Resilient Connecticut Synthesis Report
Appendix F

White Papers

UCONN UNIVERSITY OF CONNECTICUT
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RESILIENT CONNECTICUT
RESILIENCE WHITE PAPER SERIES

Historic Resource Surveys in Risk Zones: Climate Action

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I. Introduction

Increasingly, municipalities are utilizing existing planning processes such as natural hazard mitigation plans (NHMPs) and other comprehensive plans to incorporate climate change mitigation and adaptation for preserving important historic and cultural resources. Connecticut municipalities are no exception.[1] The Capitol Region Council of Government (CRCOG), the Western Connecticut Council of Government (WestCOG), and Naugatuck Valley Council of Government (NVCOG) completed their plans in 2019, 2020 and 2021, respectively. Natural Hazard Mitigation Plans included climate-related hazard mitigation actions related to historic sites.[2] One such action included for the 38 towns of the CRCOG, for the 19 towns of the NVCOG, and for the WestCOG municipalities was:

> "Coordinate with CT SHPO [State Historic Preservation Office] to conduct historic resource surveys, focusing on areas within natural hazard risk zones (flood zones, wildfire hazard zones, steep slopes) to identify historic resources at risk and support the preparation of resiliency plans across the state." [3]

Facing increased risks due to climate change, historical and cultural sites require greater protection to ensure community resiliency. Historic sites "are more than just physical sites; they testify to shared history. They connect us to our past, often in deeply spiritual ways. They speak to human identity and create a sense of connection across generations. If we fail to act now, tangible cultural heritage, feats of architecture and engineering, and icons of our shared history connection [will be lost]."[4]

These historical sites, whether tangible or intangible, contribute to a unique local heritage and cultural identity that create a "sense of place" within a landscape. Preservation of historic places is stated by the Advisory Council on Historic Preservation and the National Trust for Historic Preservation to contribute to a "strong sense of community identity, positively affects property values, supports place-based economic development, and is environmentally sensitive in its use of existing built resources."[5]

Historic sites are often perceived as beacons of resilience for communities, acting as the inspiration to rebuild following disaster, and often act as a point where many members of a community can come together, which builds community resilience.[6] Community resilience is defined as "the capability to anticipate, prepare for, respond to, and recover from significant multi-hazard threats with minimum damage to social well-being, the economy, and the environment."[7] Historic preservation and resilience go hand in hand, sharing the holistic wellbeing of the community from the environmental to the social and economic aspects. For example, in 2018, New London Landmarks contacted SHPO and the Connecticut Trust for Historic Preservation after learning that two buildings, 116 and 130 Bank Street were going to be demolished. Both of these sites were from the nineteenth-century era of commercial buildings. Though the property owner had been contacted to explore alternatives to demolishing these sites, preservation partners were unsuccessful.

Following a public demonstration, the surrounding community formed a petition of more than 1500 individuals against demolishing the structures.[8] So, the Historic Preservation Council voted to "refer the matter to the State Attorney General's Office pursuant to the Connecticut

Environmental Protection Act."[9] Assistant Attorney General Alan Ponanski demonstrated under protocol that the structures are listed and important additives to the Downtown New London Historic District, that "the proposed actions are unreasonable, and that there are prudent and feasible alternatives to demolition."[10]

After testimony from experts, on March 29, 2018, the judge ruled in favor of the State.[11] Today, these buildings contribute to the historical cultural heritage of New London and indeed, Bank Street - South Water Street in New London are the site of a CIRCA-identified resiliency project. This project involved staff from UConn CIRCA and the Department of Plant Science and Landscape Architecture who worked with the city's Mayor's Office and the Business Owners Association to develop a science-based design to mitigate negative impacts of sea level rise while spurring economic growth along South Water Street. More about the project can be found here.

Evaluation becomes critical so that historical and cultural sites are protected from likely climate and related natural hazard vulnerabilities. Safeguarding the historic character of Connecticut's communities can address resilience and preservation goals. Preservation supports a town's identity and its "brand."[12] Resilience supports the preservation of that identity through proactive planning to prepare, withstand, recover, and adapt from potentially catastrophic events. While many communities recognize the importance of historic properties through local ordinances, local historic districts, and preservation guidelines, formally recognizing the nexus between resilience and preservation is relatively new and worthy of examination.

Historic properties are among the community assets that should be considered and integrated into resiliency planning.[13] Another example comes from Hartford, where the city has adopted a form-based zoning code that maintains the integrity of Hartford's historic neighborhoods and simultaneously protects "the environment with renewable energy allowances, waterway buffers, and density bonuses for integrating green roofs, combined heat and power, and fuel cells."[14] Inventorying historical and cultural sites creates means to identify and maximize protection of this limited and important resource. The following sections of this document will detail the current policy influencing historic resource resiliency, how to inventory historic resources in areas of risk and recommendations for undertaking this process, and lastly, how historic resource surveys were conducted in a case study of New Haven County and Fairfield County following Hurricane Sandy.

II. Historic Resource Resiliency Policy

Federal-Level Legislation

At the federal level, the U.S. Department of the Interior is central in historic and cultural preservation.[15] Through bills such as the National Historic Preservation Act, the National Register of Historic Places and the National Historic Landmarks Programs, and the Interior's Standards lay the initial standards for treatment and preservation of historic and cultural resources at the state and local levels.

Historic Property

"Historic property means any prehistoric or historic district, site, building, structure, or object included on, or eligible for inclusion on, the National Register, including artifacts, records, and material remains relating to the district, site, building, structure, or object." [54 U.S.C. § 300308]

Historic Resources

"Historical resource means any resource possessing historical, cultural, archaeological or paleontological significance, including sites, contextual information, structures, districts, and objects significantly associated with or representative of earlier people, cultures, maritime heritage, and human activities and events. Historical resources include "submerged cultural resources", and include "historical properties," as defined in the National Historic Preservation Act, as amended, and its implementing regulations, as amended." [15 CFR § 922.3]

Cultural Landscapes

Within 15 CFR § 922.3 and "Cultural landscape - a geographic area, including both cultural and natural resources and the wildlife or domestic animals therein, associated with a historic event, activity, or person or exhibiting other cultural or aesthetic values." There are four general types of cultural landscapes, not mutually exclusive: historic sites, historic designed landscapes, historic vernacular landscapes, and ethnographic landscapes. (National Park Service, n.d.)

The National Historic Preservation Act of 1966 (NHPA) initiated standards, funding, and general guidance for historic sites from the state to local level. The NHPA stands to highlight the importance of protecting heritage sites across the nation from "rampant federal development."[16] Within the Act are policies preserving the nation's heritage, foundations for federal-state and federal-tribal partnerships, for creating Certified Local Governments within the States, and establishing the National Register of Historic Places and National Historic Landmarks Programs within the National Park Service among other programs.[17]

The National and State Register of Historic Properties "affords consideration of the effects of state and federal undertakings under the Connecticut Environmental Policy Act and/or Section 106 of the National Historic Preservation Act of 1966 (NHPA)."[18] SHPO mandated a review agency in the former, and SHPO required participants in the latter–local governments were invited to participate as consulting parties on effects of federal undertaking on historic properties under the Section 106 process. Section 106 expanded opportunities between the SHPO and municipal planners to collaborate on local preservation objectives. Section 106 asked for "Municipal P&Z officers to keep a stack of A Citizen's Guide to Section 106 on hand. Produced by the Advisory Council on Historic Preservation, the brochure explains the Section 106 process for non professionals [for brochure click here]."[19]

State- and Local-Level Legislation

State governments have several means to protect historically and culturally important resources. They can create plans of action for historic resources through the State Hazard Mitigation Plan (HMP) and/or State Historic Preservation Plan (SHPP). Through these plans, historic resources can be made into priorities with proper funding, resources, and integrated policy across plans to support their preservation.

The Connecticut State Historic Preservation Office (SHPO) serves within the State's Department of Economic and Community Development to assist "town planners, historic district commissions, and local preservation advocates in developing tools to help preserve the state's character-defining historic properties."[20] The tasks of SHPO includes organizing main cultural resource management through administration of "such state and federal programs as the State and national register of Historic Places, historic tax credits, and grants funded by the National Park Service and the state's Community Investment Act fund."[21]

In the next five years, SHPO plans to "pursue this vision by working to enrich and expand partnerships, enhance public education on preservation, diversify audiences and resources, and develop a resiliency strategy for the state's historic resources."[22] SHPO can also aid in economic development in the state through the State Historic Rehabilitation Tax Credit Program to create houses that are overwhelmingly affordable. SHPO aids in disaster relief; in providing grant support to historic property owners who had their historical sites damaged during natural disasters as well. Through the Statewide Historic Preservation Plan Shared Stewardship: 2018-2023, created by SHPO, one of the prime goals was to "Integrate historic properties and cultural heritage values in Hazard Resiliency Planning on the state and local levels."[23] SHPO also aids in the discovery and inventory of "previously uncovered stories about Connecticut's past," recognition of the historic places that define the state's culture, protection of historical sites, and continuing the evaluation of over 3000 historical project sites across the state. These are after all, finite resources, and history "brings relevance and understanding to the present."[24] We can learn about who we are now by knowing where we are from.

State planning plays a critical role in how historic resources are surveyed and placed in inventory. The most fundamental means of maximizing protection of historic sites is to catalog historic resources on registries through statutes, local ordinances, and agency regulations, as well as through voluntary lay processes and criteria for listing a site in an official register. Preservationists deliberate on how law can protect resources before and following disaster, including the debris of historically important buildings, as well as the artifacts of tribes and archeological sites affected. State law dictates ownership of archaeological resources on private land, and debris including tribal artifacts is protected under the Native American Graves Protection and Repatriation Act of 1990, which asserts that such artifacts are to be identified and through repatriation, returned to the relevant tribe.[25]

In Connecticut, both the state historic preservation plans (SHPP) and state hazard mitigation plans (SHMP) prioritize cultural and historic resources. These two plans, if developed in isolation, are less effective. If coordinated, these two plans together can complement efforts to protect historic resources.

Goal 4 of Connecticut's SHPP is to "Develop a Resiliency Strategy for Historic Resources" and aims to preserve historic resources from natural hazards, including ones that are intensifying climate change. Further and more specific goals related to historic preservation can be found in municipal individual HMPs or their annexes within their regional Council of Government (COG). Currently, there is a great emphasis in the state on building resiliency.

Further, the State's *Resilient Historic Resources*: *Best Practices for Planners* outlined four steps to historic resource resiliency:

1. **Prepare**
    - Assessment - locate historic resources and their vulnerabilities,
    - Plan - prioritize, budget and create policy to mitigate risk, integrate planning documents,
    - Educate stakeholders.
2. **Withstand**
    - Work during a disaster including implementation and execution of plans created during prepare phase.
3. **Recovery Step**
    - After the disaster, execute disaster recovery protocols,
    - Enforce design guidelines and requirements during rebuilding,
    - Good communication and collaboration between stakeholders.
4. **Adapt**
    - Following disaster, revise and update planning documents.[26]

In the state Natural Hazard Mitigation Plan 2019-2024, two recommended hazard mitigation activities are recommended. Goal 59 recommends that the state, in response to the flooding and climate change hazards, "conduct new or updated surveys of historic resources to better understand their vulnerability to natural hazards."[27] Activity 59 recommends an "Increase support of the State-level Cultural and Natural Resources Initiative to increase resiliency of cultural and natural resources from disasters. Expand SHPO resiliency-focused technical assistance project completed in 2018 to northern four counties."[28] A case study of the activities undertaken to assess historical sites in four counties during 2016-17 can be found below.

Currently, as CT planning is largely confined to pre-disaster preparations, there is yet more effort that will need to be made, though CT has gone farther than many other states in taking federal guidance and using state specific knowledge to prepare historic properties at risk. Further reading and guidance on surveying and protecting historic resources is provided by state guides including "Resilient Historic Resources: Best Practices for Planners" and the "Historic Resource Resiliency Planning in CT."

III. How to Inventory Historic Resources in Areas of Risk

To understand what is possibly at risk to hazards and climate change, municipalities should conduct an inventory of historic and cultural resources. This product, usually a written report with maps and a database of each location, can then be used across pertinent planning documents. This inventory process is a high-level reconnaissance survey that likely will not include long historical narratives and site descriptions. In fact, some sites may need to be generalized to an area especially places at risk of looting or desecration in the case of archeological excavations or traditional ecological knowledge.

