loss of Use
Emergency Operation Centers	13	0	0	0
Fire Stations	33	0	0	0
Hospitals	3	0	0	0
Police Stations	10	0	0	0
Schools	48	0	0	0

If this report displays all zeros or is blank, two possibilities can explain this.

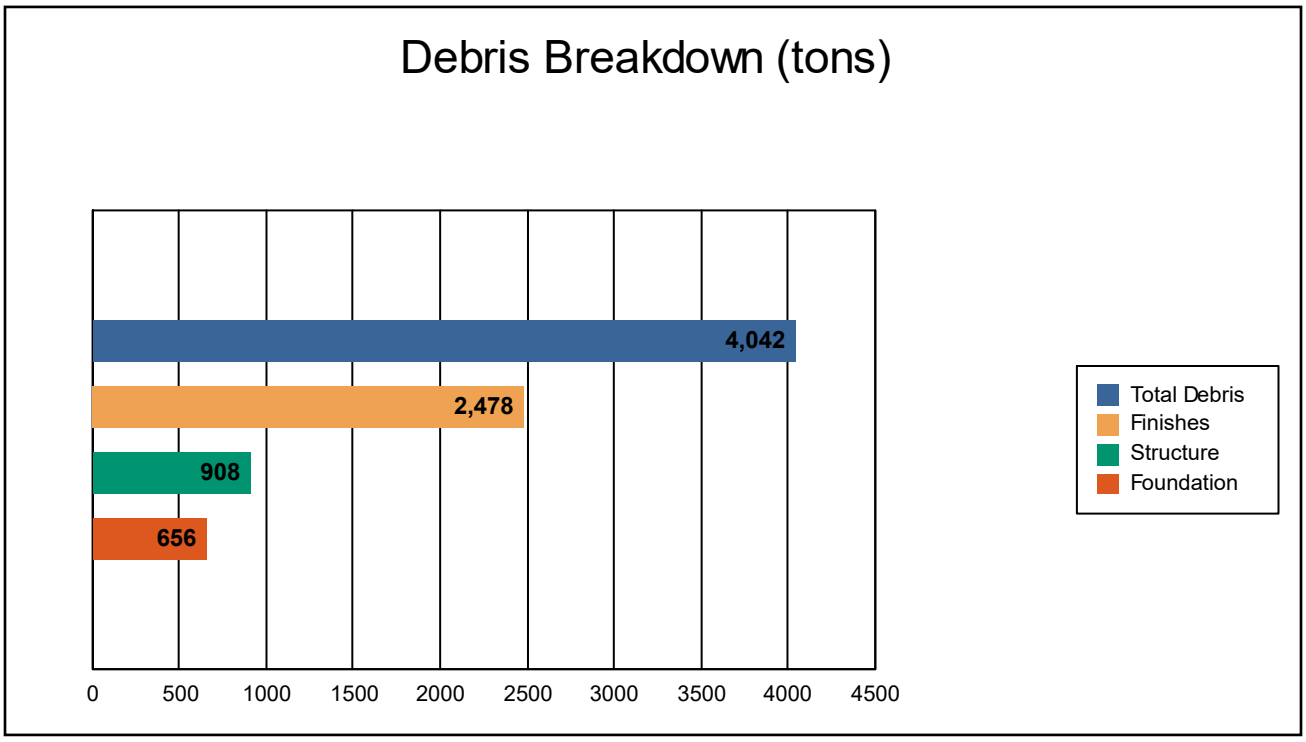
(1) None of your facilities were flooded. This can be checked by mapping the inventory data on the depth grid.

(2) The analysis was not run. This can be tested by checking the run box on the Analysis Menu and seeing if a message box asks you to replace the existing results.

Induced Flood Damage

Debris Generation

Hazus estimates the amount of debris that will be generated by the flood. The model breaks debris into three general categories: 1) Finishes (dry wall, insulation, etc.), 2) Structural (wood, brick, etc.) and 3) Foundations (concrete slab, concrete block, rebar, etc.). This distinction is made because of the different types of material handling equipment required to handle the debris.

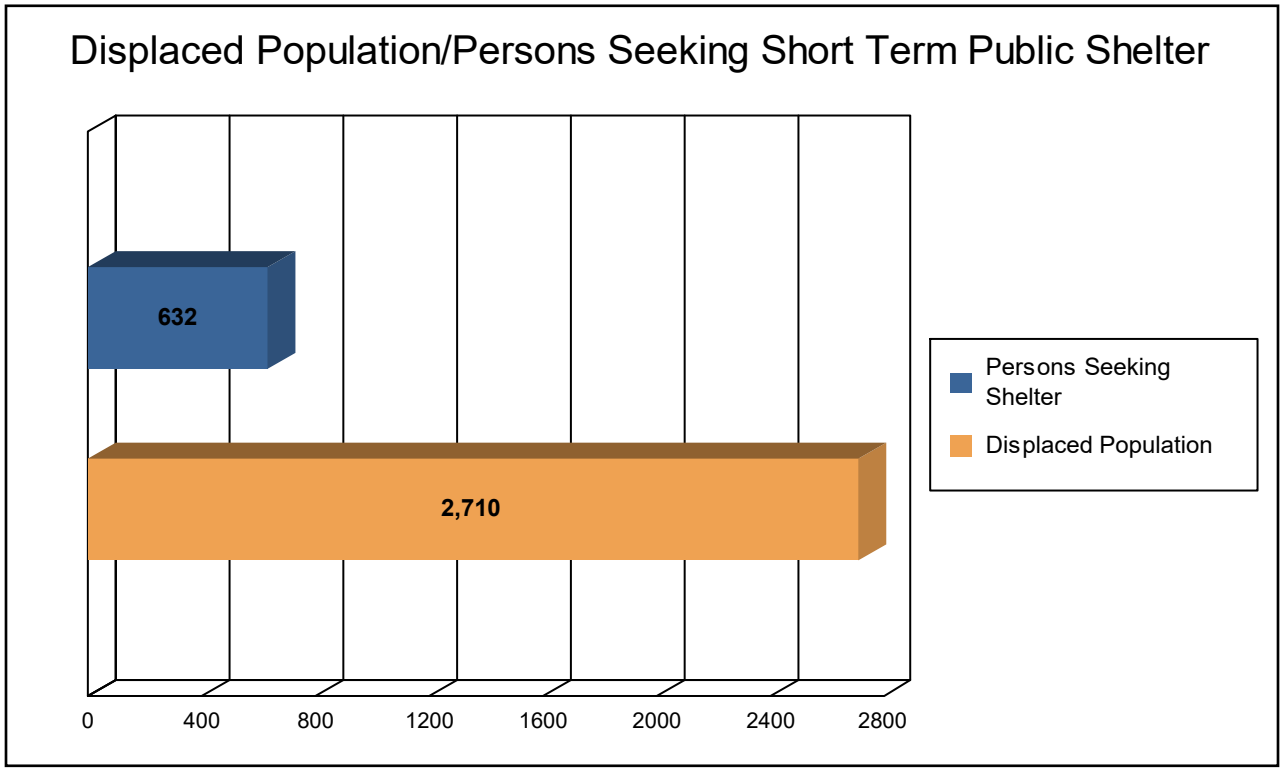


The model estimates that a total of 4,042 tons of debris will be generated. Of the total amount, Finishes comprises 61% of the total, Structure comprises 22% of the total, and Foundation comprises 16%. If the debris tonnage is converted into an estimated number of truckloads, it will require 162 truckloads (@25 tons/truck) to remove the debris generated by the flood.

Social Impact

Shelter Requirements

Hazus estimates the number of households that are expected to be displaced from their homes due to the flood and the associated potential evacuation. Hazus also estimates those displaced people that will require accommodations in temporary public shelters. The model estimates 903 households (or 2,710 of people) will be displaced due to the flood. Displacement includes households evacuated from within or very near to the inundated area. Of these, 632 people (out of a total population of 149,768) will seek temporary shelter in public shelters.



Economic Loss

The total economic loss estimated for the flood is 712.05 million dollars, which represents 7.30 % of the total replacement value of the scenario buildings.

Building-Related Losses

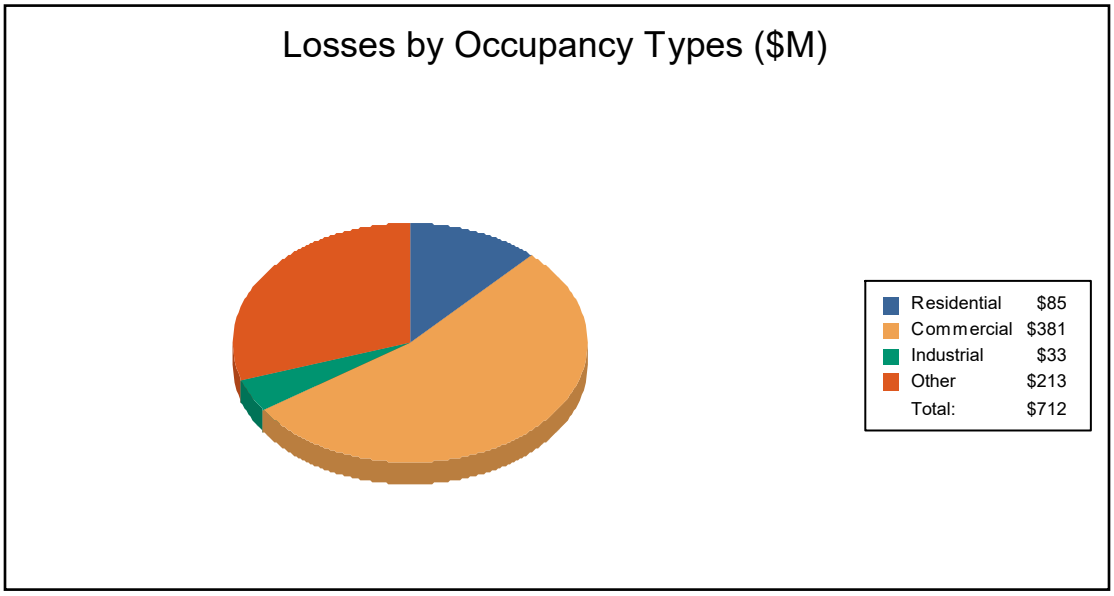
The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the flood. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the flood.

The total building-related losses were 328.41 million dollars. 54% of the estimated losses were related to the business interruption of the region. The residential occupancies made up 11.95% of the total loss. Table 6 below provides a summary of the losses associated with the building damage.

Table 6: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Building Loss						
	Building	42.90	39.97	8.84	5.00	96.71
	Content	21.30	125.52	19.31	26.05	192.19
	Inventory	0.00	36.08	2.61	0.83	39.52
	Subtotal	**64.20**	**201.56**	**30.77**	**31.88**	**328.41**
Business Interruption						
	Income	1.09	59.75	0.42	6.25	67.51
	Relocation	10.33	21.15	0.51	4.94	36.92
	Rental Income	6.88	14.09	0.09	1.08	22.14
	Wage	2.61	84.41	0.75	169.30	257.07
	Subtotal	**20.91**	**179.40**	**1.77**	**181.56**	**383.64**
ALL	**Total**	**85.11**	**380.97**	**32.54**	**213.44**	**712.05**





Appendix A: County Listing for the Region

Connecticut

- Tolland

Appendix B: Regional Population and Building Value Data

	Population	Building Value (thousands of dollars)		
		Residential	Non-Residential	Total
Connecticut				
Tolland	149,768	19,494,697	9,788,429	29,283,126
Total	**149,768**	**19,494,697**	**9,788,429**	**29,283,126**
Total Study Region	**149,768**	**19,494,697**	**9,788,429**	**29,283,126**

Hazus: Flood Global Risk Report

Region Name: CT_FLD_Windham

Flood Scenario: Windham_100

Print Date: Tuesday, April 11, 2023

Disclaimer:

Totals only reflect data for those census tracts/blocks included in the user's study region.

The estimates of social and economic impacts contained in this report were produced using Hazus loss estimation methodology software which is based on current scientific and engineering knowledge. There are uncertainties inherent in any loss estimation technique. Therefore, there may be significant differences between the modeled results contained in this report and the actual social and economic losses following a specific Flood. These results can be improved by using enhanced inventory data and flood hazard information.

FEMA

RiskMAP
Increasing Resilience Together

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General Description of the Region

Hazus is a regional multi-hazard loss estimation model that was developed by the Federal Emergency Management Agency (FEMA) and the National Institute of Building Sciences (NIBS). The primary purpose of Hazus is to provide a methodology and software application to develop multi-hazard losses at a regional scale. These loss estimates would be used primarily by local, state and regional officials to plan and stimulate efforts to reduce risks from multi-hazards and to prepare for emergency response and recovery.

The flood loss estimates provided in this report were based on a region that included 1 county(ies) from the following state(s):

- Connecticut

Note:
Appendix A contains a complete listing of the counties contained in the region.

The geographical size of the region is approximately 41 square miles and contains 2,469 census blocks. The region contains over 46 thousand households and has a total population of 116,384 people. The distribution of population by State and County for the study region is provided in Appendix B.

There are an estimated 43,539 buildings in the region with a total building replacement value (excluding contents) of 22,000 million dollars. Approximately 88.11% of the buildings (and 58.97% of the building value) are associated with residential housing.

Building Inventory

General Building Stock

Hazus estimates that there are 43,539 buildings in the region which have an aggregate total replacement value of 22,000 million dollars. Table 1 and Table 2 present the relative distribution of the value with respect to the general occupancies by Study Region and Scenario respectively. Appendix B provides a general distribution of the building value by State and County.