While many historic resources may already be listed in the Connecticut State Register of Historic Resources, it may not include cultural landscapes, locally important sites or places that contribute

to local character, or areas of tribal importance (that may be affected by municipal actions). It's important to supplement use of statewide or federal databases with local outreach to identify places of importance such as notable trees, religious practices dependent on a location, and community traditions.

Connecticut holds a "State Register of Historic Places: that lists criteria for creating historic and cultural sites based on factors related to the "integrity of location, design, setting, materials, workmanship, association" and:

1. "that are associated with events that have made a significant contribution to our history and the lives of persons significant in our past; or

2. that embody the distinctive characteristics of a type, period or method of construction; or that represent the work of a master; or that possess high artistic values; or that represent a significant and distinguishable entity whose components may lack individual distinction; or

3. that have yielded, or may be likely to yield, information important in prehistory or history."[29]

Having a property listed on the National Register creates eligibility for recovery grant assistance for historic properties through the SHPO and NPS after previous hazard events.

Following Hurricane Sandy, the DECD and SHPO published the following guidelines for preparing historic preservation and hazard mitigation goals before a disaster that are as follows:

- Identify historic resources at risk and understand the qualities that make them significant.
- Determine vulnerabilities of those resources.
- Understand the hazards they face.
- Incorporate historic resource information into planning documents.
- Integrate historic preservation and hazard mitigation goals in planning documents.[30]

Further, we offer the following suggestions on how to follow those guidelines below.

Basic Steps to Conduct the Survey and Identify Risk:

1. ***Identify historic resources at risk and understand the qualities that make them significant***
    i) Assign the Survey to a Local Committee. This can be an existing historic commission, the planning commission, or a mix of representatives from different groups. Reach out to the State Historic Preservation Office.
    ii) Prioritize the types of historic and cultural resources that your community would like to focus on.

iii) You may find ideas for the places of importance by reviewing the local Plan of Conservation & Development. Look for practices or places in that document that contribute to the local community character. Review the State Register of Historic Places.

iv) Ask the community and other stakeholders. Use a survey, mapping application, or town-wide workshop to collect ideas.

2. ***Using volunteers or a consultant, identify the resources and collect preliminary information.***

   i. Going by each category you found in the previous step might make it easier to search i.e. sites on the state register, religious sites, cultural landscapes, etc. Consider holding another public event for folks to brainstorm ideas.

   ii. Collect information that can help you in planning i.e. name, address, parcel id, and short description of why it's important. Photographs may also be helpful.

   iii. Put the locations on a map.

3. ***Determine vulnerabilities of those resources & understand the hazards they face.***

Natural hazards can create areas of risk that threaten to damage or hurt the environment, people, economy, and property residing in those zones. Natural Hazard Risk Zones include areas subject to flooding, erosion, blizzards, tropical storms, extreme heat, drought, wildfires, and other potential natural hazards. With climate change, many hazards are anticipated or are already of greater threat to communities in Connecticut and across the rest of the country. Climate change not only creates more frequent severe natural events, but also increases the intensity of these occurrences. Already annually across the United States, natural hazards threaten lives and livelihoods, resulting in billions of dollars of damage.[31] Historical sites are particularly vulnerable to severe and frequent weather events given that they are older structures that have sustained weathering already. Historical Site surveys can determine the risk factors surrounding a resource or site of importance from the past so action can be taken to improve the area's resiliency.

The state of Connecticut is susceptible to natural hazards, notable storms including hurricanes throughout our history (1936, 1938, and 1955) as well as the more recent "Hurricane Irene (2011) and Superstorm Sandy (2012), and Blizzard of 1978 to Winter Storm Nemo in 2013."[32] Historic and cultural resources were identified through working with the State's COGs and municipalities that are "specifically at risk now, could be at risk in the future, and could help generate consensus for resiliency actions."[33] The CT HMP identified and quantified risks for hazards that our state has been historically exposed to, including hurricane winds, flooding, severe winter weather, wildfires, tornadoes, and earthquakes. Many of these are anticipated to increase in frequency and severity with climate change. Vulnerability to the changing climate varies depending on the different resources available to address environmental hazards, which range from "social, economic, historical, and political factors, all of which operate at multiple scales."[34] Understanding an area's vulnerability is necessary to effectively create resilience in a community. Heat, wind and flooding information for CT can be found at the NOAA National Centers for Environmental Information: Connecticut. However, identifying the issues through surveys allows communities to get to the root of the issues their historical sites and resources face. Understanding the specific causes and

effects of these natural hazards on historic sites, resources and their surrounding communities enables an area to develop greater resiliency. Data collection and integration of data is critical to ensure protection of historic sites. However, it must be noted that it is unlikely that historic resources can be flood proofed, elevated, nor relocated due to the potential loss of their historical worth. It is then through a good knowledge of site-specific options that sites can be protected prior to natural disasters that would possibly damage these, and make recovery easier.[35]

CIRCA is currently developing a statewide climate change vulnerability index (CCVI) that will illustrate the flood impacts across the state, which will aid in identifying potential risks to communities and their historic resources. Below are available CIRCA resources for understanding a few hazards buildings face:

CIRCA: Sea Level Rise and Storm Surge Viewer

CIRCA: Critical Infrastructure

CREST Map Viewer on CT ECO

Modeling Site Suitability of Living Shorelines in Connecticut on ArcGIS

4. Integrate these Resources into Planning

Towns are recommended to consider revising "their zoning and subdivision regulations to allow municipalities to require archaeological and historic surveys prior to approvals for work."[36] Analysis should prioritize preservation of those features that are identified as significant during the survey and registered as data for the properties.

An important consideration when preparing to assess your community is what persons or departments will be designated for the job of assessing historic resources before, during, and after a disaster.[37]

- Preservation of historical or agricultural heritage or preservation of a natural landscape feature – there are specific open space sites in the Town with historical or other cultural importance that merit their retention as open space. While the most important function of agricultural land is food production, it also contributes greatly to the visual qualities of the community.[38]
- Coordinate with CT SHPO to conduct outreach to owners of historic properties to educate them on methods of retrofitting historic properties to be more hazard-resilient while maintaining historic character.[39]
- Towns should work to attract a younger demographic by marketing Sprague and Baltic Village as a socio-economic, diverse community that is historically and architecturally significant, affordable, walkable, eco-friendly, safe, and rich in natural resources. The town should also promote its small school system and community atmosphere where "everybody knows your name"[40]

- Support the listing of historic sites and districts on the National Register of Historic Places and the State Register of Historic Places[41]
- Use recently published GIS inventory for historic and cultural risk assessment and protection
- "Encourage cooperation and communication between existing volunteer groups, historic and cultural institutions."[42]

Following survey and assessment of the natural hazards that threaten your municipality's historic and cultural sites of importance, taking steps to ensure the preservation of these sites is a must. The following steps are a few recommendations to start this process. Taking appropriate climate action by incorporating historic preservation and resiliency into policy is the next step, followed by implementing the necessary changes in real time. Additionally, beyond this white paper, creating plans for protecting cultural sites and the surrounding community as well during and following disasters will vastly increase the resiliency of your town regardless of the circumstances you may find yourselves in.

IV. Conclusion

Historical and cultural resources are critical for community preservation and resiliency. They create a sense of place and often act as a point of rally following calamity. With climate change, the security and stability of our surroundings will likely lessen due to natural hazards. Protecting sites by affording them greater resiliency extends greater resiliency in turn to the surrounding community. One of the first steps to protecting and preserving historic sites is to assess and inventory historic sites to understand the impact climate change may have on the sites. A number of recommendations are available to begin this process. In Connecticut, the state assessment in Fairfield County and New Haven County have GIS data, including vulnerability assessment. Surveying and inventorying historic sites is a significant step for the preservation and resiliency not just of our past, but also for the strength of our current and future communities. The DECD notes further that though surveys may have occurred in your area, that does not ensure that all historic resources were documented in previous work. Maintaining a complete and up-to-date inventory informs resilience planning and thus highly recommended.

Takeaways:

- "Sense of Place" is important for community identity. Historic places of importance often are points of rally–foundations of community resiliency, following natural disaster.
- Survey and Assessing risks to historic resources is the first step to effectively protecting these important sites.
- Consider and/or follow the Basic Steps for Conducting a Historic Survey.
- Define what qualities make historic and cultural resource important in your community.
- Integrate goals for historical site preservation into active planning documents.

Additionally, from the "Resilient Historic Resources: Best Practices for Planner - Guidance for Connecticut municipalities in an era of climate change:"

- Incorporate Historic preservation into resiliency planning policy:
    - Including specific strategies, actionable items, and possible funding sources,
    - Creation of Strategy Tables with assigned agency responsible for task as well as possible funding sources
- Conduct Public Outreach Locally.
- Stay aware of developments in climate science and projections.
- Develop during and after protocols and policies regarding disaster.
- Get Certified: Strengthen municipal preservation efforts by becoming part of Certified Local Government program.

V. Case Study: Adaptation and the State Assessment of Historical Site Vulnerabilitys in Fairfield and New Haven Counties

Following Hurricane Sandy in 2012, SHPO was awarded disaster relief and recovery funds from the U.S. Department of Interior through the Emergency Supplemental Historic Preservation Fund from "the National Park Service (authorized by the Public Law 113-2, the Disaster Relief Appropriations Act)."[43] Connecticut's Historic Preservation Office launched a project in 2016[44] to actively include historic properties in local plans and protocols for hazard and resiliency planning in areas affected by the hurricane.[45] These sites could be affected by future natural disasters as well, particularly with the expectedly more intense storms of the future.

The project team was composed of R. Christopher Goodwin & Associates, Dewberry, and Milone & MacBroom. These parties undertook an effort to collect data and map, conduct outreach to planning officials within a four-county target area of Fairfield, New Haven, Middlesex, and New London, audit existing plans, and develop a best practices guide for "integrating historic preservation into state-level resiliency planning and initiatives; and of addressing historic resource resiliency in the Connecticut State Historic Preservation Plan (2018)."[46] This was done drawing upon Federal Emergency Management Agency (FEMA) hazard mitigation planning recommendations, they adopted these principles and tailored them to the area of interest:

- "Assess risks by mapping identified resources and overlaying hazard data (FEMA flood zones, hurricane surge areas, etc.) relative to existing and future high-risk areas;
- Develop a mitigation plan focusing on the four coastal Connecticut counties most affected by recent Storms Irene and Sandy (Fairfield, New Haven, Middlesex, and New London);
- Undertake planning outreach in communities in the four counties to integrate historic resource consideration into other planning, hazard mitigation, and emergency management planning documents;
- Organize resources by building strategic partnerships with local municipalities and emergency management personnel; and,
- Provide a framework to implement the plan, monitor progress, and update data as needed."[47]

From these guidelines, they came up with a general plan for data collection, charettes, municipal meetings, creating and distributing best practices guides tailored to every town, and updated the state historic preservation plan.

Data Collection

Historical site vulnerabilities were identified in Fairfield & New Haven counties based on the increased use of geographic information systems (GIS) for finding overlap between historic places and natural hazards. Indeed, property types can be overlaid through aerial photography to provide better orientation for public and for town officials about location of historic resources, particularly as they have relations to other landmarks, streets, as well as environmental areas such as rivers, streams, and inland/tidal wetlands. This data included all known and recorded historic properties listed on State and national Registers of Historic Places, as well as National Historic Landmarks in CT's counties.[48] It can be accessed on the CT DEEP GIS website.

When new and updated information regarding the terrain, whether properties or a change to the land, these can be added to the GIS layers. Attributes of a historic property may also be expanded to include resilience data, such as character-defining features, level of recognition, and hazard vulnerabilities.[49] Using GIS will aid in identifying means to protect historic sites and resources further in coordination with the municipalities they are collaborating with.[50] Users can pinpoint individual properties, neighborhoods, or areas of community to graphically depict where historic properties and higher-risk areas intersect.[51] GIS mapping allows communities to quickly identify possible gaps in planning, policy and regulation to protect their important heritage sites. Survey of these coastal counties can provide a useful methodology and many insights that can be applicable to communities across all of Connecticut. The GIS data revealed not just areas of special concern where natural hazards may occur, but the geographic conditions and land use as well, which can only help in planning.

Charrettes

Charrettes are defined as meetings between stakeholders within a project that attempt to resolve conflicts and create solutions. These meetings focused on identifying historical resources, the risks these face, the benefits to preserving these sites, the challenges specific to local and regional challenges, and the measures needed to integrate historic resources into active community plans and real-time practices. Questions provided by the historical site resiliency planning team and discussed during these meetings with community representatives included:

- Where do municipal planning documents and codes address historic resources? Hazards?
- What are the barriers to incorporating hazard resiliency of historic resources into municipal planning documents and codes?
- What are specific actions, strategies, codes, or ordinances that could be added to municipal documents and codes to improve the resiliency of historic resources to natural hazards?
- What municipal personnel need to be engaged to make changes?[52]

Town Meetings

Historic resources resiliency planning meetings were held in June 2016 in the five coastal COGs of Connecticut. Individual meetings were held next with shoreline communities during the winter

of 2016-2017 that resulted in personalized reports for each of these communities in late 2017. Twenty-eight town meets were held along the coast following the charrettes to review results from the gap analyses and to discuss ways to integrate historic resources into community plans. The team examined "conservation and development plans, zoning regulations and ordinances, hazard mitigation plans, historic preservation ordinances, coastal resiliency plans, and emergency operations plans from the 91 communities in the four coastal counties."[53] All municipalities received GIS data for their historic resources to assist in planning efforts, as well as a specific written assessment regarding their active plans from the gap analysis, as well as a summary of the challenges to historic resources for informing planning efforts. An example can be seen below in the Best Practices Guide.

Best Practices Guide

Best Practices Guides were created for all municipalities in Connecticut to aid regional planners and communities in integrating "historic resources into resiliency planning and with resources for technical assistance."[54] Here too is guidance on language for regulation and planning that would aid in the protection of historic resources.

Example of Best Practices Guide (Goodwin et al., 2019):

Sample Guidance
Building Historic Resources into Hazard Mitigation Plans
Townville, CT

Critical Facilities: Historic and Cultural Resources

Historic and cultural resources include districts, sites, buildings, structures, and objects that are significant in history, architecture, archaeology, engineering, and culture (National Trust for Historic Preservation). In its 2014-2017 Strategic Plan, the Connecticut Trust for Historic Preservation explains that protection of these resources grows economies, enhances community character, and highlights our cultural heritage. FEMA report 386-6, Integrating Historic Property and Cultural Resource Considerations Into Hazard Mitigation Planning, published in 2005, states that the loss of irreplaceable historic and cultural resources, including buildings, artwork, monuments, heirlooms, and documents, can be particularly painful because "residents rely on their presence after a disaster to reinforce connections with neighbors and the larger community, and to seek comfort in the aftermath of a disaster." Consideration of these resources in this Hazard Mitigation Plan is critical.

The importance of historic resources to Townville is written into the Town's Plan of Conservation and Development. The Townville historical society points to the following buildings that are listed on the National Historic Register:

- Rushing Creek Mill Building
- Townville Town Hall
- Old Elementary School
- Union Station

Historic preservation planning allows for the protection of historic properties and cultural resources before they are threatened with demolition or alteration. Hazard mitigation planning allows for the protection of life and property from damage caused by natural and manmade hazards. Integrating these two planning processes will help to ensure the future growth of safe and sustainable historic communities.

FEMA Report 386-6, May 2005

Other historic and cultural resources in Townville may be listed on State or Local Registers.

Historic buildings and structures may be particularly susceptible to natural hazards because they were built prior to the establishment of more recent construction standards. Additionally, some of the structural integrity of these resources may have been degraded over the decades or centuries since their original construction. Structural retrofits and hazard mitigation methods may be challenging or restricted in cases where alteration of a resource will also diminish its cultural or historical aesthetic and value. Finally, miscommunications or lack of knowledge may lead to historic resources being damaged during the disaster recovery process.

- Inventory and survey historic and cultural resources
- Implement appropriate mitigation measures for those resources
- Move portable resources, such as artwork or documents, to safe locations prior to the occurrence of a hazard
- Consider these resources in emergency operations plans to prevent accidental damages during recovery efforts

State Historic Preservation Plan Update

Lastly, the 2018 State Historic Preservation Plan (SHPP) was the first update of Connecticut's SHPP that included resilience planning for historical and cultural site preservation. This plan is updated every five years. The update includes information gathered from the "charettes, community gap analyses, and town meetings," that were held in the year 2016 through 2017.[55]

More generally, it was found that there were eight strategies outlined that were considered most important for making historic and cultural resources resilient. They are:

1. Strategy: Identify Historic Resources
2. Strategy: Revisit Historic District Zoning Regulations
3. Strategy: Strengthen Recovery Planning
4. Strategy: Incorporate Historic Preservation into Planning Documents
5. Strategy: Revisit Floodplain Regulations and Ordinances
6. Strategy: Coordinate Regionally and with the State
7. Strategy: Structural Adaptation Measures
8. Strategy: Educate.[56]

For the report and additional information, visit:

Historic Preservation and Resiliency Planning in Connecticut

New Haven Preservation Trust Historic Resources Inventory

Preservation Meets Resiliency Municipal and State Planning for the Future

VI. Endnotes

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Many thanks for the helpful comments and advice on the white paper provided by John Guszkowski and CIRCA staff.

DISCLAIMER: This white paper addresses issues of general interest and does not give any specific legal advice pertaining to any specific circumstance. Parties should obtain advice from a lawyer or other qualified professional before acting on the information in this paper.

VII. References

1. Please see our factsheet on integrating climate adaptation into local plans. (INSERT LINK LATER)
2. In the context of NHMPs, mitigation is an action that reduces risk, which can be confused with mitigation in climate change literature that refers to reduction in greenhouse gas contributions. For this paper, hazard mitigation is used similarly to adaptation, which is an action to reduce climate impacts on people, places, or ecosystems.
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Integrating Climate Change Adaptation into and across Local Plans

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I. Introduction

In Connecticut, municipalities must complete comprehensive local plans at least every 10 years to remain eligible for discretionary state funding, and natural hazard mitigation plans must be updated every 5 years to remain eligible for hazard mitigation project funding from the Federal Emergency Management Agency (FEMA). Municipalities may also complete other plans, but those plans are not uniformly distributed or required across the state. For example, some municipalities prepare Consolidated Plans for housing to be eligible for Community Development Block Grant funding from the Department of Housing and Urban Development (HUD); however, grant eligibility is dependent on population. Other optional plans include Open Space Plan, Economic Development Strategy, Public Facilities, Health, etc. With or without these, every municipality in Connecticut has a comprehensive plan known as a Plan of Conservation and Development (POCD) and a Natural Hazard Mitigation Plan (NHMP).

The **Plan of Conservation and Development (POCD)** defines a common vision for the future of a community and the policies to best achieve this vision. POCDs update every 10 years.

The **Natural Hazards Mitigation Plan (NHMP)** identifies natural hazards and risks as well as the capabilities of the municipalities and the actions that can be executed by the community to prevent injury, illness, loss of life, and reduce property damages associated with identified hazards. NHMPs update every 5 years.

Effective in 2023 from the update of the Local Mitigation Plan, under Requirement 44 CFR § 201.6(c)(4)(ii) of the FEMA program[1], Hazard Mitigation Plans must provide comprehensive or capital improvements for each municipalities' mitigation planning mechanisms, including to incorporate climate action plans into active policy. Afterall, some of the ways we use land affects municipal resiliency in the face of climate change, as well as influences whether a municipality adds carbon or removes carbon from the atmosphere.

A barrier to creating effective climate action has also been addressed in the 2023 Local Mitigation Plan update. NHMPs are now required to coordinate across local plan efforts. Natural Hazard Mitigation Plans "must identify the local planning mechanisms where hazard mitigation information/actions may be integrated. The identified list of planning mechanisms must be applicable to the plan participant(s) and not contradict the identified capabilities."[2] Integrating climate adaptation into these plans creates greater strength, and resiliency within communities and across Connecticut. When plans are not coordinated, lack of clear direction impedes the speed and efficiency that towns and cities can mitigate and adapt to climate change where they are vulnerable.[3] This means incorporating climate action plans into POCD's, Long Term Transportation Plans (LRTPs) or Metropolitan Transportation Plans (MTPs), and more across a multi-jurisdictional region and indeed, within a respective individual municipality.

Many Connecticut municipalities are integrating climate change adaptation into these planning efforts, making any actions the community has prioritized eligible for state or federal funding. CIRCA's inventory of local planning documents in Fairfield and New Haven Counties as part of the Resilient Connecticut project identified numerous actions in local plans that were designed as adaptation actions or ways to reduce the impacts from particular climate stressors. The following

climate actions were identified from currently active, local plans. When these types of actions are adopted across all relevant active plans, the efficiency and effectiveness of implementing such actions could be increased. Throughout active plans including POCDs and NHMPs, climate actions are identified that could be greatly beneficial to the municipalities if and when implemented.

Highlighted Climate Actions

- "Develop and promote strategies to mitigate increased heat. Actions can include "cool roofs" programs to paint roofs white or other light colors to reflect sunlight and increase albedo; green roofs (vegetated roofs); tree planting; and green parking lots that use surfaces that reduce heat production."[4]
- "Utilize GIS to assess and identify the locations and extent of exposure from flooding for all structures within the SFHA."[5]
- "Work with the Greater Bridgeport Regional Council and other regional entities to address climate change and hazard mitigation issues and enroll in the Community Rating system to ensure an environmentally sustainable region."[6]
- "Conduct a detailed flood/coastal risk assessment to improve resiliency efforts to key assets and vulnerable properties."[7]
- "Increase Townwide tree and limb maintenance budget to limit road blockage and power outages during storms."[8]

II. Climate Change in Plans of Conservation and Development (POCDs)

Land use can amplify the effects of climate change or moderate the impacts of climate change. Amplifying land use activities such as deforestation, creating impervious surfaces, and hardening shorelines tend to lean towards less resiliency for a given municipality. Moderating through land use such as planting trees along rivers, painting rooftops white, and habitat restoration improve a community's resilience. Land use is also changing with climate change. For instance, certain crops are being planted as opposed to others as temperature and weather patterns shift. Towns are adapting to climate change in practical, resiliency-boosting and/or cost-saving ways.

Climate Action Examples from POCDs:

- "Seek over the long term to put overhead wires into underground conduits where lines/circuits will have the greatest impact if they fail."[9]
- "Tie community resiliency to individual sustainability actions, such as community gardens for food supplies, renewable energy for power generation, and rain barrels for emergency drinking water when wells become contaminated during floods."[10]
- "Seek funding for climate adaptation and mitigation projects, including the conservation of forested lands."[11]

- "Plan for food distribution during emergencies; Incorporating the food supply into our disaster planning—and ensuring people know about these plans —will ensure that all of our residents can access food when they need it."[12]
- "Support the Rebuild by Design: Resilient Bridgeport/Natural Disaster Resilience Competition project's efforts to create a comprehensive flood protection system throughout the South End."[13]

III. Climate Change in Natural Hazard Mitigation Plans (NHMPs)

Hazards include flooding, high winds associated with hurricanes, storms, earthquakes, dam failures, tornadoes, winter storms, hail and lightning, ice and snow, wildfires, and falling trees among others. Many of these have increased effects because of climate change, as severity and/or frequency of natural hazards are amplified. Impacts from hazards include injury, illness, and death to persons as well as loss or damage to property if efforts to prevent or mitigate impacts are not taken.

"Extreme temperatures will continue to be a likely occurrence in the planning area. It is anticipated that the effects of climate change will result in an increase in the frequency, duration and intensity of extreme heat events, and a decrease in the frequency of extreme cold events. Heat waves are projected to become much more commonplace in a warmer future with potentially major implications for human health." -SCRCOG NHMP Update, 2018, p.113

Climate Action Examples from NHMPs:

- "Perform study to determine Town's ability to maintain sufficient water supply to use for wildfire suppression in the future given continued development. Consider the effect of droughts and climate change."[14]
- "Drought Management Plan. Develop a drought management plan to address water conservation and the risk of drought and disease on commercial agriculture in Middlefield. Should reference updated State of CT Water Plan."[15]
- "Eisenhower Park Pond – Wepawaug River Dredging/Dam Spillway Rehabilitation: Dredge Wepawaug River Pond at Eisenhower Park. Repair dams and shore walls. The pond has been filled with silt and debris which threatens wildlife and habitats. Dredging, dam and spillway repair has not been done in several decades."[16]
- "Pursue a target of 30 additional GI installations on City-owned land and along streets in the 2019 [through] 2024 planning timeframe. Select some locations from the Regional Framework for Coastal Resilience."[17]

IV. Climate Change in Transportation Plans

The Long-Range Transportation Plan (LRTP) is designed to improve and balance transit and mobility within a given region, as well as to create more transparency that raises the public's awareness of transportation decisions.[18] The term LRTP is used interchangeably with Metropolitan Transportation Plan (MTP) in many regions of Connecticut to decide where federal transportation funding goes.[19] LRTPs are long term plans that are updated every three to five years.