Table 1
Building Exposure by Occupancy Type for the Study Region

Occupancy	Exposure ($1000)	Percent of Total
Residential	12,972,917	59.0%
Commercial	4,555,602	20.7%
Industrial	1,772,385	8.1%
Agricultural	64,059	0.3%
Religion	342,879	1.6%
Government	729,105	3.3%
Education	1,563,408	7.1%
Total	**22,000,355**	**100%**

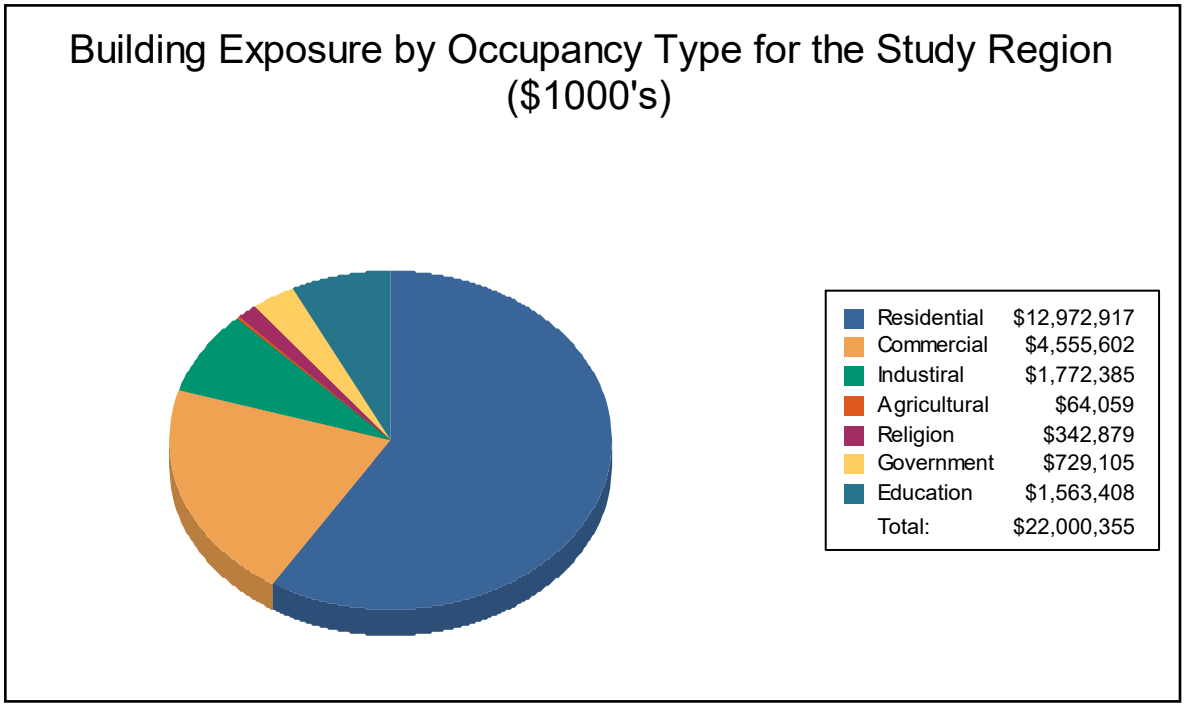
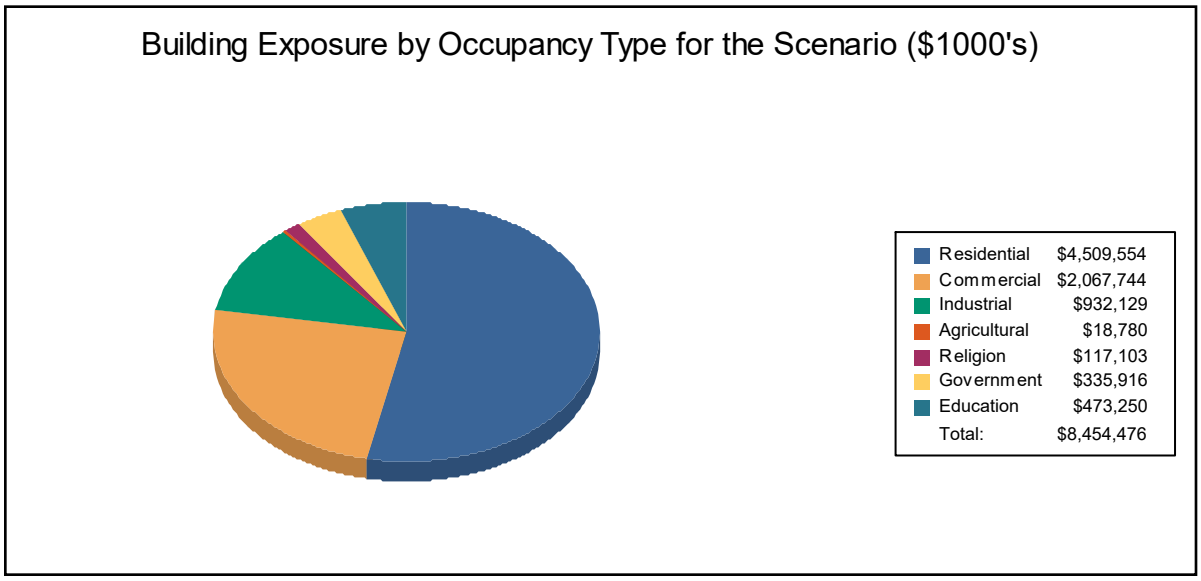


Table 2
Building Exposure by Occupancy Type for the Scenario

Occupancy	Exposure ($1000)	Percent of Total
Residential	4,509,554	53.3%
Commercial	2,067,744	24.5%
Industrial	932,129	11.0%
Agricultural	18,780	0.2%
Religion	117,103	1.4%
Government	335,916	4.0%
Education	473,250	5.6%
Total	**8,454,476**	**100%**



Essential Facility Inventory

For essential facilities, there are 3 hospitals in the region with a total bed capacity of 234 beds.
There are 55 schools, 37 fire stations, 11 police stations and 15 emergency operation centers.

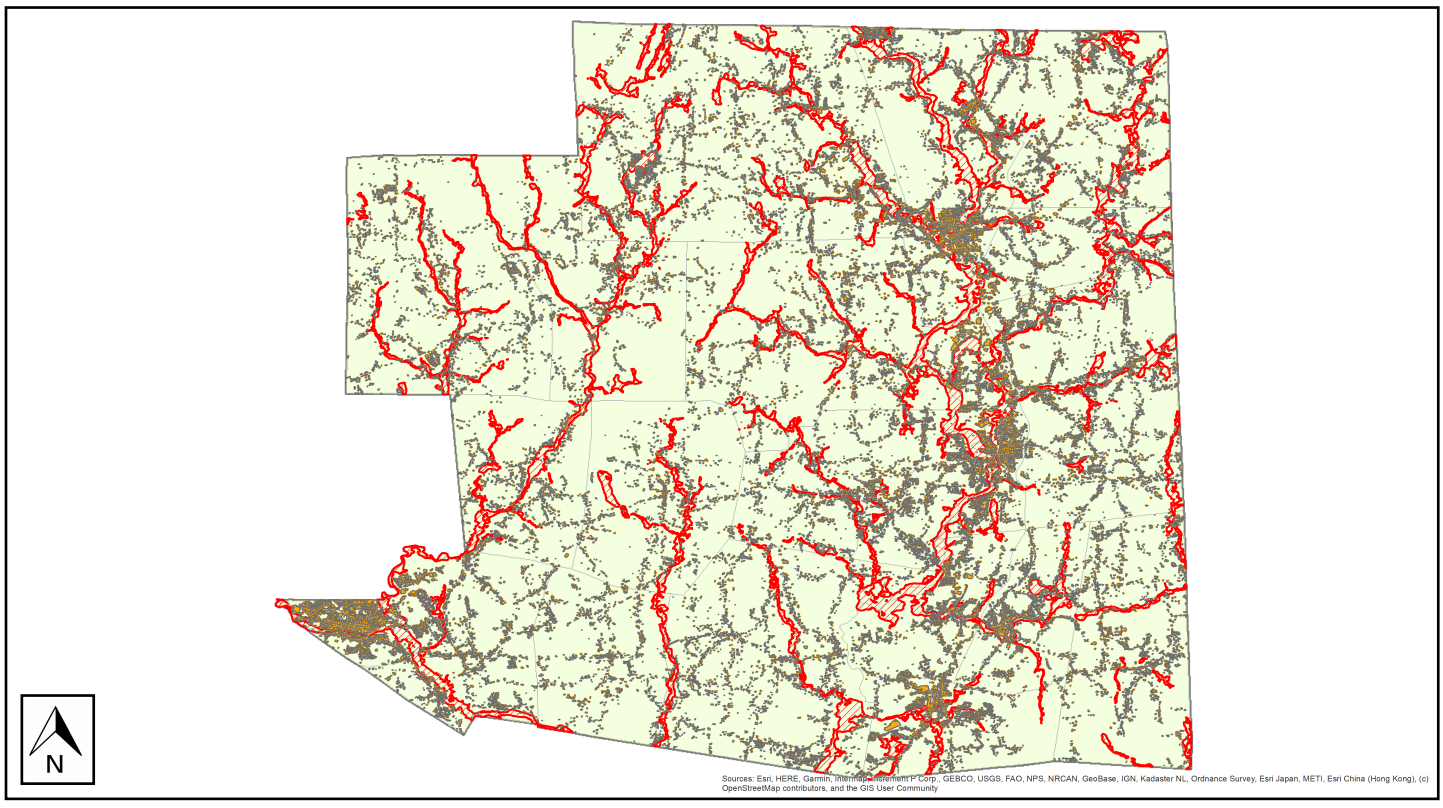
Flood Scenario Parameters

Hazus used the following set of information to define the flood parameters for the flood loss estimate provided in this report.

Study Region Name:	CT_FLD_Windham
Scenario Name:	Windham_100
Return Period Analyzed:	100
Analysis Options Analyzed:	No What-Ifs

Study Region Overview Map

Illustrating scenario flood extent, as well as exposed essential facilities and total exposure



Building Damage

General Building Stock Damage

Hazus estimates that about 143 buildings will be at least moderately damaged. This is over 75% of the total number of buildings in the scenario. There are an estimated 9 buildings that will be completely destroyed. The definition of the 'damage states' is provided in the Hazus Flood Technical Manual. Table 3 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4 summarizes the expected damage by general building type.

Total Economic Loss (1 dot = $300K) Overview Map

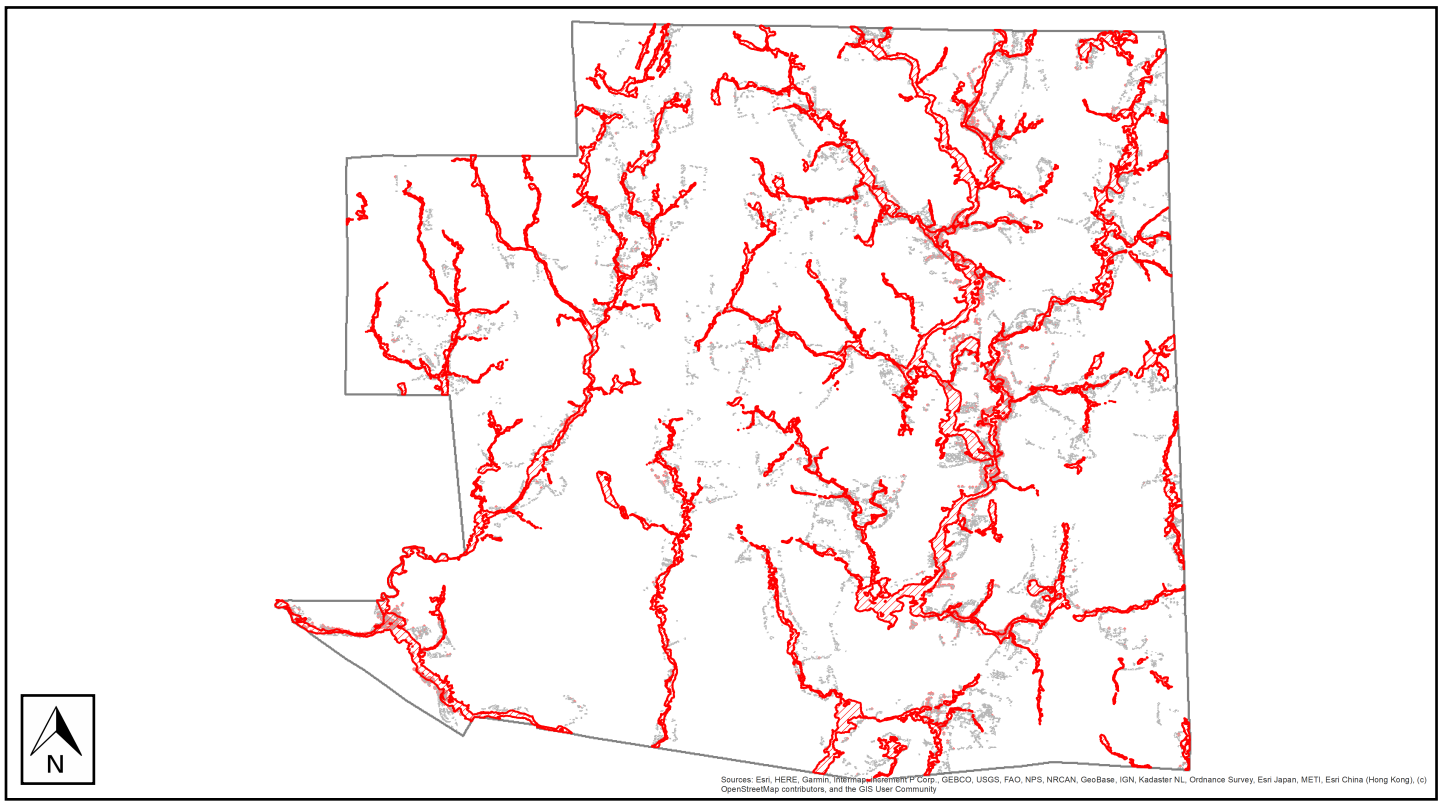


Table 3: Expected Building Damage by Occupancy

	1-10		11-20		21-30		31-40		41-50		>50	
Occupancy	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Agriculture	0	0	0	0	0	0	0	0	0	0	0	0
Commercial	4	18	10	45	4	18	1	5	3	14	0	0
Education	0	0	0	0	0	0	0	0	0	0	0	0
Government	0	0	4	100	0	0	0	0	0	0	0	0
Industrial	0	0	0	0	0	0	0	0	0	0	0	0
Religion	0	0	0	0	0	0	0	0	0	0	0	0
Residential	46	28	42	25	43	26	19	11	8	5	9	5
Total	**50**		**56**		**47**		**20**		**11**		**9**	