Federally, it is required that there be a Statewide Long-Range Transportation Plan to preserve and maintain the existing transportation system, as well as regional LRTPS that unlike the statewide plan, are short-term and long-term project specific to "meet future transportation demand in the future."[20] Each Metropolitan Planning Organization is responsible for preparing an LRTP for their region. The Southeastern Regional COG describes the LRTP as a "living" document that is 25 years in length but updates every four years. This transportation plan identifies the commonly shared goals of the region, as well as the highest priority needs in transportation including "bridges, roads, transit, bicycle, and pedestrian facilities."[21]

LRTPs can enable all interested stakeholders in transportation planning a foundation of information to discuss further investment decision making. Climate change is going to have a large impact on transportation systems across Connecticut, making incorporation of climate resilience and adaptation into these plans critical. Transportation resilience has multiple aspects, including "(1) the ability to maintain its normal level of services or return to that level in a timely manner; (2) the ability to compensate for losses to allow functionality, even when that system is damaged or destroyed; (3) the ability to manage unexpected situations without complete failure; and (4) the ability to absorb consequence of disruption and maintain freight mobility."[22] Long Range Transportation Plans are thus one plan that needs to be coordinated with active municipal plans to ensure community resiliency; this way, access to critical services remains.

WestCOG–LRTP 2019 Examples:[23]

- "Work with state agencies and municipalities to study the likely impacts from climate change and to develop mitigation strategies."
- "Continue to work with Federal and State agencies to review inventories of historic, natural, and cultural resources and to determine environmental impacts and mitigation activities that restore and maintain the environmental functions affected by the Region's transportation system."

MetroCOG—MTP 2019 Examples:[24]

- "Monroe Route 25: Bridge replacements and roadway reconstruction. Replacement of two bridges and raising of the roadway to address flooding issues."
- "Fairfield Beach Area: Evacuation route improvements. Raise Fairfield Beach Road, Beach Road, Reef Road, and other low-lying local roads used for evacuation."
- "Fairfield Route 1: Implement resiliency measures to address flooding during rain events on Post Road/US 1."

V. Actions for Integrating Plans

Plan integration improves the ability for municipalities to focus on community priorities like climate resiliency by creating consistency among municipal projects. Integration is accomplished through activities focused on coordinating the network of existing plans including long-term and local plans involving land-use regulation and code administration.[25] When plans have consistency, municipalities reduce risk of losing life, property, and critical service access (to such needs as pharmacies, emergency shelters, gas stations, and grocery stores) caused by unexpected failures in their infrastructure. Despite clear advantages to coordinating plans, hazard mitigation plans have "frequently disconnected from other urban planning initiatives [i.e. other active plans within a municipality] that influence development patterns in hazardous area."[26] Without integrating plans, economic losses and the lives of people are vulnerable to natural hazards that are increasingly frequent and severe due to climate change. For example, the long-term development of a flood plain to avoid potential flooding hazards will be consistent in short term developmental plans in the same area.[27] A number of gaps in policy and barriers to coordinating effectively currently exist. Within POCDs, it depends entirely on the interest and commitment of "local leadership and staff.…in addressing climate change in the POCD, it must also be within the capacity, expertise, or experience of the staff or consultant preparing the plans."[28]

Recognizing the need for integration, planners and academics have been studying the efficacy of how to integrate plans. In fact, in FEMA's Local Mitigation Planning Policy Guide (Effective April 19, 2023), local jurisdictions need to include local sources like plans either by narrative or citation. The 44 CFR § 201.6(c)(4)(ii) requires local mitigation plans to describe how the mitigation plan will be integrated into other local plans such as the comprehensive or the capital improvement plans.[29] The following are examples of actions to coordinate efforts across plans regarding climate change.

Examples of Plan Integration:

- "Follow Coastal Resilience Plan Recommendations and Guidance for Coastal Development."[30]
- "Large, new Town Development projects (i.e., projects presented in the POCD). Comply with local, State and federal flood regulations. For large area sited development, elevate site grades during future construction. Develop and use special development Design Flood Elevation (DFE) to reflect sea level rise."[31]
- "Implement recommendations from Hazard Mitigation Plan to be best prepared for future natural disasters."[32]
- "Require hazard mitigation plans for all plants, factories, and industrial uses that are either in a FEMA flood zone or handling toxic materials."[33]
- "Implement the Hazard Mitigation Plan, as amended."[34]
- "Support public water supply extensions in neighborhoods vulnerable to sea level rise in accordance with the Coastal Resilience Plan."[35]

The following below are suggestions for possible actions to pursue to integrate climate action into a municipality's plans.

Potential Planning Actions for Integration

- **Organization and Responsibility:** Establish a climate (natural hazard) and resiliency agency, commission, or committee at the municipal level. This committee includes staff from different departments that can coordinate in implementing actions.[36]
- **Developing Resilience:** Create greater resource availability and have public investments to develop local resilience capacities to review relevant plans so as to "identify conflicts within and between zoning regulations, subdivision codes, and infrastructure or public facilities plans."[37]
- **Setting a Standard:** Prioritize climate resilience by providing a state and/or regional standard for comprehensive, subarea, and functional plans[38]
- **Consistency:** Coordinate among the network of multiple plans active in a community such as through creation of communication pathways and working groups that can collaborate on reviewing, developing, implementing, and updating the network of active plans for consistency in climate action[39]
- **Community involvement:** Climate and hazard data integration must include talks with the community, which may be emotionally charged, considering the impacts of changing climate on places of personal value. Critically, within internal and external collaborative process there must include a focus on bringing underrepresented groups to the table[40]
- **Consider:** Given limited resources, evaluate trade-offs for prioritizing certain courses of planning and action. Describe from available resources what positive benefit-to-cost ratio actions can be taken by you.[41]
- **Meeting Goals:** Develop a timeline and milestone to make your progress; involve stakeholders invested in the plan and recognize that some groups may take responsibility or make major contributions for specific parts of the plan and select a project management method that works for your group to document your plans. Ask yourself if your plan describes the group's best actions to protect what you all value.[42]

VI. Conclusions

Integrating climate action across active plans can promote the safety and wellbeing of municipalities across Connecticut. With the recent NHMP requirement updates, it is now a necessity to do. This resource can provide some guidance towards efforts to streamline and direct this process and increase engagement with stakeholders and members of the community. As a result of integration efforts, municipalities can communicate priorities across departments more quickly and indeed, have a clearer understanding of what these priorities are. A number of possible points of introducing integration into plans exist, from examples in current plans, to recommendations of policies or processes to take to begin. Such endeavors improve consistency across plans and improve use of resources while promoting the aims and major projects of a community. Below are a number of actions to begin the process of integrating climate actions across plans.

Recommendations for Initiating an Integration Process

Recognizing the different expertise, regulatory obligations, timelines, and stakeholders needed for each of the different types of plans, we offer the following recommendations for a municipality to consider as the start to integrate their plans. Additional important local plans include Open Space Plan, economic development plan, and the Affordable Housing plans, among others. All of these plans should be considered for integration and goal consistency as it pertains to them.

1) Timing - update POCD if substantial changes to NHMP even if less than 10 years, make data (GIS/research available) and easily accessible for other planning teams

2) GIS creation and maintenance

3) Funding - Increasingly, opportunities exist to support endeavors by communities to become more climate resilient, including through plan coordination. For instance, DEEP CT has 'The Municipal Primer- Your Guide to Creating a "Green and Growing" Community'. The CT Department of Economic and Community Development additionally has a page devoted to municipal Funding Opportunities.

4) Participants - consider sharing participants from multiple planning processes in each. All stakeholders should be involved or given the opportunity to be involved.

5) Schedule in opportunities to connect with other planners – have meetings specifically designated for ensuring goals are aligned among all groups

6) Try the Plan Integration Scorecard (See below[43])

7) Ongoing stakeholder involvement and public communication – better means for citizens to know when important votes, meetings, town halls are occurring

8) Understand core values and priorities for yourself and your community- what is most important to members? What climate coordination actions are aligned with the values of citizens in your region or municipality? Why is taking climate action important for you and the others? There can be baselines from which to continue work from and developing motivation for transitioning to a more sustainable and resilient manner of cohabiting with the environment.

Endnotes

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DISCLAIMER: This white paper addresses issues of general interest and does not give any specific legal advice pertaining to any specific circumstance. Parties should obtain advice from a lawyer or other qualified professional before acting on the information in this paper.

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RESILIENT CONNECTICUT
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Gaps and Opportunities for Local Resilience Planning in Connecticut

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Executive Summary

As of this writing, there are numerous efforts underway at the local, regional, and state level across the state of Connecticut to address the impacts of climate change. Scientific assessments, community engagement, and adaptation project designs are just a few of the key activities. Additionally, climate-related goals are being integrated into some local planning processes and some municipalities have undertaken resilience plans. The expansion of climate vulnerability data and mapping tools will likely increase the capacity for climate change planning across the state.

Despite these projects, there are gaps in the existing authority or obligations of local governments that potentially hinder climate planning at the local level. The systems analysis presented here highlights specific planning obligations that could but have not yet incorporated climate impacts and potential adaptations. For example, natural hazard mitigation planning can address climate impacts as they relate to natural hazards and plans of conservation and development can address climate impacts or solutions as they relate to land use planning. For the former, new guidance (not regulation) describes some inclusion of climate change vulnerabilities. The latter is narrowly on one particular climate and does not have specifics as to how it should be considered regarding land use.

Optimizing or expanding existing local authority or planning obligations regarding climate change could significantly advance adaptation across the state. Firstly, it would make climate planning an ongoing effort as opposed to episodic. Secondly, it could enable or reduce disruptions to projects currently underway. Thirdly, it could advance efforts to address historically excluded and harmed communities across the state by ensuring they are included in climate change planning and that adaptation projects or resilience efforts redress those inequities. This white paper outlines the gaps in resilience planning authority and planning mechanisms then provides potential opportunities to address the gaps.

I. Problem Statement

As a home-rule state, significant land use planning and regulation in Connecticut occurs at the local level. Land use, by limiting or encouraging activities in specific locations, can be a powerful climate change adaptation tool.

State regulations require local Planning & Zoning Commission (Ch. 124. Sec. 8-1 and Ch 126. Sec. 8-19.), updates to comprehensive plans every 10 years (Ch 126. Sec. 8-23(a)(1)), and consideration of “the most recent sea level change scenario” in Plans of Conservation and Development (POCDs) (Ch 126. Sec 8-23(d)(11)). There are additional planning parameters

from federal programs that influence local planning such as FEMA's National Flood Insurance Program (NFIP) regulations (floodplain regulations) and a requirement to develop Hazard Mitigation Plans (HMPs) per the Disaster Mitigation Act to receive disaster funds. Connecticut has been a leader in mitigating its contributions to climate change with aggressive greenhouse gas reduction targets[1]. It has also made great strides in developing an adaptation program at the state level, including a renewed Governor's Council on Climate Change, additional funding to UConn CIRCA for resilience planning, expansion of CT Green Bank funding mechanisms to include resilience, creation of resiliency teams in several state agencies, etc. Land use power held at the local level, however, remains a significant opportunity to deepen adaptation efforts and increase community resiliency across the state. However, the diffusion of land use planning across the state's 169 municipalities (or even 176 NFIP jurisdictions) can present inefficiency or even obstruction to significant action; however, this is unlikely to change in the present or near future.

In this white paper, I outline prominent obstructions or gaps that may hinder deep and systematic adaptation and resilience planning across the state's towns and cities[2]. Then, I describe potential solutions to these issues to strengthen, clarify, and enable municipal authority and action on climate change. In Connecticut, municipalities are also members of regional councils of governments (COGs) as county government was abolished in 1960. The COGs are not able to levy taxes or establish regulations. They do, however, support regional planning with both federal and state funding and can foster inter-municipal coordination. Regional planning efforts are discussed here where they incorporate local goals and projects. While mentioned, other geographic scales (e.g., state agencies, sub-municipal entities, or other COG functions) are not the primary focus of this paper. This white paper is intended to provide guidance to the state legislature, state agencies, and municipalities about the unseen but potentially transformative mechanisms that affect local land use to optimize resilience.

II. Identified Gaps in Local Resilience Planning Authority & Activities

Gap #1: Inclusion of Climate Change in Primary Local Planning Documents is Voluntary and Sporadic[3].