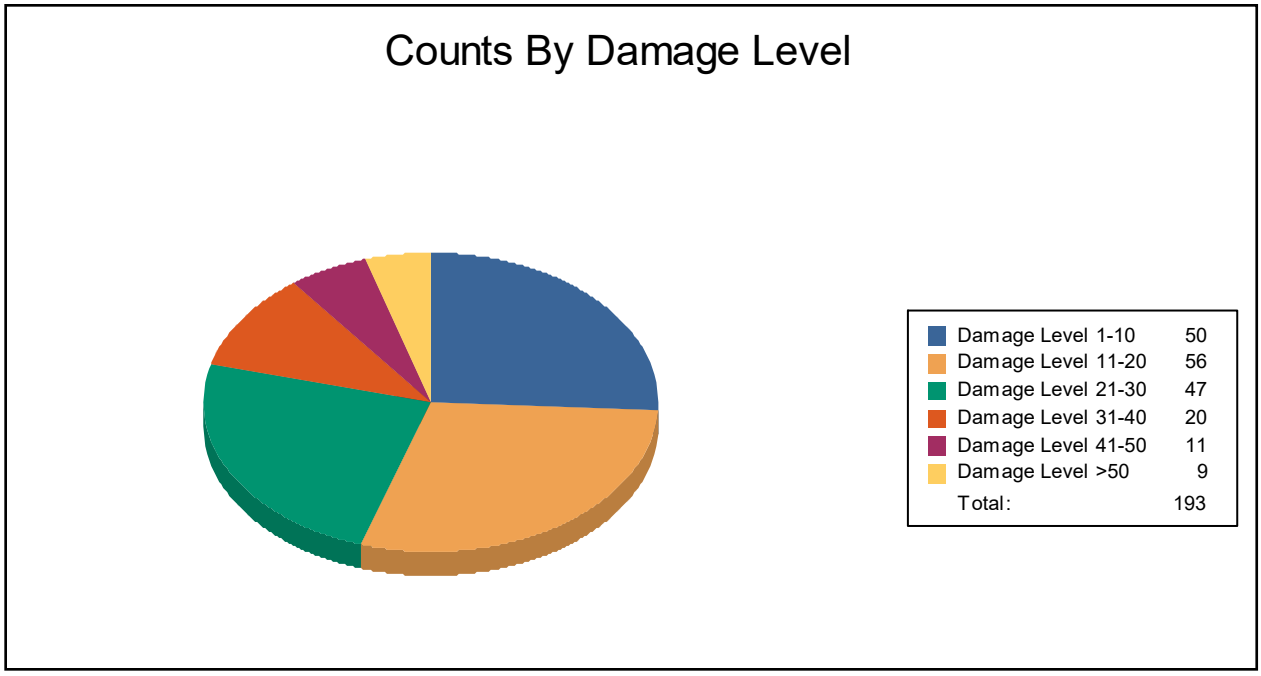




Table 4: Expected Building Damage by Building Type

Building Type	1-10		11-20		21-30		31-40		41-50		>50	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Concrete	0	0	0	0	0	0	0	0	0	0	0	0
ManufHousing	0	0	0	0	0	0	0	0	0	0	0	0
Masonry	1	11	5	56	3	33	0	0	0	0	0	0
Steel	3	19	10	63	1	6	0	0	2	13	0	0
Wood	45	28	38	24	40	25	19	12	8	5	9	6

Essential Facility Damage

Before the flood analyzed in this scenario, the region had 234 hospital beds available for use. On the day of the scenario flood event, the model estimates that 234 hospital beds are available in the region.

Table 5: Expected Damage to Essential Facilities

		# Facilities		
Classification	Total	At Least Moderate	At Least Substantial	Loss of Use
Emergency Operation Centers	15	0	0	0
Fire Stations	37	0	0	0
Hospitals	3	0	0	0
Police Stations	11	0	0	0
Schools	55	0	0	0

If this report displays all zeros or is blank, two possibilities can explain this.

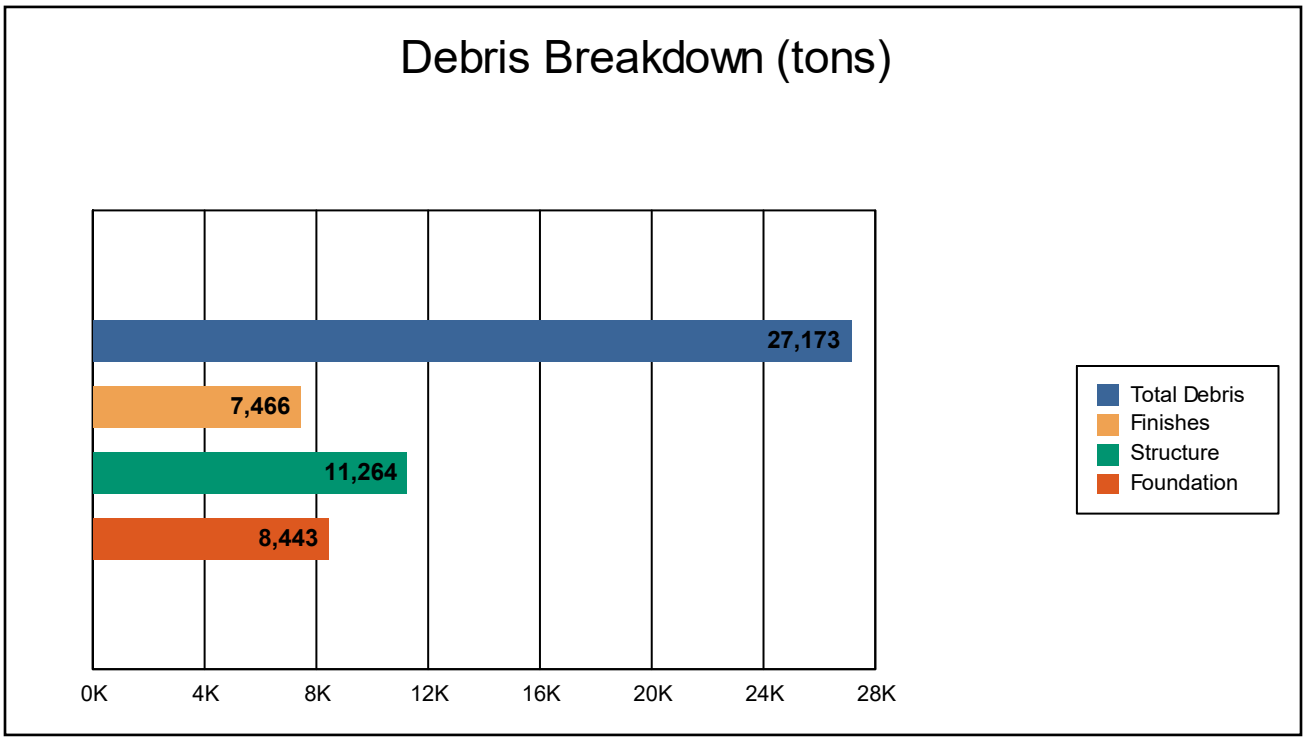
(1) None of your facilities were flooded. This can be checked by mapping the inventory data on the depth grid.

(2) The analysis was not run. This can be tested by checking the run box on the Analysis Menu and seeing if a message box asks you to replace the existing results.

Induced Flood Damage

Debris Generation

Hazus estimates the amount of debris that will be generated by the flood. The model breaks debris into three general categories: 1) Finishes (dry wall, insulation, etc.), 2) Structural (wood, brick, etc.) and 3) Foundations (concrete slab, concrete block, rebar, etc.). This distinction is made because of the different types of material handling equipment required to handle the debris.

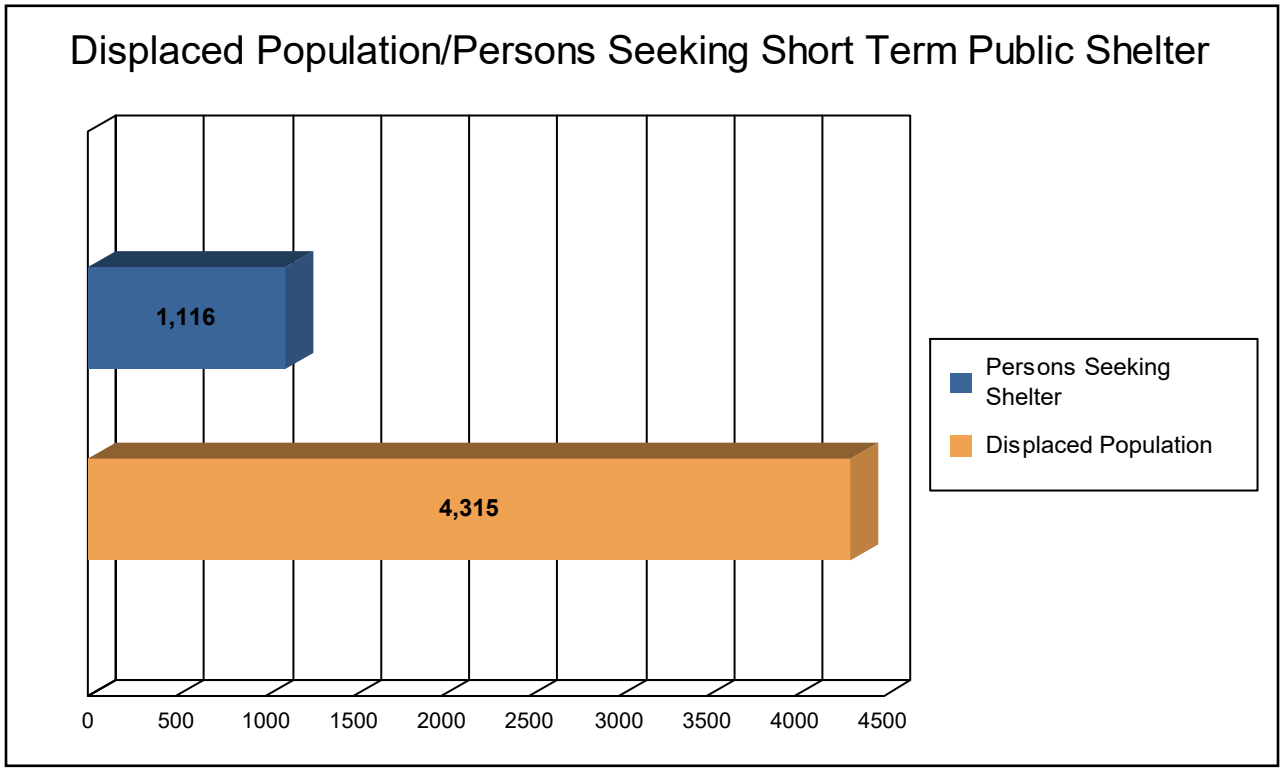


The model estimates that a total of 27,173 tons of debris will be generated. Of the total amount, Finishes comprises 27% of the total, Structure comprises 41% of the total, and Foundation comprises 31%. If the debris tonnage is converted into an estimated number of truckloads, it will require 1087 truckloads (@25 tons/truck) to remove the debris generated by the flood.

Social Impact

Shelter Requirements

Hazus estimates the number of households that are expected to be displaced from their homes due to the flood and the associated potential evacuation. Hazus also estimates those displaced people that will require accommodations in temporary public shelters. The model estimates 1,438 households (or 4,315 of people) will be displaced due to the flood. Displacement includes households evacuated from within or very near to the inundated area. Of these, 1,116 people (out of a total population of 116,384) will seek temporary shelter in public shelters.



Economic Loss

The total economic loss estimated for the flood is 1,238.08 million dollars, which represents 14.64 % of the total replacement value of the scenario buildings.

Building-Related Losses

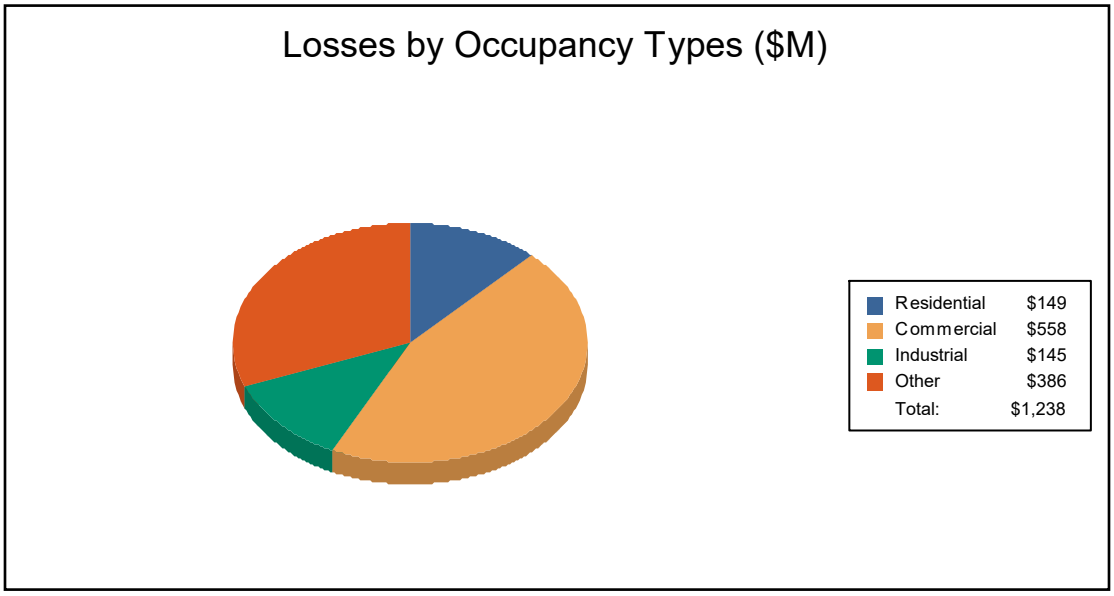
The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the flood. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the flood.