State and federal regulations directing local comprehensive plans (plans of conservation and development or POCD) and local HMPs do not require climate change to be assessed and addressed.

- In Connecticut, state statute Chapter 476a Sec. 25-68o, *'Consideration of sea level change scenarios re municipal evacuation and hazard mitigation plans publishing of sea level change scenarios,'* says "(a) On and after October 1, 2019, in the preparation of any municipal evacuation plan or hazard mitigation plan, such municipality shall consider the most recent sea level change scenario updated pursuant to subsection (b) of this section". Commissions updating a local POCD shall similarly consider "the most recent

sea level change scenario" (Sec. 8-23(d)). Sea level rise is an anticipated impact from climate change in Connecticut. Neither the POCD or the hazard mitigation plan statutory sections describe how sea level rise would be considered e.g., how it impacts the other required considerations, how land use would mitigate its impacts, or how emergency preparedness would be updated per the scenario. Since POCDs are required to be updated every ten years and HMPs every five, current plans as of this publication are not yet required to consider this. Notably, many municipal evacuation plans are not publicly available on town websites and there is no known shared GIS file for the coastline available for analysis by a technical partner.

Plans of Conservation and Development.

- Inclusion of climate change, except for that reference to sea level rise, in the POCD is not prohibited or required. Inclusion is currently dependent on the interest and commitment from local leadership, staff, or stakeholders. If there is local interest in addressing climate change in the POCD, it must also be within the capacity, expertise, or experience of the staff or consultant preparing the plan. Degree and depth of inclusion depends on availability of vulnerability assessment information and adequate local understanding of applicable planning remedies.
- CGS 126 Sec 8-23(2) requires that municipalities contiguous to Long Island Sound must be: (A) consistent with the municipal coastal program requirements of sections 22a-101 to 22a-104. The referenced statutes say, "coastal municipalities **may** [emphasis added] adopt a municipal coastal program". Sec 22a-101 also refers to other applicable plans, which may or may not reference climate change[4]. Climate change impacts are not listed as an adverse impact on coastal resources (Ch 444 Sec 22a-93(15). Sec 22a-102 does not require addressing or limiting the adverse impacts in the POCD. Secs 22a- 103 and 104 similarly do not address climate change.

Local Natural Hazard Mitigation Plans.

- In 44 CFR § 201.6, the Federal Emergency Management Agency (FEMA) offers regulatory boundaries for the performance of local HMPs.
    - Vulnerability is to be described in terms of "(A) The types and numbers of existing and future buildings, infrastructure, and critical facilities located in the identified hazard areas; (B) An estimate of the potential dollar losses to vulnerable structures identified in paragraph (c)(2)(ii)(A) of this section and a description of the methodology used to prepare the estimate; (C) Providing a general description of land uses and development trends within the community so that mitigation options can be considered in future land use decisions." It does not include vulnerability in terms of people. Assessing and comparing vulnerability by built environment metrics provides a narrow view of vulnerability by avoiding impacts on individual people (especially injury or death) and ignores a community's ability to recover.

- "Hazard" is not defined in accompanying federal statutes. In 44 CFR § 201.2, there is a definition that states "*Hazard mitigation means any sustained action taken to reduce or eliminate the long-term risk to human life and property from hazards."* In a separate subchapter, 44 CFR § 312.2 within the same Title (Emergency Management and Assistance) and Chapter (Chapter I Federal Emergency Management Agency, Department of Homeland Security) as the *Local Mitigation Plans* , "(b) The term natural disaster means any hurricane, tornado, storm, flood, high water, wind-driven water, tidal wave, tsunami, earthquake, volcanic eruption, landslide, mudslide, snowstorm, drought, fire, or other catastrophe in any part of the United States which causes, or which may cause, substantial damage or injury to civilian property or persons and, for the purposes of the Act, any explosion, civil disturbance, or any other manmade catastrophe shall be deemed to be a natural disaster." Connecticut General Statutes Chapter 476a Sec. 25-68j defines hazard mitigation as "activities that include, but are not limited to, actions taken to reduce or eliminate long-term risk to human life, infrastructure and property resulting from natural hazards including, but not limited to, flooding, high winds and wildfires." **The lack of a coordinating definition within the regulations and a non-climate description for hazard mitigation drive climate change further away from the center of hazard mitigation plans.**
    - The combinations of these definitions indicate a focus on long-term risk from intense and discrete, time-limited events.
    - The natural disasters listed in 44 CFR § 312.2 are like natural hazards described in Connecticut HMPs except for unlikely hazards to Connecticut such as tsunamis and volcanic eruptions. Some of these disaster events may be altered by climate change or occur because of climate change.
- Likewise, the requirements for State Mitigation Plans are discussed in 44 CFR § 201.4 and similarly does not require climate change to be evaluated or planned for in the document. Each element required for state hazard mitigation plans is outlined in FEMA's State Mitigation Planning Policy Guide (Effective April 19, 2023) and the corresponding federal regulation is referenced for each element. Text in four of the seven elements[5] in the Policy Guide (planning process; hazard identification and risk assessment; state mitigation capabilities; local planning coordination and capability building) describe climate change and how it could be related to each element; however, the corresponding regulations do not require climate change. Reliance on guidance to replace codified requirements perpetuates confusion and reduces the likelihood of climate change inclusion. It may also result in gaps between generations of plans either from one version to the next or between the state and local plans as federal guidance changes.
- Each element required for local hazard mitigation plans is outlined in FEMA's Local Mitigation Planning Policy Guide (Effective April 19, 2023) and the

corresponding federal regulation is referenced for each element. Four of the six elements[6] in the *policy guide* (risk assessment, mitigation strategy requirements, plan maintenance, and plan update) describe climate change and how it could be related to each element; however, the corresponding regulations do not require climate change. An argument could be made that climate change could be included in the definition of hazard mitigation in 44 CFR 201.2, "Hazard mitigation means any sustained action taken to reduce or eliminate the long-term risk to human life and property from hazards." Yet, this gradual shift to interpret this to mean climate change happens by interest of the local jurisdiction and the contemporary policy guide not by regulation across all jurisdictions.

Gap #2: Local Responsibility for Climate Resilience is Not Clear. While most sectors within municipalities have traditional assignments of responsibility (e.g., local road maintenance is overseen by the local public works department; building departments oversee building construction and renovation; and health departments monitor prevailing illnesses or environmental exposure), climate change has not been assigned to a formal department or job title at the local level. Resilience, as a concept, generally includes systematic capacity to address climate change impacts while adaptation refers to specific strategies. The use of "resilience" in this context refers to a program, policy, or systematic approach to address these impacts, which will include adaptation. Resilience is not exclusive of hazard mitigation or emergency management but is inclusive, thus requiring a thoughtful method to coordinate activities where they merge with climate change.

- Current planning capacities are varied across Connecticut municipalities. Planning and/or zoning commissions and staff are not required of municipalities. Present planning staff may not have the time or technical capacity to conduct these activities; moreover, municipalities may not have any dedicated staff for planning activities outside of building departments, administrative staff, and/or an unpaid planning and zoning commission. For example, municipalities in Connecticut currently have difficulty designating floodplain managers and where there is not one, CT Department of Energy and Environmental Protection (CT DEEP) and NFIP must recognize the chief elected official as the floodplain manager. According to responses to the Connecticut Conference of Municipalities (CCM) 2020 salary survey, at least 91 of 169 municipalities have a full-time planning staff member, where 8 of those planners have additional duties such as zoning administration or economic development. Thirteen municipalities have part-time or contracted staff.
- Connecticut General Statutes, Ch. 368 Sec. 19a discusses local health administration with noted topical purview areas of properties with filth, streams, wells, water service, sewage disposal systems, removal of refuse, swampy lands, mosquito breeding places, fuel oil and bottled gas retail, reportable illnesses and health conditions, blindness in newborns, vaccinations, anchorage of houseboats, inspections of salons, etc. Climate change, extreme heat, or flooding are not listed.

- Several components of Connecticut Public Act 21–115: *An Act Concerning Climate Change Adaptation*, enacted July 6, 2021, offered additional local authority for stormwater management specifically. This act grants municipalities additional authorities that relate to stormwater and flood concerns related to climate change and authorizes use of funds towards a control system. It enabled municipalities to create stormwater authorities that will hold significant power in the ability to "plan, lay out, acquire, construct, reconstruct, repair, maintain, supervise, operate and manage a flood [or] prevention, climate resilience and erosion control system" and to "to enter upon and to take and hold, by purchase, condemnation or otherwise, any real property or interest therein which it determines is necessary for use in connection with the…system." In these activities, "such board (1) shall consider all applicable regional and municipal hazard mitigation plans, resilience plans and identifications of vulnerable communities, as defined in subsection (a) of section 16-243y, as well as all applicable municipal plans of conservation and development adopted pursuant to section 8-23, and (2) may consult with the Connecticut Institute for Resilience and Climate Adaptation." At present, HMPs and POCDs, mentioned in that statute, are not required to include climate change.[7]
- In Ch 517 Sec 28-8a, "(a) The chief executive officer of the municipality in which a major disaster or emergency occurs, or his designee, may take such action as he deems necessary to mitigate the major disaster or emergency and to secure and preserve any documents and evidence pertinent to and necessary for a future investigation." A definition is also provided but a process not defined for a "Local civil preparedness emergency" or "disaster emergency" [which] means an emergency declared by the chief executive officer of any town or city in the event of serious disaster affecting such town or city" Ch 517 Sec 28-1(8). Climate change is not described in the "major disaster" or "emergency" definitions; however, some municipalities have used executive powers to declare "climate emergencies."

Gap #3: Primary Regional Planning Documents Do Not Require that Climate Change be Addressed. In Connecticut, regional planning includes: regional Plans of Conversation and Development created in addition to local and state POCDs; multi-jurisdictional HMPs that are not a regional planning document but are instead a compendium of hazard mitigation narratives for the included municipalities with some regional objectives; and transportation planning conducted by the inclusive metropolitan planning organizations. These plans typically include specific projects or strategies that will impact municipalities. Regulations for transportation planning by Metropolitan Planning Organizations (MPOs)[8] (which are usually similar jurisdictional areas with COGs) include but do not define "resilience" with respect to climate change nor, by absence of a definition, is it bounded[9] to a reasonable and commonly understood expectation.

- In 23 CFR 450.306 '*Scope of the metropolitan transportation planning process*', "(b) The metropolitan transportation planning process shall be continuous, cooperative, and comprehensive, and provide for consideration and implementation of projects,

strategies, and services that will address the following factors: (9) Improve the resiliency and reliability of the transportation system and reduce or mitigate stormwater impacts of surface transportation." A nearly verbatim regulation exists for the statewide and nonmetropolitan transportation planning process (23 CFR 450.206). Neither regulation references climate change nor defines resilience. MPOs are required to prepare Long-range Transportation Plans (LRTP) and a Transportation Improvement Program (TIP), but resiliency is not described in 23 CFR 450.324 '*Development and content of the metropolitan transportation plan*' or 23 CFR 450.326 '*Development and content of the transportation improvement program*' (TIP). A definition of resilience was added via the Bipartisan Infrastructure Law to 23 USC 101, which provides definitions to 23 CFR 450; therefore, the generation of plans prior to fall of 2021 were not required to abide by the definition of resiliency, which still limits resilience to the context of "weather events and natural disasters." State transportation asset management plans are required to consider "current and future environmental conditions including extreme weather events, climate change, and seismic activity" (23 CFR 515.7(b)).

- The requirements[10] for the long range (20-year or greater) metropolitan transportation plan, does include "reduce the vulnerability of the existing transportation infrastructure to natural disasters." Neither natural disaster or vulnerability are defined or given a time prospective (See discussion in Gap #1 for distinctions of risks from natural disasters or hazards).[11]
- MPOs also develop Transportation Improvement Program (TIP) at four-year intervals which includes a list of priority capital and non-capital surface transportation projects. They have to be 'fiscally constrained,' i.e. they have to have demonstrated available or committed funds. These projects have to be consistent with the long-range transportation plans.
- Connecticut has two rural councils of governments (Northwest Hills and Northeast COG) that do not also serve as an MPO and are therefore not required to complete an LRTP. Connecticut DOT, in the June 2017 "CTDOT Handbook for Councils of Governments and Metropolitan Planning Organizations," encourages the rural COGs to complete an LRTP. According to 23 CFR § 450.210(b), "the State shall provide for nonmetropolitan local official participation in the development of the long-range statewide transportation plan and the STIP". The STIP must be in cooperated with the affected nonmetropolitan area.
- Climate change, resilience, hazards, or vulnerability or other related concepts are not in 23 U.S.C. 150 National goals and performance management measures. Metropolitan planning organizations and statewide transportation processes must establish performance targets to meet those goals[12].