The total building-related losses were 648.59 million dollars. 48% of the estimated losses were related to the business interruption of the region. The residential occupancies made up 12.04% of the total loss. Table 6 below provides a summary of the losses associated with the building damage.

Table 6: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Building Loss						
	Building	78.12	73.54	38.77	13.41	203.84
	Content	44.22	190.68	89.04	73.50	397.44
	Inventory	0.00	35.94	10.99	0.39	47.32
	Subtotal	**122.35**	**300.15**	**138.80**	**87.30**	**648.59**
Business Interruption						
	Income	0.69	95.03	1.59	21.50	118.82
	Relocation	14.00	26.97	1.95	12.42	55.34
	Rental Income	10.38	19.58	0.40	2.81	33.17
	Wage	1.66	116.16	2.46	261.89	382.16
	Subtotal	**26.73**	**257.74**	**6.39**	**298.63**	**589.49**
ALL	**Total**	**149.07**	**557.89**	**145.19**	**385.93**	**1,238.08**





Appendix A: County Listing for the Region

Connecticut

- Windham

Appendix B: Regional Population and Building Value Data

	Population	Building Value (thousands of dollars)		
		Residential	Non-Residential	Total
Connecticut				
Windham	116,384	12,972,917	9,027,438	22,000,355
Total	**116,384**	**12,972,917**	**9,027,438**	**22,000,355**
Total Study Region	**116,384**	**12,972,917**	**9,027,438**	**22,000,355**

Quick Assessment Report

April 10, 2023

Study Region : CT_FLD_Fairfield
Scenario : Fairfield_100
Return Period: 100
Analysis Option: 0

Regional Statistics

Area (Square Miles)	188
Number of Census Blocks	10,120
Number of Buildings	
Residential	247,008
Total	289,295
Number of People in the Region (x 1000)	957
Building Exposure ($ Millions)	
Residential	138,195
Total	202,326

Scenario Results

Shelter Requirements

Displaced Population (# Households)	19,836
Short Term Shelter (# People)	7,165

Economic Loss

Residential Property (Capital Stock) Losses ($ Millions)	1,181
Total Property (Capital Stock) Losses ($ Millions)	2,908
Business Interruption (Income) Losses ($ Millions)	5,535

Disclaimer:

Totals only reflect data for those census tracts/blocks included in the user's study region.

The estimates of social and economic impacts contained in this report were produced using Hazus loss estimation methodology software which is based on current scientific and engineering knowledge. There are uncertainties inherent in any loss estimation technique. Therefore, there may be significant differences between the modeled results contained in this report and the actual social and economic losses following a specific flood. These results can be improved by using enhanced inventory data and flood hazard information.

Quick Assessment Report

April 11, 2023

Study Region : CT_FLD_Hartford
Scenario : Hartford_100
Return Period: 100
Analysis Option: 0

Regional Statistics

Area (Square Miles)	184
Number of Census Blocks	10,136
Number of Buildings	
Residential	229,441
Total	264,089
Number of People in the Region (x 1000)	899
Building Exposure ($ Millions)	
Residential	103,342
Total	170,771

Scenario Results

Shelter Requirements

Displaced Population (# Households)	5,062
Short Term Shelter (# People)	4,296

Economic Loss

Residential Property (Capital Stock) Losses ($ Millions)	151
Total Property (Capital Stock) Losses ($ Millions)	461
Business Interruption (Income) Losses ($ Millions)	1,403

Disclaimer:

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Quick Assessment Report

April 10, 2023

Study Region : CT_FLD_Litchfield
Scenario : Litchfield_100
Return Period: 100
Analysis Option: 0

Regional Statistics

Area (Square Miles)	68
Number of Census Blocks	3,969
Number of Buildings	
Residential	70,135
Total	80,760
Number of People in the Region (x 1000)	185
Building Exposure ($ Millions)	
Residential	28,640
Total	43,122

Scenario Results

Shelter Requirements

Displaced Population (# Households)	3,494
Short Term Shelter (# People)	1,607

Economic Loss

Residential Property (Capital Stock) Losses ($ Millions)	436
Total Property (Capital Stock) Losses ($ Millions)	2,059
Business Interruption (Income) Losses ($ Millions)	1,608

Disclaimer:

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Quick Assessment Report

April 11, 2023

Study Region : CT_FLD_Middlesex
Scenario : Middlesex_100
Return Period: 100
Analysis Option: 0

Regional Statistics

Area (Square Miles)	51
Number of Census Blocks	2,515
Number of Buildings	
Residential	55,018
Total	62,821
Number of People in the Region (x 1000)	164
Building Exposure ($ Millions)	
Residential	22,030
Total	33,001

Scenario Results

Shelter Requirements

Displaced Population (# Households)	2,968
Short Term Shelter (# People)	1,529

Economic Loss

Residential Property (Capital Stock) Losses ($ Millions)	257
Total Property (Capital Stock) Losses ($ Millions)	550
Business Interruption (Income) Losses ($ Millions)	638

Disclaimer:

Totals only reflect data for those census tracts/blocks included in the user's study region.

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Quick Assessment Report

April 10, 2023

Study Region : CT_FLD_NewHaven
Scenario : NewHaven_100
Return Period: 100
Analysis Option: 0

Regional Statistics

Area (Square Miles)	164
Number of Census Blocks	9,728
Number of Buildings	
Residential	231,800
Total	267,508
Number of People in the Region (x 1000)	864
Building Exposure ($ Millions)	
Residential	92,885
Total	154,036

Scenario Results

Shelter Requirements

Displaced Population (# Households)	11,426
Short Term Shelter (# People)	6,160

Economic Loss

Residential Property (Capital Stock) Losses ($ Millions)	419
Total Property (Capital Stock) Losses ($ Millions)	1,194
Business Interruption (Income) Losses ($ Millions)	2,650

Disclaimer:

Totals only reflect data for those census tracts/blocks included in the user's study region.

The estimates of social and economic impacts contained in this report were produced using Hazus loss estimation methodology software which is based on current scientific and engineering knowledge. There are uncertainties inherent in any loss estimation technique. Therefore, there may be significant differences between the modeled results contained in this report and the actual social and economic losses following a specific flood. These results can be improved by using enhanced inventory data and flood hazard information.

Quick Assessment Report

April 11, 2023

Study Region : CT_FLD_NewLondon
Scenario : NewLondon_100
Return Period: 100
Analysis Option: 0

Regional Statistics

Area (Square Miles)	79
Number of Census Blocks	4,394
Number of Buildings	
Residential	81,467
Total	92,777
Number of People in the Region (x 1000)	268
Building Exposure ($ Millions)	
Residential	32,862
Total	51,620

Scenario Results

Shelter Requirements

Displaced Population (# Households)	3,578
Short Term Shelter (# People)	1,733

Economic Loss

Residential Property (Capital Stock) Losses ($ Millions)	371
Total Property (Capital Stock) Losses ($ Millions)	775
Business Interruption (Income) Losses ($ Millions)	1,063

Disclaimer:

Totals only reflect data for those census tracts/blocks included in the user's study region.

The estimates of social and economic impacts contained in this report were produced using Hazus loss estimation methodology software which is based on current scientific and engineering knowledge. There are uncertainties inherent in any loss estimation technique. Therefore, there may be significant differences between the modeled results contained in this report and the actual social and economic losses following a specific flood. These results can be improved by using enhanced inventory data and flood hazard information.

Quick Assessment Report

April 10, 2023

Study Region : CT_FLD_Tolland
Scenario : Tolland_100
Return Period: 100
Analysis Option: 0

Regional Statistics

Area (Square Miles)	47
Number of Census Blocks	2,234
Number of Buildings	
Residential	44,453
Total	49,779
Number of People in the Region (x 1000)	150
Building Exposure ($ Millions)	
Residential	19,495
Total	29,283

Scenario Results

Shelter Requirements

Displaced Population (# Households)	903
Short Term Shelter (# People)	632

Economic Loss

Residential Property (Capital Stock) Losses ($ Millions)	64
Total Property (Capital Stock) Losses ($ Millions)	328
Business Interruption (Income) Losses ($ Millions)	384

Disclaimer:

Totals only reflect data for those census tracts/blocks included in the user's study region.

The estimates of social and economic impacts contained in this report were produced using Hazus loss estimation methodology software which is based on current scientific and engineering knowledge. There are uncertainties inherent in any loss estimation technique. Therefore, there may be significant differences between the modeled results contained in this report and the actual social and economic losses following a specific flood. These results can be improved by using enhanced inventory data and flood hazard information.

Quick Assessment Report

April 11, 2023

Study Region : CT_FLD_Windham
Scenario : Windham_100
Return Period: 100
Analysis Option: 0

Regional Statistics

Area (Square Miles)	41
Number of Census Blocks	2,469
Number of Buildings	
Residential	38,362
Total	43,539
Number of People in the Region (x 1000)	116
Building Exposure ($ Millions)	
Residential	12,973
Total	22,000

Scenario Results

Shelter Requirements	
Displaced Population (# Households)	1,438
Short Term Shelter (# People)	1,116
Economic Loss	
Residential Property (Capital Stock) Losses ($ Millions)	122
Total Property (Capital Stock) Losses ($ Millions)	649
Business Interruption (Income) Losses ($ Millions)	589

Disclaimer:

Totals only reflect data for those census tracts/blocks included in the user's study region.

The estimates of social and economic impacts contained in this report were produced using Hazus loss estimation methodology software which is based on current scientific and engineering knowledge. There are uncertainties inherent in any loss estimation technique. Therefore, there may be significant differences between the modeled results contained in this report and the actual social and economic losses following a specific flood. These results can be improved by using enhanced inventory data and flood hazard information.

STATE OF CONNECTICUT
HAZARD MITIGATION GRANT PROGRAM
DR-4500 ADMINISTRATIVE PLAN

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Governor's Authorized Representative

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Governor's Alternate Authorized Representative
State Coordinating Officer

HAZARD MITIGATION GRANT PROGRAM
DISASTER #4500
August 5, 2021

Prepared by the State of Connecticut
Department of Emergency Services and Public Protection
Division of Emergency Management and Homeland Security
1111 Country Club Rd, Middletown, Connecticut 06457

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Record of Changes

Recorded Change	Section	Revised By	Revised Date
Added Alternate GAR	Cover Page	Ian Alexander/Ken Dumais	5/9/2022
Updated cost share to 90/10 to reflect the FY22 Omnibus Appropriations bill (H.R. 2471, "Consolidated Appropriations Act, 2022") that was signed into law on Tuesday, March 15, 2022	1.2	Ian Alexander/Ken Dumais	5/9/2022
Updated cost share to 90/10 to reflect the FY22 Omnibus Appropriations bill (H.R. 2471, "Consolidated Appropriations Act, 2022") that was signed into law on Tuesday, March 15, 2022	3.2	Ian Alexander/Ken Dumais	5/9/2022
Updated cost share to 90/10 to reflect the FY22 Omnibus Appropriations bill (H.R. 2471, "Consolidated Appropriations Act, 2022") that was signed into law on Tuesday, March 15, 2022	8.1.1	Ian Alexander/Ken Dumais	5/9/2022
DEMHS management of 90/10 cost share and cost overruns.	8.9.4	Ian Alexander/Ken Dumais	7/12/2022

1. Introduction

1.1 Purpose

The purpose of the State of Connecticut's Hazard Mitigation Grant Program Administrative Plan is to fulfill and implement the goals and strategies contained in the State Natural Hazard Mitigation Plan Update approved on January 7, 2019. This Administrative Plan outlines the management procedures that the State will use to administer the Federal Hazard Mitigation Grant Program (HMGP).

The management of mitigation projects funded under the HMGP will be carried out under the provisions of Section 404 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act, Pub. L. No. 93-288 (1974) (codified as amended at 42 U.S.C. § 521 et seq.) (Stafford Act). Section 404 of the Stafford Act establishes an independent grant program to be used to fund State and local mitigation measures. This administrative plan is intended to be added as an appendix Hazard Mitigation Grant Program sections of the State Disaster Recovery Framework and/or State Response Framework, where applicable.

This Plan has been updated as a result of the recent Presidential Disaster Declaration on March 28, 2020 (FEMA-4500-DR-CT) for COVID-19 Pandemic which has resulted in ongoing emergency protective measures to combat the COVID-19 pandemic.

1.2 Summary of the Hazard Mitigation Grant Program:

The HMGP is active only following a Presidentially Declared Disaster. The HMGP provides grants up to 90% of the total project cost for projects that mitigate damage from natural disasters, in accordance with the FY22 Omnibus Appropriations bill (H.R. 2471, "Consolidated Appropriations Act, 2022". In response to a flash flood disaster declaration in June 1982 (FEMA-661-DP), the State of Connecticut drafted its first flood hazard mitigation plan under the provisions of Section 406 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act (Public Law 93-288). When Connecticut was struck again by widespread flooding in June 1984 (FEMA-711-DR-CT) additional mitigation measures were added to Connecticut's mitigation plan.

Section 404 of the Stafford Act and its implementing regulations at 44 C.F.R. Part 206, Subpart N authorize FEMA to provide financial assistance under a major disaster declaration to states, local governments, federally-recognized tribes, and certain nonprofit organizations to implement hazard mitigation efforts that are cost-effective and substantially reduce the risk of future damage, hardship, and suffering. FEMA administratively carries out this authority under the HMGP. The DESPP serves as the Recipient for HMGP funding.

The State Administrative Plan is a procedural guide that details how the Recipient will administer the HMGP. The Regulations at 44 C.F.R. §§ 206.433(d) and 206.437 require the Recipient to have a current state administrative plan approved by FEMA before receiving HMGP funding and sets forth the various content requirements for that plan. Following a major disaster declaration, the regulation requires the Recipient to submit any updates, amendments, or plan revisions required to meet current policy guidance or changes in the administration of the HMGP. The Recipient will also amend the State Administrative Plan whenever necessary to reflect a material change in any state law, organizational, policy, or State agency operation.

The Recipient must comply with all applicable federal laws, regulations, FEMA policies, agreements, and terms and conditions when carrying out the HMGP award, such as the FEMA-State Agreement, Department of Homeland Security Standard Terms and Conditions, and *Hazard Mitigation Assistance Guidance*.

1.3 Authorities and References

- Robert T. Stafford Disaster Relief and Emergency Assistance Act, Pub. L. No. 93-288, §§322 and 404 (1974) (codified as amended at 42 U.S.C. § 5156 and 5170c)
- Flood Disaster Protection Act 1973, Pub. L. No. 93-234, §§ 102 and 202 (1973) (codified as amended at 42 U.S.C §§ 4012a and 4106)
- Single Audit Act Amendments of 1996, 31 U.S.C. §§ 7501-7507
- 44 C.F.R. Part 80 (Property Acquisition and Relocation for Open Space)
- 2 CFR to 2 C.F.R. § 200.334 Records Retention and as written in the 4500-CT federal state agreement, page 13
- 44 C.F.R. Part 201 (Mitigation Planning)
- 44 C.F.R. Part 206, Subparts A (General), B (Declaration Process), M (Minimum Standards), and N (Hazard Mitigation Grant Program)
- 2 C.F.R. Part 200 (Uniform Administrative Requirements, Cost Principles, and Audit Requirements for Federal Awards)
- 31 C.F.R. pt. 205 (Rules and Procedures for Efficient Federal-State Fund Transfers)
- Federal Emergency Management Agency, *Hazard Mitigation Assistance Guidance* (2015)
- FEMA Policy No. 104-11-1 *Hazard Mitigation Program Management Costs* (*Interim*) (Nov. 14, 2018)
- FEMA-State Agreement, signed by Governor Lamont on April 14, 2020.
- 2020 DHS Standard Terms and Conditions v10.1
- Connecticut General Statutes Titles 28 and 29.
- Records Retention

1.4 Definitions

Applicant: The entity, such as the Department of Emergency Services and Public Protection (DESPP) or federally recognized Native American tribe, applying to FEMA for a Federal award that will be accountable for the use of the funds. Once funds are awarded, the applicant becomes the recipient and, after it issues a subaward, a pass-through entity.

Application: The request to FEMA for HMGP funding, as outlined in 44 C.F.R. §206.436, by DESPP or Indian tribal government that will act as the recipient.

Subapplication: The request to the Recipient for HMGP funding by the eligible subapplicant as outlined in 44 C.F.R. §206.436.

Federal Award: The Federal financial assistance that a non-Federal entity receives directly from FEMA or indirectly through a pass-through entity. In the case of HMGP, FEMA provides Federal financial assistance in the form of a grant to a recipient. A recipient, in turn, may issue subawards under the HMGP grant to eligible subrecipients.

Connecticut Interagency Hazard Mitigation Committee (CIHMC): The committee formed to assist the DEMHS Hazard Mitigation and Resiliency Unit in review of mitigation project applications.

Department of Emergency Services and Public Protection (DESPP): The agency designated by the Governor as the responsible agency for all matters related to the HMGP. The Division of Emergency Management and Homeland Security (DEMHS) within DESPP is responsible for emergency management activities under Connecticut General Statutes Title 28.

Governor's Authorized Representative (GAR): The person empowered by the governor to execute, on behalf of the State, all necessary documents for FEMA disaster assistance and who shall administer the FEMA disaster assistance on behalf of the State and local governments and other non-Federal entities. The Commissioner of the Department of Emergency Services and Public Protection or designated representative may be the GAR.

Grant: The form of Federal financial assistance that a non-Federal entity may receive directly from FEMA or indirectly through a pass-through entity

Grant Agreement: A legal instrument of financial assistance between a Federal awarding agency or pass-through entity and a non-Federal entity that is consistent with 31 U.S.C. 6302, 6304

Local Mitigation Plan: The hazard mitigation plan required of a local government acting as a subrecipient as a condition of receiving a project subaward under the HMGP as outlined in 44 C.F.R. § 201.6.

Tribal Mitigation Plan: The hazard mitigation plan required of a federally recognized tribe acting as a recipient as a condition of receiving a Federal award or federally or non-federally recognized tribe acting as a subrecipient as a condition of receiving a subaward

under the HMGP as outlined in 44 C.F. R. § 201.7.

State Mitigation Plan: The hazard mitigation plan approved under 44 C.F.R. pt. 201 as a condition of receiving HMGP assistance as outlined in 44 C.F.R. § 201.4.
Hazard Mitigation Survey Team (HMST): The team that is established as the method of identifying mitigation issues in an immediate post-disaster setting. The HMST is also integral to early identification of measures to be funded under some hazard mitigation grant programs.

Mitigation Activity: A mitigation measure, project, plan, or action proposed to reduce risk of future damage, hardship, loss, or suffering from disasters. The term "measure" is used interchangeably with the term "project" in the HMGP.

Mitigation: Any sustained action taken to reduce or eliminate long-term risk to life and property from a hazard event.

Project: Any mitigation measure or action proposed to reduce risk of future damage, hardship, loss or suffering from disasters. The term "project" is used interchangeably with the term "measure" in the HMGP.

Recipient: A non-Federal entity that receives a federal award directly from a Federal awarding agency to carry out an activity under a Federal program. A recipient does not include subrecipients. When used in this document, the term "Recipient" refers to the Department of Emergency Services and Public Protection.

State Hazard Mitigation Officer (SHMO): The SHMO is the official representative of State government who is the primary point of contact with FEMA, other Federal agencies, federally-recognized tribes, and local governments in mitigation planning and implementation of mitigation programs and activities under the Stafford Act. As it relates to a major disaster, the SHMO serves as the responsible individual for all matters related to the HMGP. The SHMO is typically an employee of the Department of Emergency Services and Public Protection (DESPP), which is the agency designated by the Governor as the responsible agency for the HMGP.

Deputy State Hazard Mitigation Officer (DSHMO): The individual designated by the GAR as the responsible deputy for matters related to the HMGP. The DSHMO carries out duties in conjunction with the SHMO including processing reimbursement requests from subrecipient, preparing any necessary Memoranda of Agreement or Contracts with municipalities, monitoring projects through the performance period and preparing any necessary quarterly reports and preparing the necessary closeout reports at the end of the performance period.

Subapplicant: The non-Federal entity that submits a subapplication to the applicant for FEMA assistance. Once FEMA approves the subapplication and the applicant awards a subaward to the subapplicant, the subapplicant becomes a subrecipient. Eligible subapplicants under the HMGP include state agencies, local governments, federally-recognized tribes and certain private nonprofit organizations.

Subaward: An award provided by a pass-through entity to a subrecipient for the

subrecipient to carry out part of a federal award received by the pass-through entity. It does not include payments to a contractor or payments to an individual that is a beneficiary of a Federal Program. A subaward may be provided through any form of legal agreement, including an agreement that the pass-through entity considers a contract.
Subrecipient: A non-Federal entity that receives a subaward from a pass-through entity to carry out part of a Federal program, but does not include an individual that is a beneficiary of such program. A subrecipient may also be a recipient of other Federal awards directly from a federal awarding agency. Under the HMGP, eligible subrecipients include state agencies, local governments, federally recognized tribes, and certain private nonprofit organizations.

The regulation at 44 C.F.R. 206.431, 2 C.F.R. Part 200, and the *Hazard Mitigation Assistance Guidance* contain additional definitions for terms relevant to the HMGP.

1. Responsibilities

2.1 State Government

2.1.1 The State of Connecticut DESPP is designated to administer the HMGP program resulting from disaster declaration FEMA-4500-DR-CT.

2.1.2 The State Hazard Mitigation Officer (SHMO) and Deputy State Hazard Mitigation Officer (DSHMO), if any, within DESPP are designated to coordinate activities of the Connecticut Interagency Hazard Mitigation Committee (CIHMC) and to serve as the responsible individual(s) for project management and program administration. The SHMO and DSHMO will administer the HMGP on a day to day basis.

2.1.3 The CIHMC members are designated by the appropriate Directors or Commissioners of State Agencies having hazard mitigation expertise and responsibilities. State and Federal agencies represented on the CIHMC are listed in Appendix B to this Plan (this list is subject to change as the need arises).

2.1.4 HMGP Staffing Plan: HMGP management costs will fund two full time permanent employees at 50%. It is expected that these positions will be funded through the completion of all awarded projects. Durational positions may be funded on an as-needed basis and as funding allows.

2.2 Local Government

2.2.1 The Chief Executive Officer of the local government (e.g. First Selectman, Mayor, and Town Manager), the Chief Executive Officer of a qualified private non-profit organization, or the Chief Executive Officer of a federally-recognized tribe must designate an individual in its subapplication who will serve as the point of contact on all matters related to the subapplication.

2. Funding

3.1 HMGP Project Funding. FEMA will determine the funding that it will make available for HMGP mitigation activities by a lock-in, which will act as a ceiling for funds available to the Recipient and all subrecipients. The level of HMPG funding for a major disaster is based on a sliding scale percentage of the total estimated total federal assistance under the Stafford Act, excluding administrative costs, for a major disaster as detailed in 44 C.F. R. § 206.432.

- FEMA will provide an initial estimate of the HMGP lock-in within 30 days of the major disaster declaration or soon thereafter. This estimate does not represent a minimum or floor amount
- FEMA will provide a revised estimate of the HMGP lock-in within six months of the major disaster declaration. This estimate does not represent a minimum or floor amount
- FEMA will establish the HMGP funding ceiling at 12 months after the major disaster declaration.

3.2 Cost Sharing. FEMA may contribute up to a 90 percent of the cost of mitigation activities approved for funding under the HMGP, in accordance with the FY22 Omnibus Appropriations bill (H.R. 2471, "Consolidated Appropriations Act, 2022". The federal funds provided by FEMA will be based on the cost-sharing provisions outlined in the FEMA-State Agreement and FEMA will not contribute to costs above the HMGP funding ceiling. The nonfederal share may exceed the federal share and the general requirements for matching all contributions can be found at 2 C.F. R. § 200.306 and the *Hazard Mitigation Assistance Guidance*.

The non-federal share of a HMGP project may generally not be paid by the federal government under another federal award. However, where the federal statute authorizing a program specifically provides that federal funds made available for such program can be applied to matching or cost sharing requirements of other federal programs, then it is possible that the other federal award funding could be applied to the non-federal share requirement of the HMGP project. Several examples are the Community Disaster Block Grants awarded by the U.S. Department of Housing and Urban Development and certain grants awarded by the U.S. Department of the Interior under the Indian Health and Self-Determination Act of 1965."

3. Eligibility Requirements

The State of Connecticut's eligibility requirements conform to Federal standards. Federal definitions are used to determine eligibility.

4.1 Eligible Subapplicants:

4.1.1 State agencies, with an approved state hazard mitigation plan.

4.1.2 Indian tribal government with an approved tribal mitigation plan. An Indian tribal government is the governing body of any Indian or Alaska Native tribe, band, nation, pueblo, village, or community that the Secretary of the Interior acknowledges to exist as an Indian tribe under the Federally Recognized Indian Tribe List Act of 1994.

4.1.3 Local governments with an approved local or tribal mitigation plan. A local government includes special districts and non-federally recognized tribes, which may include any Indian tribe or authorized tribal organization or Alaska Native village or organization that is not federally recognized.

4.1.4 Private nonprofit organizations that own or operate a private nonprofit facility as defined in 44 C.F.R. § 206.221(e).

4.2 Eligible Projects must:

- Be in conformance with the State Mitigation Plan and Local or Tribal Mitigation Plan approved under 44 C.F.R. Part 201.
- Have a beneficial impact upon the designated disaster area, whether or not located in the designated area.
- Be in confirmation with 44 C.F. R. Part 9, *Floodplain Management and Protection of Wetlands,* and other applicable environmental and historic preservation laws, regulations, Executive Orders and agency policy.
- Be in conformance with the Stafford Act, its implementing regulations, the *Hazard Mitigation Assistance Guide*, and other applicable FEMA policies.
- Solve a problem independently or constitute a functional portion of a solution where there is assurance that the project as a whole will be completed. Projects that merely identify or analyze hazards or problems are not eligible.
- Be cost-effective and substantially reduce the risk of future damage, hardship, loss or suffering resulting from a major disaster. This includes demonstrating that the project:
    - Addresses a problem that has been repetitive, or a problem that poses a significant risk to public health and safety if left unsolved;
    - Will not cost more than the anticipated value of the reduction in both

direct damages and subsequent negative impacts to the area if future disasters were to occur;

- Has been determined to be the most practical, effective, and environmentally sound alternative after consideration of a range of options;
- Contributes, to the extent practicable, to a long-term solution to the problem it is intended to address, and
- Considers long-term changes to the areas and entities it protects and has manageable future maintenance and modification requirements.

- Comply with the duplication of benefits and duplication of program prohibitions under Section 312 of the Stafford Act and 44 C.F.R. § 206.434(f).

5. Applicant Notification

5.1 Public Assistance Briefings for the HMGP

The State will coordinate the presentation of information, as needed, on the HMGP at Public Assistance Applicant's Briefings. The intent of participation in Applicant Briefings is to create an early awareness of Mitigation Grant Programs.