Gap #4: Spatial Data across Connecticut is varied in availability, accessibility, adequacy, and accordance.

In Connecticut, Geographic Information Systems (GIS) data is generated by multiple levels of government, academic institutions, utilities, nonprofit organizations, and consultants. The generated data may be created for a singular purpose on a limited time frame. It may or may not be maintained or available for other potential users. Coverage of any particular data type across Connecticut may be sporadic and even similar datasets may not be easily reconcilable.

- Federal regulation on the prevailing datasets for particular topics limits the usage of additional datasets and, if using non-federal data, requires additional actions that may discourage the use of non-federal data. For example, 40 CFR 60.3 says "If the Federal Insurance Administrator has not provided sufficient data to furnish a basis for these regulations in a particular community, the community shall obtain, review and reasonably utilize data available from other Federal, State or other sources pending receipt of data from the Federal Insurance Administrator. However, when special flood hazard area designations and water surface elevations have been furnished by the Federal Insurance Administrator, they shall apply." Currently, the procedure for production of the Flood Insurance Rate Maps (FIRM) does not account for climate change-flood impacts such as sea level rise, sea level rise-induced storm surge, or predicted increases in precipitation volumes. Some towns address this deficiency by requiring flood-proofing at distances above base flood elevation. There is not a federally designated method for assessing sea level rise.
- Starting in 2019, CGS Section 7-100l requires municipalities to submit their digital parcel and assessor databases, if they have it, to their regional council of governments, which then submits the information to the CT Office of Policy and Management. The provisioning of such data is dependent on the existence of such geospatial data. It does not provide mechanisms for the creation of such data.
- State agencies have data sets at different stages of completeness. Even similar data sets (e.g., roads) are different for reasons of source, use, and maintenance[13].
- Councils of governments have data sets at different stages of completeness and update intervals.
- UConn CIRCA has developed a Climate Change Vulnerability Index (CCVI) for Fairfield and New Haven Counties and will be expanding it to the remaining Connecticut counties by Spring 2023. This is a multi-criteria decision-support tool for identifying patches and patterns of vulnerability. It is not intended to serve as a parcel-by-parcel analysis of climate risk or as the sole source for interpreting climate vulnerability across a municipality.

III. Potential Remedies to the Planning Gaps

Tools for addressing these gaps in local climate resilience planning could include financial investments, changes to agency services, state legislation, and/or local and state program updates. Several remedies require action from the state legislature while some may be developed within the existing auspices of state agencies and local departments. Suggested

implementing actors are provided in bolded brackets after each recommendation. A table is provided below illustrating which remedies address which gaps.

1. **<u>Mandate inclusion of climate change considerations in local plans.</u>** This may require a more robust inclusion of climate change as elements in HMPs or POCDs; alternatively, it may be a mandate for the creation of local climate vulnerability and adaptation plans. Mandates should be combined with community-level context, incentives, and guidance on appropriate information[14]. At the very least, the role of sea level rise in the POCD should be clarified. Some options are provided below:
   a. **Add requirements for HMPs that address climate change supra federal regulatory requirements[15] [CT State Legislation].** Requiring the inclusion of climate change is not contrary to the intent of such plans but it is not yet included in the federal regulation. It is included in the latest FEMA's Local Mitigation Planning Handbook[16] as described above and some consultants have incorporated climate change vulnerabilities, vulnerable populations, and, to a lesser extent, resilience strategies into their hazard mitigation templates. Standardizing the requirement may lead to other complementary actions such as standardized datasets, training, and programmatic support for common resilience-related mitigation strategies.

      Legislation that adds additional requirement should be clear in the climate stressor, timeline, and/or resources or processes to conduct such analysis and identifying appropriate mitigation strategies. For example, one potential clear action could be modifying the required content of natural hazard plans to include: "In such plans, by 2030, municipalities shall include an inventory of community lifelines[17] and critical transitory and permanent infrastructure, that are of vital importance to immediate and longer-term recovery following an extreme event." The legislation could also include a requirement to identify which infrastructure will be within the codified 2050 planning threshold for sea level rise.
   b. **Require Plans of Conservation & Development to include climate change impacts in the planning decisions[18] [CT State Legislation].** While the textual *and specific* addition of climate change to CGS Sec 8-23 would be a significant step, new legislation should be explicit in how climate change impacts are to be included in POCDs, such as mapping specific climate stressors, identifying at-risk critical infrastructure, developing mitigating land use strategies for at-risk areas of the municipality, and integrating across other local plans. Municipal land use planning and development are significant opportunities for adaption and are consistent with zoning commission authority to establish regulations "to secure safety from fire, panic, flood and other dangers [and] to promote health and the general welfare…" (CGS 8-2). The Rhode Island Division of Planning provides a Comprehensive Planning Standards Manual and Comprehensive Planning Guidance Handbook that describe how climate change should be incorporated into the local comprehensive plan[19].

Some specific potential prescriptions or remedies include:

i. Amend CGS 8-23 (2)(d) to include a (13) that could say "impacts of climate change on the physical environment, infrastructure, and public health of the municipality and methods to address such impacts on the activities described in 8-23(e), with identification and special consideration of impacts to traditionally marginalized populations."
ii. Highlighting or identifying source data to guide decision making[20].
iii. Incorporating findings from Consolidated Plans (housing) or requiring towns that do not have Consolidated Plans to include increased climate risks to low- and moderate-income households[21];
iv. Identify key land uses in risk areas and redirect out of the risk area, even if it requires a phased plan. For example, identify areas for increased housing density elsewhere in the community outside the floodplain. The goals should be to maintain social capital of residents by preserving social networks to the extent practicable. Accompanying efforts to that relocation are likely necessary from social services, religious institutions, social clubs, and recreational groups.
v. Identify areas, including developed and undeveloped areas that are likely to be inundated by 2050, then 2100, and prioritize those areas for acquisition, use change, or protection.
vi. Requiring municipalities of certain sizes or identified as environmental justice communities to include land use management strategies to reduce the heat island effect and to identify zoning regulations, town ordinances, and land use policies, that would reduce such impacts.
vii. Ch 444 Sec 22a-102 may provide an opportunity to include climate change in consideration of coastal programs by requiring discussion of risks to coastal resources with respect to climate change.

c. Require Climate Change Vulnerability and Adaptation Plans [CT State Legislation]. This requirement may be considered in addition to the inclusion of climate change in POCDs or HMPs, or it may be considered as a separate plan with a requirement for consistency across the POCD, HMP, and Climate Change Vulnerability and Adaptation Plans. As described above, mandates for consideration of climate impacts can be set at certain intervals or for municipalities of certain sizes or geography. It may also be for municipalities of certain social risk or noted as a 'distressed municipality.' State programming should be established to support distressed or smaller municipalities with vulnerability analysis and adaptation planning. These plans should at least consider vulnerabilities related to flooding and heat with secondary impacts related to these. Legislation should set expectations such as requiring the geographic extent of the impacts, special risk populations within those areas, and potential methods to address those the vulnerabilities. The Infrastructure Investment and Jobs Act, enacted in November 2021 as Public Law 117-58, also known as the "Bipartisan Infrastructure

Law," designated new funds for MPOs. Where that funding does not include climate resilience, or where there is not an MPO, financial support or technical assistance should be coordinated, perhaps through the councils of government with a climate-focused institute such as UConn CIRCA[22].

Alternatively, the Office of Policy and Management could produce guidance on integrating land-use and climate-related plans such that each plan meets their respective requirements while coordinating their final actions to address the local vulnerabilities[23] similar to Rhode Island. In 23 CFR § 450.324(g), MPOs are already required to consult state and local agencies regarding conservation plans or maps and inventories of natural or historic resources. The new BIL also called for the development of regional goals for the integration of housing, transportation, economic development strategies.

d. **Amend other local plans to include climate change, which may be dependent on other supporting measures (data, training, etc.). These may be plans that address targeted goals such as Open Space or Comprehensive Economic Development Strategy (CEDS) [CT State Legislature or local departments with support from state agencies].** For example, Open Space Plans could consider repetitive loss properties for potential acquisition and alternative recreational access acquiring areas to be inundated or CEDS could review and support business continuity plans for recovery following disaster events or retrofitting commercial area infrastructure for expected risk. Notably, 24 CFR 91 Subpart D, which regulates Consolidated Plans for housing, does include climate change[21].
e. **Implement requirements for addressing short-term responses to the climate vulnerabilities at the local level [CT State Legislature or local departments with support from state agencies].** In addition to the climate vulnerability and adaptation plans and the natural hazard mitigation plan, Climate Vulnerability & Adaptation plans should illustrate how local agencies will address the short-term impacts from these growing vulnerabilities. For example, municipal heat response plans are a potential coordinating mechanism during these events. State legislation could require municipalities of certain sizes (higher urbanized areas may have increased risk) or distressed municipalities, which may have residents with less resources to escape the impacts, to prepare such plans at regular intervals and direct the Department of Public Health or Department of Emergency Management and Homeland Security to assist. The legislature might also consider requiring heat in the Local Emergency Operations Plan. Recent research by CIRCA and the CT Department of Public Health indicates that Heat Response Plans are not a common practice in Connecticut and where produced, are not always publicly available[24]. A heat audit of civic spaces that serve critical functions for heat relief (emergency shelters, cooling stations, schools, fire departments, town halls, recreation services, etc.) should also be considered. OPM or the Department of Administrative Services may assist with such an audit.

2. **<u>Create and maintain GIS infrastructure</u>.** GIS data for decision-making should be consistent, compatible, reliable, and accessible across state agencies and different levels of government, especially for municipalities, COGs, and state agencies. Data should be comprehensively developed and regularly maintained at the state level. Standard data sources need to complete the above recommended planning activities can be identified and reviewed at regular intervals. The Geographic Information Systems Advisory Council and Geographic Information Officer position created in Public Act 21-2 should review existing state data and consider how such data should support state resiliency planning in its evaluation. While the work of the Advisory Council and Officer is underway, supporting activities may include:
   - **a.** Provide state support to municipalities in the preparation and/or maintenance of digital parcel maps joined with real estate information, planimetric data that illustrates climate vulnerabilities including but not limited to building outlines; complete datasets of locations of critical infrastructure like substations, shelters, and roadway elevations; and areas of planned investment. Perhaps through a state agency effort or planning funds to COGs, a GIS database of all hazard mitigation projects should be created. The state should also produce maps of areas of state investment of equipment or infrastructure that has a certain cost threshold and/or is located in the floodplain or within areas impacted by projected 2050 sea level rise.
   - **b.** Provide state funding and a cadastral standard for municipalities to create spatial data layers that identifies community lifelines that mirror categorization established by FEMA[25]. This action is a way to formalize the priority locations municipalities communicate to electric utilities for restoration following outages, identify infrastructure at risk to flooding, and including their protection in hazard mitigation plans.
   - **c.** Continue investment in downscaling of climatic data to achieve the following if not complete list of benefits: 1) articulating the threat multiplier effect on natural hazards for HMPs 2) directing land use away from risk areas or designing land use that mitigates vulnerabilities such as heat 3) informing investment that is expected to last beyond the lifetime of the incoming vulnerability and 4) providing a consistent source of data across CT municipalities. This downscaling could apply to heat or flooding/sea level rise exposure to municipalities. Special care should be taken to address uncertainty in long-term projections or climate impacts with less specific boundaries such as intense precipitation. The latest conditions/projections and assessment techniques should be incorporated on an ongoing basis. This down-scaled data could give more specific guidance to particular parcels or even identify patterns of risk across the state for a coordinated statewide response.
   - **d.** Develop or refine maps that identify natural resources that are either at risk and/or of important resilience function to protect the landscape character, maintain or restore ecosystem services, and protect species unique to Connecticut. Engage conservation

biology and climatology expertise to identify areas of high vulnerability or high resiliency. Provide sufficient mapping and description that these areas may be considered in planning e.g., in areas of planned conservation, in Environmental Assessment/Environmental Impact Statements, or revising infrastructure design.

e. Incorporate additional climate vulnerability maps into existing map usages (e.g. the State Locational Guide Map, Statewide Comprehensive Outdoor Recreation Plan, Connecticut Wildlife Action Plan, State Green Plan) to clearly delineate areas of regional resilience such as important landscape corridors for habitat migration, access to subsistence fishing, planned state investments, and areas to direct development. A special land use mapping assessment process should review potential priority funding areas in the context of projected flooding vulnerabilities to determine if limitations on development in those areas would be appropriate. Currently, conservation criteria that can alter the status of a priority funding area includes Hurricane inundation zones and 100-year flood zones. These could be expanded to include high heat or high flood vulnerabilities. CGS Sec. 16a-35d. '*Funding of growth-related projects*' can be amended to include exception for funding in a non-priority growth area if, with special mitigations for the local conservation factor, the project reduces harm to people, property, and ecosystem services. At the local level, current areas of planned development should be contrasted to areas of known or potential climate vulnerabilities and how development should respond appropriately.