5.2 Notice to Potential Applicants for HMGP Awards

When sufficient funding is determined to be available for the HMGP to warrant the solicitation of new applications, an invitation to apply will be sent to the chief executive officer of each municipality, chief executive officer of each federally recognized Native American Tribe, and in the designated disaster area as well as other areas deemed by the SHMO and DSHMO to benefit from the announcement. When funding is limited, the State may also consider projects already on its list of priority projects developed and ranked by the CIHMC. (See Section 6, 6.4 List of Projects).

5.3 Special Briefings for the HMGP

As necessary, detailed HMGP briefings for potential applicants will be scheduled. The briefings will describe eligible activities, funds and Subrecipient administrative requirements, application process and key deadlines.

6. Project Identification

6.1 Dissemination for HMGP

Information on the HMGP shall be widely disseminated through multiple sources to potential applicants. However, this will not be done when the State determines that there is a sufficient number of applications already submitted for funding.

6.2 Public Damage Assessment Teams

Information acquired during Preliminary Damage Assessments (PDA) for presidentially-declared disasters is an excellent opportunity for the identification of mitigation issues and potential projects under the HMGP. PDA teams should be briefed, as necessary, as to the availability of funds and requirements of the HMGP so potential projects can be identified for follow-up by the CIHMC.

6.3 Public Assistance Briefings

Applicants for Public Assistance may be aware of potential mitigation projects that will not be funded through the Public Assistance Program. They will be briefed on the availability of the HMGP during the Applicant Briefings that are held for Public Assistance. The Public Assistance inspection teams consisting of Federal, State and local representatives will complete detailed inspections of damaged facilities and will be in a position to identify broad or comprehensive projects that may impact several sites.

6.4 List of Projects

An ongoing list of potential HMGP projects shall be identified and maintained by DESPP for various types of mitigation projects. This shall include those applications not funded in prior rounds of funding.

7. Application Procedures

7.1 Submission of Subapplications to the State

7.1.1 Subapplication forms with instruction brochures and notices of sub-application intent will be provided for the applicant to provide information necessary to determine eligibility (Sec. 4) and ranking (Sec. 7, 7.2.1).

7.1.2 Subapplications should be completed by the responsible governmental entity or private non-profit organization, signed by the Chief Executive Officer of the jurisdiction or organization, and submitted to the DESPP/DEMHS. Un-signed applications will not be accepted.

7.1.3 Subapplicants must submit information on their proposed project, in a complete application, by the announced due date to the State Hazard Mitigation Officers to be considered for HMGP (Section 404). Incomplete applications will not be accepted.

7.1.4 The State will submit to FEMA all State-Approved HMGP projects after all

State reviews, benefit cost analyses, and ranking by the CIHMC have been completed. When the State has project applications submitted in prior rounds of HMGP that have not yet been obligated, but are deemed eligible for funding, these projects may be submitted to FEMA for consideration and Steps 7.1.1 through 7.1.3 above will not be taken.

7.1.5 DESPP staff will provide technical assistance to grant applicants during the application period. Technical assistance typically includes answering questions concerning eligibility of proposed projects and the approval procedure. All questions regarding permits, licenses and code compliance will be the responsibility of the applicant's jurisdiction.

For more specialized projects applicants may seek technical assistance from other State and Federal Agencies such as:

- Connecticut Department of Energy and Environmental Protection.
- National Weather Service.
- Natural Resources Conservation Service.
- U.S. Army Corps of Engineers.

7.2 Review, Ranking and Selection of Projects

7.2.1 **Review:** The function of the CIHMC is to review and recommend HMGP projects to the SHMO for funding. The SHMO submit the approved funding recommendations to FEMA.

7.2.2 **Ranking:** The CIHMC will rank and assign priorities for funding to all eligible projects. The CIHMC has developed a ranking form (see Page 14) which integrates the top strategies and goals of the State Natural Hazard Mitigation Plan and in accordance with the criteria in Section 4, 4.2 of this Administrative Plan and 44 CFR Section 206.434 (c).

The proposed mitigation measure:

- Should protect life, property and safety.
- Should protect essential services, critical facilities, or the economy of the community.
- Will have the greatest potential impact for reducing future disaster losses.
- Is well-designed, well-organized, and demonstrates the technical capacity to undertake and implement proposed measures successfully.
- Indicates a degree of commitment and support by participants (e.g.

active participation, including financial, by local beneficiaries, public and private) and likelihood that the project, as proposed, will succeed in attaining its objectives.

- Fits within the local and State Hazard Mitigation Plan and an overall plan for development and/or hazard mitigation in the community, disaster area, or state.

- Encourages regional or multi-agency cooperation.

- Will serve as a model for other communities and/or State agencies.

During the review and ranking process it may be found that the CIHMC or DESPP will need additional information about the project. The SHMOs are responsible for obtaining the needed information from the Subapplicant' s point of contact.

7.3 Notification of Subapplicants: Following selection of projects to be submitted to FEMA for HMGP funding, the SHMO or DSHMO will notify each applicant of the decision regarding submission of Selected Projects to FEMA.

The SHMOs will ensure that minimum program requirements are met by ensuring that each applicant is a member in good standing of the NFIP and that each application is complete prior to being submitted to FEMA. Incomplete applications will not be submitted to FEMA.

As per 44 CFR § 206.436 (d), the State's application may be amended as the State identifies and selects local project applications to be funded. The State must submit all local HMGP applications and funding requests for the purpose of identifying new projects to the Regional Administrator within 12 months of the date of disaster declaration.

The SHMO is also responsible for sending to FEMA a Standard Form (SF) 424 (Application for Federal Assistance) and an SF 424D (Assurance for Construction Programs) for each project application. The package must contain any pertinent project management information not contained in the State Hazard Mitigation Administrative Plan and identify the specific mitigation measures for which funding is requested. The SF 424 must be signed by the FAM of DESPP and forwarded to FEMA within 60 days of the disaster declaration. If this deadline cannot be met a request for extension shall be submitted to FEMA within 60 days.

Reviewer Name:_____

Figure 1: CIHMC Ranking Questions

CIMHC Ranking Questions

HMA Sub-Applications

Question	Project Title						Y	N	Total
1	Mitigation Planning **(5)** – *via state set aside*	Infrastructure **(5)**	Property Acquisition of Structures in SFHA **(5 each)**	Property Elevation of Structures in SFHA **(3 each)**	Other Mitigation Projects **(1)**	Other Community Capacity Building **(2)**			
2	Does the project mitigate risk to one or more FEMA lifelines? • 1 **(1)** • 2 **(2)** • 3 or more **(3)**								
3	Does the project incorporate nature-based solutions? **(1)**								
4	Does the project demonstrate community-wide benefits and identify the proportion of the population that will be impacted, including how impacts (positive or negative) to socially vulnerable populations informed project selection and design? **(1)**								
5	Does the project protect a critical facility such as a police, fire station, hospitals, or wastewater facility? **(1)**								
6	Does the project meet a State Hazard Mitigation Plan Priority? **(1 per goal)** • Goal 1: Promote implementation of sound floodplain management and other natural hazard mitigation principles on a State and local level. • Goal 2: Implementation of effective Natural Hazard Mitigation Projects on a State and local Level • Goal 3: Increase Research and Planning activities for the mitigation of natural hazards on a State and local level.								
7	Is the proposed measure located in a community that has had or repeatedly has damages from natural disasters in the last? **(1)**								
8	Does the project impact vulnerable populations as defined under CT House Bill 7006, https://www.cga.ct.gov/2020/ACT/PA/PDF/2020PA-00005-R00HB-07006SS3-PA.PDF? **(1)**								
9	Does the project represent an innovative approach which can serve as a pilot project in another jurisdiction? **(1)**								
10	Is the sub-application generated from a previous FEMA HMA Advance Assistance/Project Scoping Award								
							Final Score		

8 Project Management

8.1 Administration

8.1.1 All HMGP mitigation funding approval for the Recipient and Subrecipient will be based on 90% - 10% cost sharing provisions outlined in the FEMA-State Agreements or other published guidance, including the FY22 Omnibus Appropriations bill (H.R. 2471, "Consolidated Appropriations Act, 2022". The Non-Federal share may exceed the Federal share and may be a combination of other State, Local, or private funding. Subrecipient applicants for HMGP funding must provide written description of its cost share agreement. Obligation of Federal funds will not take place until approval has been received for the project from FEMA.

8.1.2 Based on the approved application and work schedule of the project(s), a record keeping and financial system will be implemented for the duration of the project. The Subrecipient will submit quarterly progress reports to the SHMO, beginning the first full quarter after receipt of the funding. These reports should indicate the status and projected completion date of the project, and any problems affecting the completion date, scope, or cost, which could result in non- compliance with approved grant conditions. Failure to submit Quarterly Reports may result in a determination of non-compliance with Award terms. The SHMOs will submit reports to FEMA as required. The final report will be a complete assessment of project accomplishments.

8.1.3 DESPP staff will provide technical assistance to subrecipients during the performance of projects. Technical assistance typically includes answering questions concerning eligible expenses, processing of agreements and payments. All questions regarding permits, licenses and code compliance will be the responsibility of the applicant's jurisdiction.

8.2 Roles and responsibilities

8.2.1 Subrecipient (Subapplicant):

- Will submit complete subapplications for eligible projects for funding consideration. Incomplete applications will not be accepted.
- Implements monitoring procedures and submits quarterly progress reports to the SHMOs as directed at the time grant is awarded.
- Maintains financial records and receipts necessary to document all expenditures connected with the project including Subrecipient Administrative costs, if allowed.
- Ensures that any construction is in accordance with applicable standards of safety, decency, and sanitation, and in conformity with applicable codes, specifications, and standards.

8.2.2 Recipient (DESPP):

- Fulfilling the various requirements for pass-through entities set forth at 2 C.F.R. § 200.332.

- Identifying and notifying potential applicants of the availability of HMGP funding and providing them information on the application process, program eligibility, and key deadlines.
- Determining subapplicant eligibility.
- Establishing priorities for the selection of mitigation projects.
- Conducting, or coordinating conducting of, environmental and historic preservation reviews.
- Submitting a HMGP application meeting the requirements set forth at 44 C.F.R.§ 206.436.
- Submitting requests for management costs as detailed in FEMA Policy No. 104-1-1. *Hazard Mitigation Grant Program Management Costs (Interim).*
- Monitoring and evaluating the progress and completion of projects and ensuring projects are completed within the project completion deadlines.
- Monitoring and reporting on subrecipient management costs.
- Provides technical assistance to Subrecipients as necessary.
- Make payments to subrecipients.
- Reviewing and approving cost overruns.
- Preparing and submitting quarterly and final federal financial reports and performance reports.
- Completing all project closeout and grant closeout requirements.
- Processing appeals.

8.2.3 State Hazard Mitigation Officer (SHMO) and Deputy State Hazard Mitigation Officer (DSHMO):

- Responsible for overall grant administration.
- Notification of Subrecipients of actions taken in response to applications.
- Certifies that all claims and costs are eligible and in compliance with provisions of the FEMA/State Agreement. Submits claims to the Regional Administrator for payment.
- Coordinates all actions that pertain to the mitigation grant program with FEMA, as necessary, on matters pertaining to the HMGP.
- Will process reimbursement requests from Subrecipients.
- Prepare any necessary Memoranda of Agreement or Contracts with municipalities.

- Monitor projects through the performance period and prepare any necessary quarterly reports.

- Prepare the necessary closeout reports at the end of the performance period.

8.3 Financial Administration

8.3.1 DESPP will serve as Recipient for project financial administration for disaster declaration #FEMA-DR-4500-CT projects approved in accordance with 2 C.F.R. Part 200. Subrecipients(s) (subapplicants) are accountable to the Recipient for funds that will be awarded.

8.3.2 Allowable costs associated with administering the HMGP programs are authorized in accordance with 44 C.F.R.§ 206.439, 2 C.F.R. Part 200, and FEMA Policy No. 104-11-1, *Hazard Mitigation Grant Program Management Costs (interim).* Administrative costs must be shown as a separate line item and must be approved by the GAR or his designee.

8.3.3 Reimbursement of eligible costs.

Under previous disasters, the Recipient utilized state funds to pay towns for homeowner reimbursement requests in advance of the town paying the homeowner directly. Due to the complexity of the program, the history of payment issues with the payments made to Subrecipients under prior disasters, the Recipient will administer HMGP on a reimbursement basis, in accordance with 200.208(c)(1). The Recipient will pay Subrecipients (towns) on a reimbursement basis (after the payment to homeowners) upon the receipt of a completed reimbursement request with audit quality back up documentation for all costs. In accordance with 200.305, the Recipient, for all grant related programs, completes required Federal quarterly reporting and drawdowns within the same quarter as the reimbursements.

Only up to 90% of the award will be available until after the project is completed; the final share will be paid after the SHMOs and DESPP accounting staff conduct a final project review and all relevant parties have signed off on project completion. In cases of cost overruns, the subrecipient may request approval of additional costs providing justification (invoices, daily activity reports, progress reports, etc.) for evaluation by the SHMOs, if funding allows.

8.4 Audit Requirements

8.4.1 Single Audit Act Audit

8.4.1.1 A non-Federal entity that expends $750,000 or more during the non-Federal entity's fiscal year in Federal awards must have a single or program-specific audit conducted for that year in accordance with the provisions of 2 C.F. R. Part 200, Subpart F. In meeting this requirement, an auditee must perform the responsibilities set forth at 2 C.F.R 200.508.

8.4.1.2 The Recipient will ensure that each subrecipient is audited as required by 2 C.F.R. Part 200, Subpart F. Subrecipients must submit a copy of their completed audit documenting HMGP expenditures, as soon as it is available. DESPP shall provide a copy of all audits performed on HMGP projects to the FEMA Inspector General.

8.4.1.3 The Recipient will issue a management decision for audit findings pertaining to the subawards provided to the subrecipient as required by 2 C.F.R. 200.521.

8.4.2 FEMA Audit

FEMA may conduct or arrange for an audit of the Federal award, which includes all HMGP subawards, that it determines necessary to ensure compliance with the Stafford Act.

8.4.3 Specific Conditions

In accordance with 2 CFR, § 200.208 Specific conditions, FEMA or DEMHS may adjust specific Federal award conditions as needed, in accordance with this section, based on an analysis of the following factors:

- The applicant or recipient's history of compliance with the general or specific terms and conditions of a Federal award;
- The applicant or recipient's ability to meet expected performance goals as described in § 200.211; or
- A responsibility determination of an applicant or recipient.
- Additional Federal award conditions may include items such as the following:
    - Requiring payments as reimbursements rather than advance payments;
- Withholding authority to proceed to the next phase until receipt of evidence of acceptable performance within a given performance period;
- Requiring additional, more detailed financial reports;
- Requiring additional project monitoring;
- Requiring the non-Federal entity to obtain technical or management assistance; or
- Establishing additional prior approvals.

If the FEMA or DEMHS is imposing additional requirements, they must notify the applicant or non-Federal entity with a full detail of the conditions.

8.5 Management Costs

8.5.1 As cited at page 4, 1.3 FEMA Policy #104-11-1 HMGP-MC (Interim) A. Management Costs Definition and Rates (November 14, 2018), "Management costs are any indirect cost, any direct administrative cost, and any other administrative expense associated with a specific project under a major disaster, emergency or disaster preparedness or mitigation activity or measure."

8.5.2 FEMA will provide funding for both Recipient and Subrecipient management costs at the following specified rates. The Recipient will be reimbursed not more than 15 percent of the total amount of the HMGP award, of which not more than 10 percent may be used by the Recipient and 5 percent by the Subrecipient.

8.5.3 FEMA will provide 100 percent federal funding for management costs based on actual costs incurred up to the rates above. Management costs are provided outside of the ceiling amount for HMGP projects described in Paragraph 3.1 above.

8.5.4 The Recipient must meet the application and submission requirements in the *Hazard Mitigation Assistance Guidance* when applying for management costs on behalf of itself and Subrecipients.

8.5.5 The Recipient will reconcile its own and subrecipient management costs against actual costs of the total award on a quarterly basis.

8.5.6 At the time of application, the subrecipient must complete the required form (attached form: Sub-Recipient Management Cost Application). If they are requesting subrecipient management costs the form and budget must be included as part of the project application.

8.6 Appeals

8.6.1 FEMA Determinations

8.6.1.1 The Recipient, subapplicant, or subrecipient may appeal any FEMA determination previously made related to an application for or the provision of Federal assistance according to the procedures set forth in 44 C.F. R. 206.440.

8.6.1.2 The appeal must contain documented justification supporting the appellant's position, specify the monetary figure in dispute and the provisions in Federal law, regulation, or policy with which the appellant believes the initial action was inconsistent.

8.6.1.3 The subapplicant or subrecipient must file an appeal with the Recipient within 60 days after receipt of a notice of the action that is being appealed. The Recipient will review and forward the appeals form a subapplicant or subrecipient, with a written recommendation, to the Regional Administrator within 60 days of receipt.

8.6.1.4 A Recipient must file Recipient-related to the Regional Administrator within 60 days after receipt of a notice of the action that is being appealed.

8.6.2 Recipient Determination

8.6.2.1 The subapplicant or subrecipient may request reconsideration/appeal of any Recipient determination previously made related to an application for or the provision of Federal assistance.

8.6.2.2 The request for reconsideration/appeal must contain documented justification supporting the subapplicant/subrecipient's position, specify the monetary figure in dispute, and the provisions in Federal law, regulations or policy with which the subapplicant/subrecipient believes the initial action was inconsistent.

8.6.2.3 The request for reconsideration/appeal must be filed with the Recipient within 60 days after receipt of a notice of the action that is the subject of the reconsideration/appeal.

8.7 SHMO Appeals

8.7.1 The SHMO may, on behalf of an applicant or the state, appeal any FEMA determination of federal assistance. Local appeals must be submitted in writing through the SHMO.

8.7.2 Applicants must provide sufficient information to allow the SHMO to determine the facts and validity of the request.

8.7.3 The SHMO appeal shall be in writing and submitted to FEMA within 60 days from the date of the action being appealed.

8.8 Subrecipient Monitoring and Reporting

8.8.1 Risk Assessment. The Recipient will evaluate each subrecipient's risk of noncompliance with Federal statutes, regulations, and the term and conditions of the subaward for purposes of determining the appropriate subrecipient monitoring described in 2 C.F.R. 200.332(d) and (e).

8.8.2 Standard Monitoring. The Recipient will monitor the activity of each subrecipient as necessary to ensure that the subaward is used for authorized purposes, in compliance with Federal statutes, regulations, and the terms and conditions of the subaward and that subaward performance goals are achieved. At a minimum, the Recipients will conduct the following monitoring activities:

8.8.2.1 The Recipient will conduct a minimum of 1 desk monitoring and 1 on-site monitoring of each HMGP project.

8.8.2.2 The Recipient during desk monitoring, will review subrecipient records of project records.

8.8.2.3 The Recipient, during an onsite monitoring visit, will review the subrecipient records of project costs and conduct a visit to the project site.

8.8.2.4 The Recipient will document the desk or onsite monitoring using the DESPP Desk Monitoring Report Form and DESPP On-Site Monitoring Report Form, respectively.

8.8.2.5 The Recipient will review quarterly progress reports submitted by subrecipients. These reports are due within 15 days after the end of the fiscal quarter.

8.8.2.6 The Recipient will follow-up and ensure that a subrecipient takes timely and appropriate action on all deficiencies pertaining to the HMGP subaward provided to the subrecipient that were detected during the monitoring activities, the audits identified in Paragraph 8.4, and other reviews.

8.8.2.7 Additional Monitoring. Depending on the Recipient's assessment of risk posed by a subrecipient, the Recipient may impose additional monitoring tools to ensure proper accountability, compliance with program requirements, and achievement of program goals.

8.8.3 Quarterly Financial Reporting. The Recipient must submit a complete and accurate Federal Financial Reports (SF 425) to the FEMA Regional Office, 30 days after the end of the first federal quarter following the Federal award date for HMGP. Thereafter, the Recipient must submit quarterly financial status reports thereafter until close out of the Federal award. Reports are due on January 30, April 30, July 30, and October 30.

8.8.4 Quarterly Performance Reporting. The Recipient must submit a performance report to the FEMA Regional Office 30 days after the end of the first federal quarter following the Federal award date for the HMGP. Thereafter, the Recipient must submit quarterly performance status reports until closeout of the Federal award. Reports are due on January 30, April 30, July 30, and October 30. The Recipient must include in its quarterly performance report (OMB Form 1660-0076) the following, as further detailed in the Hazard Mitigation Assistance Guidance, VI.E.2:

8.8.4.1 Reporting period, date of report and Recipient POC name and contact information.

8.8.4.2 Project identification number, including FEMA project number, subrecipient, and project type.

8.8.4.3 Significant activities and developments that have occurred or shown progress during the quarter, including a comparison of actual accomplishments to the work schedule objectives established in the subaward.

8.8.4.4 Percent completion and whether completion of work is on schedule; a discussion of any problems, delays, or adverse conditions that will impair the ability to meet the timelines stated in the subaward; and anticipated completion date

8.8.4.5 Status of costs, including whether the costs are (1) unchanged, (2) overrun, or (3) underrun. If there is a change in cost status, the report should include a narrative describing the change. Also include amount dispersed to subrecipient by activity

8.8.4.6 A statement of whether a request to extend the award POP is anticipated

8.8.4.7 Incremental funding amounts (Strategic Funds Management) and progress completed

8.8.4.8 For acquisition projects, the current status of each property for which settlement was completed in the quarter

8.8.4.9 Additional information as required by FEMA to assess the progress of an award

Quarter	*Progress Report Due Date from Sub-recipient to DESPP*	*Report Due Date from state to FEMA R1*
October 1 – December 31	January 15	January 30
January 1 – March 31	April 15	April 30
April 1 – June 30	July 15	July 30
July 1 – September 30	October 15	October 30

8.9 Cost Overruns

8.9.1 A Subrecipient may find that the actual costs for a HMGP non-management project are exceeding the approved estimates. In such circumstances, a Subrecipient may request approval of additional funding to the Recipient. This request must include a justification and supporting documentation, such as invoices, progress reports and daily activity reports.

8.9.2 Where the cost overruns can be met without additional Federal funds or can be met by offsetting cost underruns on other projects, the Recipient need not submit the request for cost overruns to the Regional Administrator, so long as the full scope of work on all affected projects can still be met.

8.9.3 Where cost overruns exceed federal obligated funds and require additional federal funds, the Recipient must evaluate the cost overrun and submit a request with a recommendation to the Regional Administrator. The Recipient must submit project overruns requiring additional HMGP obligations to FEMA for review and approval before costs are incurred. The subaward must continue to meet cost share and eligibility requirements and a new benefit cost analysis may be required

8.9.4 In accordance with the FY22 Omnibus Appropriations bill (H.R. 2471, "Consolidated Appropriations Act, 2022" all HMGP mitigation funding approval for the Recipient and Subrecipient will be based on 90% - 10% cost sharing provisions outlined in the FEMA-State Agreements or other published guidance. To ensure that sub-recipients receive appropriate funding in accordance with the FY22 Omnibus Appropriations Bill, DEMHS will retain 10% of the federal award to use to cover approved and eligible cost overruns. As cost overruns are approved by the Applicant and FEMA, DEMHS will follow the budget and/or scope modification process outlined in this plan which will allow for additional funds to be dispersed. Any unused federal funds will be deobligated at project closeout and returned to FEMA.

9 Closeout

9.1 HMGP Project/Subaward Closeout

9.1.1 General. Within 180 days from the earlier of the date a non-Federal entity completes a project or the period of performance expires for that project, the Recipient must submit a payment of claim to FEMA as required by 44 C.F.R. 206.428(d) and the *Hazard Mitigation Assistance Guide*.

9.1.2 Content. The payment of claim will include a letter signed by the Governor's Authorized Representative that certifies that the reported costs were incurred in the performance of eligible work, the approved work was completed, and the mitigation measures complies with the provisions of the FEMA-State Agreement. The payment of claim package must also include the following:

9.1.2.1 Verification that any program income has been deducted from total project costs as specified in 2 C.F.R. 200.307

9.1.2.2 Final site inspection report that includes photographs of the completed project

9.1.2.3 Final project costs, including Federal share, non-Federal share, administrative allowance (if applicable), and cost underrun and overrun

9.1.2.4 Geospatial coordinates, in the form of latitude and longitude with an accuracy of +/- 20 meters (64 feet), have been provided for the project. For flood reduction, hazardous fuels reduction, and soil stabilization projects, an accurate recording of the official acreage, using open file formats geospatial files (i.e., shapefiles) must be submitted

9.1.2.5 Certification and documentation to support that the project was completed in compliance with environmental conditions, required permits and applicable building codes

9.1.2.6 Certification that the project meets NFIP insurance requirements (if applicable).

9.1.2.7 For new or updated hazard mitigation plans, a final copy of the FEMA-*approved* and community-adopted plan has been submitted.

9.1.2.8 For planning-related activities, the certification that the activity is consistent with 44 C.F. R. Part 201.

9.1.2.9 For management costs, certification the total amount does not exceed the 10% or 5% limits for the Recipient or subrecipient, respectively

9.1.2.10 The supporting documents required by FEMA to close mitigation project types as outlined in the HMA Job Aids: (1) *Closeout Toolkit: Checklist for Hazard Mitigation Grant Program and (2) Closeout Toolkit: Hazard Mitigation Grant Program Subaward Closeout FAQs.*

9.2 HMGP Award Closeout

9.2.1 General: In accordance with 2 C.F.R § 200.344(a) 2 C.F.R. § 200.344(a) The recipient must submit, no later than 120 calendar days after the end date of the period of performance, all financial, performance, and other reports as required by the terms and conditions of the Federal award. A subrecipient must submit to the pass-through entity, no later than 90 calendar days (or an earlier date as agreed upon by the pass-through entity and subrecipient) after the end date of the period of performance, all financial, performance, and other reports as required by the terms and conditions of the Federal award. The Federal awarding agency or pass-through entity may approve extensions when requested and justified by the non-Federal entity, as applicable..

9.2.2 Content. The closeout request will include a letter from the Governor's Authorized Representative with supporting documentation, including the following:

9.2.2.1 Statement that the scope of work has been completed as approved

9.2.2.2 Final Federal Financial Report (SF-425)

9.2.2.3 Final performance /progress report

9.2.2.4 SF-428, *Report on Government Property*, if applicable

9.2.2.5 SF-270, Request for Advance or Reimbursement, if applicable, or request for de-obligation of unused funds, if applicable

9.2.2.6 Statement that no inventories were made or patents applied for in the implementation of the award

9.3 Extensions

9.3.1 General. DEMHS as the applicant will submit HMGP extensions in accordance with 44 CFR § 206.436 and the 2015 Hazard Mitigation Assistance (HMA) Guide, as amended.

9.3.2 Content. DEMHS will submit to FEMA a period or performance extension request to FEMA at least 60 days prior to the expiration of the award POP and justifications must be submitted in writing. The justification must include:

9.3.2.1 Verification that progress has been made as described in quarterly reports

9.3.2.2 Reason(s) for delay

9.3.2.3 Current status of the activity/activities

9.3.2.4 Current POP termination date and new projected completion date

9.3.2.5 Remaining available funds, both Federal and non-Federal

9.3.2.6 Budget outlining how remaining Federal and non-Federal funds will be expended

9.3.2.7 Plan for completion, including updated schedule

9.4 Non-Compliance of Grant Conditions:

9.4.1 Remedies for Non-Compliance: DEMHS will coordinate and work with FEMA and sub-grantees in good collaboration, in the event of non-compliance and seek to remedy said non-compliance in accordance with Section D.8 of the 2015 HMA guide and 2 CFR § 200.339.