3. **Develop clearly designated local authority for coordinating, evaluating, and implementing climate change assessment and planning [municipalities].** Municipalities should consider a singular point of contact or a committee to manage climate change adaptation planning. While individual municipal departments will have authority to make certain purchases or conduct certain activities, a coordinating office or position could reduce inefficiencies, serve as a reference on best practices, apply for grants, support the executive offices, etc. Nationally, any significant urban areas or states have started employing Chief Resilience Officers or even Chief Heat Officers.
4. **Support municipal resilience planning activities at multiple scales.** Regional-scale planning, complex infrastructure construction or renovation, and widespread climate impacts such as sea level rise or heat islands require methodical, inclusive, and ongoing effort to limit the enormity of the vulnerability and to provide equitable adaptation. Larger scale planning is also a component to creating a resilient system such as creating redundancies in the applicable system (e.g., transportation or drinking water), distributing costs, and increasing capacity.
   a. CGS 8-2e permits two or more towns to create a system of transfer of development rights across municipal boundaries. Legislation could enable COGs or another regional entity to coordinate such systems and for resilience purposes, such as purchasing development rights in anticipated sea level rise inundation areas or coastal properties purchasing rights in inland areas that could serve as water storage. Coastal overlay zones are a related tool to support development in appropriate areas.

b. In coordination with the COGs, conduct inter-municipal and inter-state resilience planning especially in key transportation corridors and economic centers. Key interstate locations include the NY-MA-CT tri-state character and economic development area; the Danbury-Brewster Corridor and the Hartford-Springfield corridor. Inter-municipal coordination could include food system planning, heat relief, and evacuation. Additionally, communities inland from the coast will likely be receiving areas on a temporary or even permanent basis as coastal residents and/or businesses leave high-risk areas[26]. These areas will require continual evaluations for ecosystem services, lifelines maintenance, and transportation reliability.

c. Where the International Code Council, and therefore the state building code[27], does not address risks to the built infrastructure for flooding, wind damage, heating/cooling, etc., municipalities should be incentivized to require additional resilience measures such as two feet or higher of freeboard above flood elevations, passive solar orientations, or wind-resistant roofing techniques.

d. Formally allow, either through regulatory action or via program implementation, municipalities to apply for adaptation projects under Urban Action Bonds or Small Town Economic Assistance Program (STEAP) bonds for projects listed in POCDs and/or Climate Adaptation Plans. Such projects should explicitly state the climate vulnerability the project would address and its consistency with local planning priorities.

e. Provide for ongoing training in climate adaptation and resilience to municipal and regional staff or volunteers.

f. Foster strategic planning for transportation. Both the MPOs and the state DOT should direct transportation dollars to reduce climate vulnerabilities or enhance protective actions. Standards should be set for new projects to evaluate if projects increase heat or flooding risks to customers or the surrounding community, similar to an Environmental Assessment or Environmental Impact Statement where alternatives are weighed and mitigating design elements are implemented. This may be addressed in the future as the BIL now requires the consideration of extreme weather and resilience in the risk management analysis in asset management plans.

5. **Remove planning impediments or inconsistencies to local adaptation strategies or resilience measures.** Current legislation may impede, contradict, or restrict commonly implemented adaptation strategies. One successful example is Public Act 21-29, which enabled zoning boards to "provide for floating zones, overlay zones and planned development districts". This corrected CGS *124 Sec 9-2m Floating and overlay zones and flexible zoning districts* which limited which municipalities could deploy flexible zoning areas.

   a. Even though two or more municipalities under CGS 8-2e can enter into an agreement, which widens the pool of properties that can participate in a transfer of development rights (TDR) program, CGS Sec. 8-2f requires joint application of the transferor and transferee. A program, whether regional or state-wide, that can identify, hold, and/or

shepherd the transfers could increase the chances of successful transfers. A TDR bank could even purchase and hold the rights for purchase by receiving zones[28].

b. Codify definitions and how they relate to climate change for terms such as vulnerability, resilience, hazard, and hazard mitigation to avoid confusion and encourage consistency across plans and regulations.

Statutes should be reviewed to identify stumbling blocks to local financing mechanisms (like the implemented stormwater authorities concept mentioned above) that could fund adaptation measures. Concepts such as developmental impact fees, municipal bonds, special assessment districts, or user fees could be considered. Improved data and planning will protect major capital investments by locating in lower risk areas or identifying risk-reductions solutions on-site before exposure to the particular climate impact.

Of the aforementioned solutions, incorporating climate change into ongoing planning processes and maintaining GIS data will be basic building blocks to implementing resilience across every municipality in Connecticut.

IV. Conclusions

Without clear responsibilities, dedication of resources, and responsibilities for implementation, the diffuse nature of local resilience planning in Connecticut will continue to be piecemeal, inconsistent, opportunistic, and inequitable. Most states and localities are grappling now with the locus of responsibility for this type of planning. Wherever possible, for expediency, changes should be made to existing programs or responsibilities. While this white paper focuses on the factors related to local resilience where there is local control, additional thorough evaluation of regional concepts such as watershed management or transportation systems could provide similar observations in the gaps and opportunities for adaptation planning. Additionally, review of how greenhouse gas mitigation can be enhanced through these mechanisms would lead to co-benefits.

Creating a more Resilient Connecticut will depend not only on individual projects in a handful of towns but on a system that enables and enhances resilience for all communities across the state. That must begin with removing the limitations that already exist, enhancing existing processes, and creating new processes or policies that make adaptation a practice and resilience an inherent character of planning.

Figure 1. Relationship between identified gaps and suggested remedies.	
Gap	**Potential Remedy**
Gap #1 Inclusion of Climate Change in Primary Local Planning Documents is Voluntary and Sporadic.	• Mandate inclusion of climate change in local plans. • Support municipal resilience planning activities at multiple scales. • Create and Maintain GIS Infrastructure.
Gap #2 Local Responsibility for Climate Resilience is Not Clear	• Develop clear local authority for coordinating, evaluating, and implementing climate change assessment and planning. • Remove planning impediments or inconsistencies to local adaptation strategies or resilience measures.
Gap #3 Primary Regional Planning Documents Do Not Require that Climate Change be Addressed	• Support municipal resilience planning activities at multiple scales. • Remove planning impediments or inconsistencies to local adaptation strategies or resilience measures.
Gap #4 Spatial Data across Connecticut is varied in availability, accessibility, adequacy, and accordance	• Create and Maintain GIS Infrastructure.

Endnotes

Funding for this project was provided by the United States Department of Housing and Urban Development through the Community Development Block Grant National Disaster Recovery Program, as administered by the State of Connecticut, Department of Housing. This publication does not express the views of the Department of Housing or the State of Connecticut. The views and opinions expressed are those of the authors. Project support comes from the Connecticut Institute for Resilience and Climate Adaptation (CIRCA) and the University of Connecticut. CIRCA's mission is to increase the resilience and sustainability of communities vulnerable to the growing impacts of climate change on the natural, built, and human environments.

Many thanks for the helpful comments and advice on the white paper provided by John Guszkowski and CIRCA staff.

DISCLAIMER: This white paper addresses issues of general interest and does not give any specific legal advice pertaining to any specific circumstance. Parties should obtain advice from a lawyer or other qualified professional before acting on the information in this paper.

[1] *Global Warming Solutions Act* (Public Act 08-98) set mandatory GHG reduction targets of 10% below 1990 levels by 2020 and 80% below 2001 levels by 2050. Gov. Lamont's Executive Order 1 established a 45% GHG emissions reduction below 2001 levels by 2030 by state government.

[2] Greenhouse gas mitigation and other carbon reduction methods are important to consider but not fully explored in this paper.

[3] As of 2017, 33 states require local (definition for local varies between borough, township, municipality, city, etc.) comprehensive plans. No state requires a discrete climate change element in a local comprehensive plan. Six have legislation enhancing resilience in the local comprehensive plan. Source: *A Survey of Climate Change Adaptation*

Planning. (2019). American Planning Association. https://www.planning.org/publications/document/9189463/ https://www.planning.org/nationalcenters/hazards/statesurvey/

[4] Since the municipal coastal program is permissible but not required, review of statutes governing these additional plans were not reviewed.

[5] There are two additional elements, High Hazard Potential Dams and Fire Management assistance grants, but it was not counted here as it's very specific and not broadly applicable. Additional elements exist for an "enhanced" plan.

[6] There is a 7th element, Element G: High Hazard Potential Dams, but it was not counted here as it's very specific and not broadly applicable.

[7] This act also expanded work of the Connecticut Green Bank including a Clean Energy Fund and an Environmental Infrastructure Fund, which may receive funds required by law to be deposited and even federal funds.

[8] USDOT has a table with examples on how to incorporate resilience into transportation planning at https://www.fhwa.dot.gov/environment/sustainability/resilience/publications/ratp/index.cfm. USDOT also prepared a white paper that provides interesting reflections on how resilience is being incorporated into MPO and State DOT planning: Dix, Brenda; Zgoda, Beth; Vargo, Amanda; Heitsch, Samantha; Gestwick, Taylor. (2018) *Integrating Resilience into the Transportation Planning Process: White Paper on Literature Review Findings.* [White paper]. U.S. Department of Transportation, Federal Highway Administration, FHWAHEP-18-050. https://www.fhwa.dot.gov/environment/sustainability/resilience/ongoing_and_current_research/planning/integrating_resilience.pdf

[9] Climate change definitions were included in FHWA Order 5520, which was completed to comply with President Obama's Executive Order 13653. President Trump rescinded EO 13653 with EO13783.

[10] 23 CFR 450.324(f)(7)

[11] The Bipartisan Infrastructure Law (BIL) (§ 11105) had amendments, which took effect October 1, 2021, which require that States take into consideration extreme weather and resilience within their lifecycle cost and risk management analysis in their transit asset management plans (TAMPs).

[12] 23 CFR 450.306(d)(2)(i) and 23 CFR 450.206(c)(1), respectively

[13] The CT Office of Policy & Management recently established a Geographic Information Systems Office directed by a Geographic Information Officer (GIO) in 2022 following the 2021 June Special Session of the state legislature. This office will be responsible for coordinate GIS across agencies, COGs, municipalities, and other constituencies. A Geographic Information Systems Advisory Council will provide consultation to the GIO.

[14] Butler, W., Holmes, T., & Lange, Z. (2021). Mandated Planning for Climate Change: Responding to the Peril of Flood Act for Sea Level Rise Adaptation in Florida. Journal of the American Planning Association, 87(3), 370–382. https://doi.org/10.1080/01944363.2020.1865188

[15] Examples see: Cal. Gov. Code § 65302 requires climate change in the safety element of their local hazard mitigation plan; R.I. Gen. Laws § 42-6.2-3 (State agencies shall support the climate change coordinating council as they "(11) Encourages [stet] municipalities to incorporate climate change adaptation into local hazard mitigation plans and, when feasible, into hazard mitigation projects"). Vermont's emergency management agency must review local plans with respect to climate change biennially. An ICLEI report, "Integrating Hazard Mitigation and Climate Adaptation Planning: Case Studies and Lessons Learned" discusses this relationship further.

[16] FEMA also released a "Guide to Expanding Mitigation: Making the Connection to the Coast" in May 2022.

[17] Community Lifelines is a framework established by FEMA to prioritize restoration of different functions (e.g., Safety & Security, Communications, Energy, etc.) following disasters.

[18] New Jersey master plan has comprehensive obligations for the inclusion of climate change in the land use element including consistency with the hazard mitigation and other plans (N.J. Stat. § 40:55D-28).

[19] https://planning.ri.gov/planning-areas/local-comprehensive-planning

[20] As an example, Colorado's comprehensive planning statutes state applicable sources - CO Rev Stat § 31-23-206 (2016).