10. Plan Review

This administrative plan will be reviewed and revised after each federally declared disaster to ensure compliance with law, implementing regulations and state policies. It will be updated as needed to reflect regulatory or policy changes or to improve program administration. The plan will be submitted to FEMA for approval by the FEMA Regional Administrator.

APPENDIX A: HMGP SUB-APPLICATION PROCEDURES

The Chief Executive Officer or designated representative of a local government, qualified private nonprofit organization, or federally recognized tribe must submit a subapplication to the Department of Emergency Services and Public Protection/ Division of Emergency Management and Homeland Security. The address for submitting applications is:

Hazard Mitigation Grant Program
CT Department of Emergency Services and Public Protection Division of Emergency Management and Homeland Security
1111 Country Club Rd
Middletown, CT 06457
demhs.hmgp@ct.gov

Project and plan Subapplications submitted for funding under disasters declared after February 27, 2015 shall use *Hazard Mitigation Assistance Guidance: Hazard Mitigation Grant Program, Pre-Disaster Mitigation Program, and Flood Mitigation Assistance Program, February 27, 2015*. FEMA link: https://www.fema.gov/media-library/assets/documents/103279

Note: For Projects (e.g. Property Acquisition, Elevation, Culverts & Wind Mitigation Etc.) **please use Sections 1, 2 and 4 only.** For Planning (e.g. Local Hazard Mitigation Plan Update) please **use Sections 3 and 4 only.**

Each subapplication must contain the following sub-application elements. This checklist will assist local communities and consultants in developing a complete HMGP Sub-Application.

Project Subapplication Task	Page Number location in the Application	State Review	FEMA Review
SECTION 1: PROJECT SUBAPPLICATION			
A. Project location			
B. Description of Existing Conditions			
C. Scope of Work (Project Description)			
D. Project Photographs			
E. Project Maps			
F. Project Drawings			
G. Alternatives			
H. Work Schedule			
J. Project Cost Information			
I. Maintenance Schedule and Associated Cost			
K. Estimated Project Cost Share			
L. Other Funding Agencies			
M. Mitigation Plan Status & Information			
N. Public Notice/Official Newspaper Information			
O. Required Benefit-Cost Analysis (BCA)			
P. Environmental/Historic Preservation Information			
Q. Waterway/Waterbody/Wetlands Information			
R. Floodplain Location			

S. National Flood Insurance Program (NFIP)			
T. General Conditions			
U. Match Funding Certification			
V. Maintenance Agreement			
W. Property Acquisition/Relocation/Elevation Worksheet			
X. Property Acquisition/Relocation/Elevation Certification			

Project Subapplication Task	Page Number location in the Application	State Review	FEMA Review
Section 2: Property Acquisition/Elevation Projects			
Property Acquisition/Relocation/Elevation Worksheet			
Photographs			
Substantial Damage Letter (If Available)			
Elevation Certificate			
Voluntary Transaction Letter			
Model Deed			
Tax Assessor Card			
Property Acquisition/Relocation/Elevation Certification			
Section 3: Hazard Mitigation Plan (New Plans or Plan Updates)			
Scope of Work (SOW)			
Work Schedule			
Plan Maintenance Schedule and Associated Costs			
Planning Cost Information			
Planning Cost Share (25%)			
Other Funding Agencies (if any)			
Mitigation Plan Status and Information			
Section 4: Grant Conditions and Assurances			
Special Conditions **(Signature Required)**			
General Conditions **(Signature Required)**			
Assurances (**Signature Required**)			
Maintenance Agreement **(Signature Required)**			

Potential subapplicants must submit a copy of complete, signed applications by the announced deadline. Subapplications must be submitted as hard copies signed by applicant (.pdf copies of signed applications are also accepted via email). Subapplications postmarked later than the deadline will not be considered.

APPENDIX B: CT INTERAGENCY HAZARD MITIGATION COMMITTEE (CIHMC)

The following State Agencies will be considered and enlisted, when appropriate, to serve on the Connecticut Interagency Hazard Mitigation Committee (CIHMC) whenever necessary to accomplish the purposes of this Plan and review HMGP project applications.

- Department of Administrative Services (DAS) – Construction Services
- Department of Emergency Services and Public Protection (DESPP)
- Department of Energy and Environmental Protection (DEEP)
- Department of Transportation (DOT)
- Office of Policy and Management (OPM)
- Department of Economic and Community Development (DECD)
- State of Connecticut NFIP Coordinator (DEEP)
- Department of Housing (DOH)
- CT Conference of Municipalities (CCM)
- Connecticut Institute of Resiliency and Climate Adaptation (CIRCA)
- Department of Insurance (DOI)

APPENDIX C: HMGP ENVIRONMENTAL CONSIDERATIONS

Projects funded under the HMGP must comply with all appropriate environmental requirements. These include the National Environmental Policy Act (NEPA), PL-190, as amended; Executive Order 11988, Floodplain Management; Executive Order 12898, Environmental Justice in Minority and Low-Income Populations, and Executive Order 11990, Protection of Wetlands.

FEMA must complete the environmental and historic preservation review of the proposed scope of work under a subapplication before awarding HMGP funding. Costs associated with implementation of a mitigation activity but incurred before FEMA conducts the environmental and historic preservation review and approves and awards a project are ineligible. Therefore, mitigation activities where implementation is initiated or completed before award are ineligible and will not be reimbursed by FEMA.

FEMA will determine the level of environmental review necessary (e.g. environmental and floodplain management review) relative to specific proposed hazard mitigation projects. FEMA will ensure that all required environmental review is performed. FEMA will determine if the individual project is categorically excluded (CATEX) from the need to prepare an environmental and/or floodplain management review.

All other projects must include environmental and/or floodplain management review to aid in the compliance with environmental requirements. Approval to initiate a project will not be granted, nor will any HMGP monies be expended prior to the completion and satisfactory outcome of a required environmental review.

Coordination

The subapplication should identify who was contacted in the development of the project and in the preparation of this environmental analysis. Appropriate agencies for coordination might include:

- Connecticut Department of Energy and Environmental Protection.
- Connecticut State Historic Preservation Office.
- U.S. Environmental Protection Agency.
- U.S. Army Corps of Engineers.
- Natural Resources Conservation Service.

References

References may be required, if appropriate.

The information provided in the environmental document will be analyzed at the FEMA Regional Office to determine if there will be significant environmental or floodplain impacts as a result of the proposed project. If not, then a Finding of No Significant Impact (FONSI) will be prepared, attached to the environmental analysis, now an Environmental Assessment, and approved by the FEMA Regional Office. If significant impacts are anticipated, then the project will be reviewed and revised or an Environmental Impact Statement (EIS) will be prepared.

APPENDIX D: SUB-RECIPIENT MANAGEMENT COST APPLICATION

Applicant Name: _____ Project Title: _____

Sub-Recipient Management costs are available at no more than 5% of the final project cost to sub-recipients who apply and can meet all federal grant requirements. Sub-recipients will provide a detailed budget of the management cost request per 2C.F.R.§§§200.403,200.404,200.405 which will be subject to DESPP/DEMHS/FEMA approval. Sub-recipients may decline management costs at their request.

Please check ONE:

☐ I DO NOT wish to receive Sub-Recipient management costs for this project:

☐ I wish to receive Sub-Recipient management costs for this project:

(if checked, please complete the budget section below)

_____ _____

Authorized Signatory Name Please Print Title

_____ _____

Signature Date

Budget:

Total Sub-Grant Award:	$
Total Management Cost Requested:	$

(Maximum of 5% total sub-grant award)

Management Cost Budget

Line Item	Description	Cost
Personnel/salaries		
Fringe Benefits		
Travel		
Equipment		
Supplies		
Other		
Subtotal		
Total Direct		
Total Indirect	Must provide indirect cost agreement	
TOTAL		

APPENDIX E: GRANT MODIFICATION REQUEST – (Digital Copy for Awareness)

Form Rev: July 2021

GRANT MODIFICATION REQUEST
State of Connecticut

Project Name:

Today's Date: Grant Program:

Applicant: Grant Number:

Contact Name: Contact Email:

State Contract End date: Contact Phone:

Request for modifications to the approved scope of work, budget, and/or period of performance may be eligible, but will not be granted automatically and must be supported by adequate justification in order to be processed. The justification must be a written explanation of the reason (or reasons) for the need to modify or change the existing scope of work, budget, or schedule. The language below serves as an outline to your modification request. You may be required to attach or include additional pages to your request. Completed requests are sent to DEMHS Hazard Mitigation Officer. If DEMHS determines that the request meets the minimum requirements, set by FEMA, this document will be forwarded to FEMA for their final approval.

1. TYPE OF REQUEST:

- ☐ *Scope of Work Modification*
- ☐ *Period of Performance Modification*
- ☐ *Budget Amendment*

2. REASON FOR MODIFICATION:

Identify and describe the reasons and issues that make the modification necessary to complete the project. Identify the current status of the approved scope of work to date. (Limit 600 Characters, Attach additional pages if needed)

Please provide any supplemental information which describes what the changes will be and how they will affect the overall performance of the project. Additional attachments may be needing including budget reallocation form, new timeline, drawings, engineers plans or specifications, photos, etc. (Limit 600 Characters, Attach additional pages if needed)

3. **BUDGET**:

a. Does this grant modification request change the budget in any way?

☐ *YES* if yes, please provide a reallocation form.

☐ *NO*

b. Does the revised budget result in the need for additional funds to complete the project?

☐ *YES*, if yes, a revised Benefit Cost Analysis will be required.

☐ *NO*

c. Describe any remaining funds, which have not yet been spent (both federal and non-federal share.) Please outline how these remaining funds will be used.

Click to Attach Revised Budget

4. **REMAINING OBJECTIVES:**

a. Tasks remaining to complete the project

Identify the tasks necessary to complete the project.

Click to Attach Additional Pages

b. New project schedule and completion date.

☐ Detailed project schedule is attached (recommended)

Click to Attach Project Schedule

If this request includes a period of performance modification, a new work schedule is required. Select and identify the new projected completion date for the Grant Award. Make sure the projected completion date is in compliance with appropriate Program statutes, regulation and Grant Award Agreement Articles.

c. Responsible Contact

Printed Name	Signature	Date

List the position/person responsible for oversight of the completion of the project.

For State Use Only

Approved by: Date:
Approved by: Date:

APPENDIX F: HMGP EXTENSION REQUEST TEMPLATE <subject to change>
<<Date>>

XXXXX, Regional Administrator
DHS – Federal Emergency Management Agency - Region 1
99 High Street
Boston, MA 02110-2132

Re: DR-XXXX-CT Hazard Mitigation Grant Program (HMGP) - Extension Request

Dear Mr. XXXX:

This letter serves as a request to extend the availability of grant funding for the above referenced disaster for one year to <<Date>>. After such date, DEMHS will coordinate with FEMA to formally close out and de-obligate any funds not liquidated by the grantee in accordance with 2 CFR 200.309 and 200.344(b). At this time, there are XX remaining sub-awards with the <<Name of Community(s)>> underway; all other mitigation activities in the grant have been completed and have been or are being closed. All financial and programmatic reporting for these grants is up to date.

Project #	Sub-recipient	Status	Project Name	Approved End Date

The <<Name of Community>> has experienced delays due to <<Insert Explanation>>

The <<Name of Community>> has experienced delays due to <<Insert Explanation>>

Attached to this request you will find Grant Modification Forms with all the required details, including funds remaining, proposed project schedules, and remaining milestones in the approved scope of work. These activities are integral to the completion of the project..

CT DEMHS fully supports this extension and will work very closely with the <<Name of Community(s)>> to ensure that their projects are completed in a timely manner.

Should your staff require any additional information, please contact Ken Dumais, State Hazard Mitigation Officer at (860) 685-8151, or Kenneth.Dumais@ct.gov

Sincerely
<insert title>

APPENDIX G: HMGP FINAL SITE VISIT

Date: _____ Grant #: _____

Site Visit Conducted by: _____ Local POC: _____

Weather Conditions:

Project Title:

Brief Project Description (from approved Scope of Work)

Consistency with approved Scope of Work:

_____**% Complete**

(Note: If not 100%, identify major work tasks remaining and proposed completion schedule in field notes below)

Field Notes:

(Attach Photos)

_____

Signature **Date**

APPENDIX H: CLOSEOUT LETTER TEMPLATE <subject to change>

Mr. Richard Verville <<Date>>
Hazard Mitigation Assistance Branch Chief
FEMA Region 1
99 High Street, 6th Floor
Boston, MA 02110

RE: FEMA DR-XXXX-CT-XR-HMGP <<Name of Community>> <<Project Title>>

The Connecticut, Division of Emergency Management and Homeland Security (CT DEMHS) is requesting the close out of the Hazard Mitigation Grant Program project DR-XXXX-CT-XR HMGP <<Name of Community>> <<Project Title>>. All work associated with this project has been completed, all project deliverables were collected and approved, audit requirements were fulfilled, and reimbursements have been finalized.

Proposed Grant Award		Actual Expenses	
Total Proposed Cost		Project Cost	
Fed Award		Fed Reimbursed	
Non-Fed Cost Share		Non-Fed Cost Share	
Award Balance			

I hereby request the closeout of this project and certify that the project was completed in accordance with FEMA approval; all required and allowable funds have been paid to the subrecipient; all reported costs were incurred in the performance of eligible work; work was completed in compliance with the FEMA-State Agreement; payments for the project were made in accordance with the existing requirements of Federal and State laws and regulations; no further requests for funding on this project will be made; and there are no pending bills. I request that you de-obligate the remaining, <<$xxx,xxx.xx>>

Quarterly performance reports associated with this award have been filed electronically with FEMA via Region I. All required financial reports and any other applicable financial paperwork as required by FEMA has been or will be transmitted to your office under separate cover. If you have any questions, please contact, me at (860) 685-8158.

Sincerely,