[21] Local and state Consolidated Plans for housing have to consider climate change. 24 CFR 91.310(2)(3) Commencing with consolidated plans submitted on or after January 1, 2018, the State must also describe the

vulnerability of housing occupied by low- and moderate-income households to increased natural hazard risks due to climate change based on an analysis of data, findings, and methods identified by the State in its consolidated plan. 24 CFR 91.210(a)(5) Commencing with consolidated plans submitted on or after January 1, 2018, the jurisdiction must also describe the vulnerability of housing occupied by low- and moderate-income households to increased natural hazard risks associated with climate change based on an analysis of data, findings, and methods identified by the jurisdiction in its consolidated plan.

[22] The Bipartisan Infrastructure Law also created the Promoting Resilient Operations for Transformative, Efficient, and Cost-Saving Transportation (PROTECT) Formula Program which encourage multimodal and multiscale resilient transportation planning.

[23] Integration of land use and transportation planning was also suggested in Peckett, H., & Duffy, C. (2012). *Best planning practices: Metropolitan transportation plans.* U.S. Department of Transportation. https://www.planning.dot.gov/documents/BestPlanningPractices_MTP.pdf

[24] Elton, N., Hayes, L.E., & Wozniak-Brown, J. *Preliminary Results: Emergency Shelter and Cooling Center Practices in Connecticut.* Connecticut Department of Public Health and UConn Connecticut Institute for Resilience and Climate Adaptation. 2022.

[25] https://www.fema.gov/emergency-managers/practitioners/lifelines

[26] Internal, regional, and national migration is difficult to predict except general acceptance of movement away from risk to areas with less risk. An example story is: Ropeik, A. (2021, January 22*). Americans Are Moving to Escape Climate Impacts. Towns Expect More to Come*. NPR.

[27] In 2022, the State Building Inspector, State Fire Marshal and the Codes and Standards Committee intend to adopt the 2022 State Building and Fire Safety codes based on the 2021 editions of the International Code Council (ICC) documents.

[28] Please see CIRCA's Legal and Policy products on additional TDR considerations.

Emergency Sheltering & Cooling Center Practices in Connecticut

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More Information on CIRCA projects can be found at circa.uconn.edu.

More information on Resilient Connecticut can be found at resilientconnecticut.uconn.edu.

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I. Introduction

Future climate scenarios for Connecticut predict that extreme precipitation and extreme heat events will occur more frequently and that sea levels will rise.[1,2] Additionally, regional projections for the entire Northeast forecast severe hurricanes and coastal storms happening more often.[3]

One strategy to protect human health and safety against these threats includes provision of facilities that offer safety from exposure to direct and indirect impacts of extreme weather conditions and events.

Temporary emergency shelters are the most common shelter facilities that provide temporary refuge to people displaced by emergency events such as floods, hurricanes, and extended power outages. They can offer on-site services such as reliable electricity and running water, beds, and heating or cooling to support a safe and secure living environment for the duration of an emergency and its aftermath to individuals and families.

Another type of shelter, cooling centers, are air-conditioned or cooled buildings that are available to the public and designated as safe spaces specifically from extreme heat. The Centers for Disease Control and Prevention (CDC) recommends designation of cooling centers, along with extreme heat response plans, to help prevent heat-related illness and death among vulnerable populations, including those without access to air conditioning.[4] Populations vulnerable to poor health outcomes associated with extreme heat exposure also include people with chronic conditions (e.g. kidney disease, diabetes, and heart disease), as well as senior citizens and very young children, due to reduced thermoregulatory function.[4]

Recognizing the value of shelters and cooling centers to increasing resilience of Connecticut's populations to the negative health impacts of climate change, the Connecticut Department of Public Health (DPH) identified a need for a baseline assessment of Connecticut practices. DPH staff worked with staff from the UConn Connecticut Institute for Resilience and Climate Adaptation (UConn CIRCA) and a Yale School of Public Health graduate student, whose participation was funded by the Yale Center on Climate Change and Health, developing and distributing a survey to gather data on temporary emergency shelters and cooling centers in Connecticut. The approach followed those used in both New York and California for obtaining municipality-level shelter information.[6,7] The primary survey objective was to organize and analyze information to inform public health officials and climate resilience planners in the development of best management practices of cooling centers and temporary emergency shelters, as first recommended by the Governor's Council on Climate Change.[8]

Details of survey content, distribution, and results are presented here as the first publicly available inventory of shelters and cooling centers and analysis of sheltering practices in Connecticut. As the response rate for the survey ranged from 36% (60 towns providing completed surveys) to 59% (99 towns with completed and incomplete surveys), the results of

this survey are preliminary. Findings presented here are thus considered preliminary assessments of shelter and cooling center practices in Connecticut and are intended to encourage more robust information exchange in the future among shelter management, emergency response, and public health stakeholders.

II. Survey Content and Distribution

The survey was created and distributed in 2020 using Qualtrics, an online survey platform. Content and questions were informed by a similar survey.[6] In total, it was comprised of 27 multiple choice-type and short answer-type questions divided among four main sections focused on respondent contact information and affiliation, temporary emergency shelters, cooling centers, and general information about local emergency management and emergency preparedness within municipalities. Respondents were instructed to complete the survey based on shelter operations during the previous year, 2019, as the COVID-19 pandemic and response likely altered the sheltering operations in 2020. The survey was initially piloted by colleagues and professionals for feedback prior to official distribution and was estimated to take 20-30 minutes to complete.

The target population for survey completion was professionals with knowledge of or direct experience with shelter and cooling center management and operations throughout the state and within all 169 local municipalities of Connecticut. Accordingly, the survey was distributed to 257 local health directors, local emergency management directors and regional Councils of Governments (COGs) throughout the state. The method of distribution was via an email that included introductory information and a link to the survey that remained active from September 2 to October 2, 2020. A copy of the survey is currently available at CIRCA's website.

We received 68 completed survey responses and an additional 49 partially completed responses which varied from 25% to 97% completion. As a result, survey questions varied in the number of total responses. Overall, we received responses from all nine COGs, however, with unequal town-specific response rates that varied from 36.8% to 100% across the COGs. One possible explanation for the low response rate is that the survey was distributed during September 2020 when the number of COVID-19 cases were increasing and attention of potential respondents in the target population was diverted to pandemic response.

III. Temporary Emergency Shelters

Connecticut temporary emergency shelters are operated with assistance from local, regional, and state partners, according to the survey results, with predominant management from emergency management and local chief elected officials (see Table 1). Nationally, and as described in the Connecticut State Response Framework, equipment allocation and food or water provisioning at shelters beyond immediate provisions often is based on similar levels of coordination.[9,10]

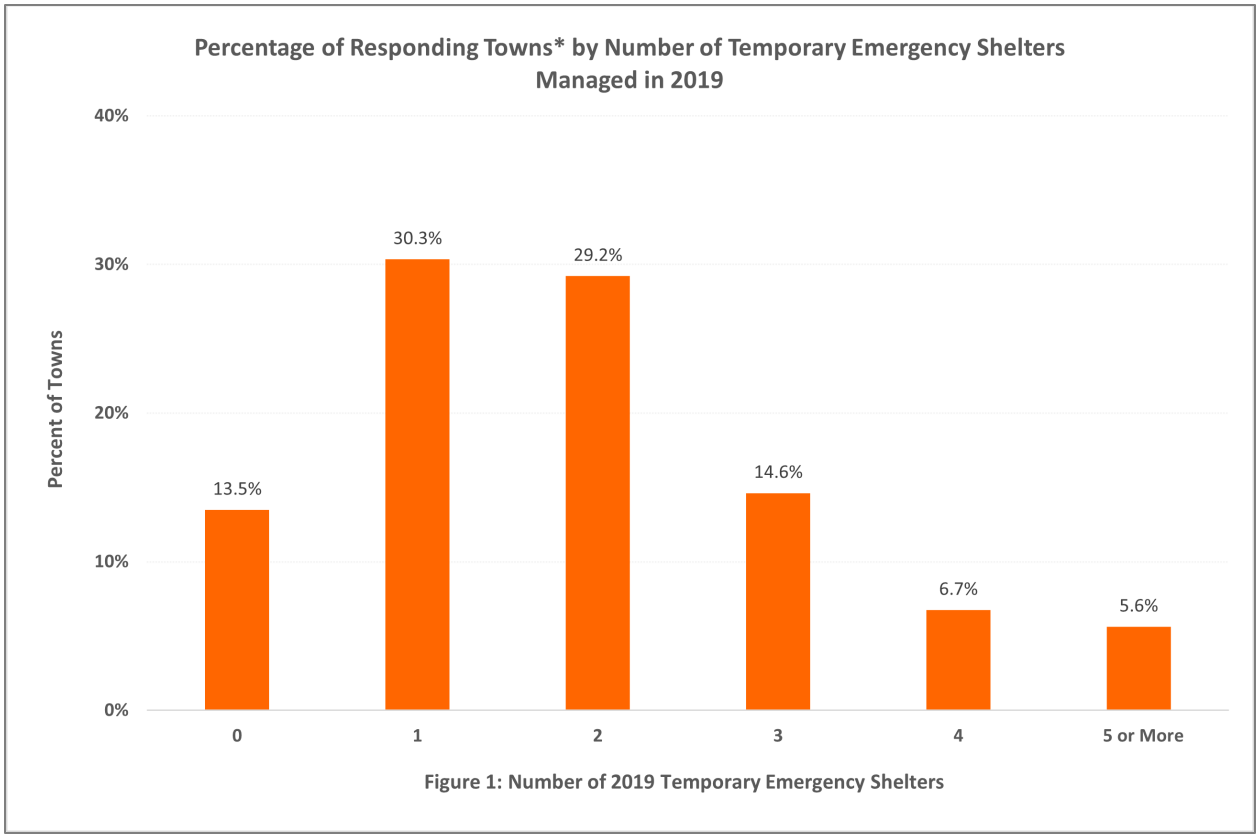

Figure 1: Number of 2019 Temporary Emergency Shelters

Provisional survey results also indicated that temporary emergency shelters are locally available and almost always based in public buildings. Among the 89 Connecticut towns that responded, counts of the total number of emergency shelters in their jurisdictions in 2019 ranged from zero to ten. Most frequently, one shelter per town was reported to be available, but overall, the majority (>50%) of towns indicated that at least two shelters were available locally (see Figure 1). Most shelters were public schools, senior centers, and other community/hospitality centers. Among these building types, most often, shelters were located at public schools, including elementary, middle, and high schools. Fire stations/departments, libraries, churches, municipal offices, homeless shelters, and a mall were also all named as shelter facility types.

Table 1: Support, Advertisement, and Amenities (Emergency Shelters)

Organizational Support Types	Methods of Advertisement	Amenities
Local Emergency Management Director	Social Media	Bathrooms
First Selectman/Mayor	Online	Electrical outlets
Local Health Department	News/media/press release	ADA access
Volunteers	Text-based service	Back-up power
		Seating area
		Cold clean drinking water

Entries provided here represent a cumulative 50% of responses after reordering from greatest frequency of responses to lowest. This also included the response that surpassed 50% cumulatively.

Table 1 provides information on common communication strategies about shelter availability, as well as amenities at shelters in 2019, as provided by survey respondent towns. Only two towns indicated that shelters were advertised in multiple languages. Limited variety of communication types can limit certain populations during an emergency event, particularly those without access to WiFi, phone services, or translation services. Provided transportation was seldom listed among the survey responses, which may indicate limited physical accessibility to shelters for at-risk populations.[11] Additionally, the amenities and operating processes are similar important elements for shelter planning.[12] Proper amenities are important to provide a respectful environment and reduce mental health issues among displaced individuals.

Organizational support in shelter operations was predominantly provided by the local emergency management director, the chief elected official, local health department, and volunteers. The frequency of health department involvement was around 10%.

IV. Cooling Centers

Of the 89 towns that responded, almost a third reported that they did not offer cooling centers in 2019 (see Figure 2). Towns with cooling centers most frequently had one available per town. The remaining approximate one-third of towns reported availability of between two and six cooling centers in 2019.

Cooling centers frequently overlapped temporary emergency shelters, with 43% of cooling centers of described as being based in the same facility/location as shelters. The majority of cooling centers were offered in public libraries, senior centers, and government and municipal

office buildings. Availability of temporary cooling spaces, as well as planning around heat response plans, was also reported by respondent towns. While 29 towns reported having a heat response plan, only 5 of the 29 towns had a publicly available heat response plan. Heat response plans, in addition to heat watch/warning systems and education, are a useful public health measure to reduce the health effects due to extreme heat.[18,19]

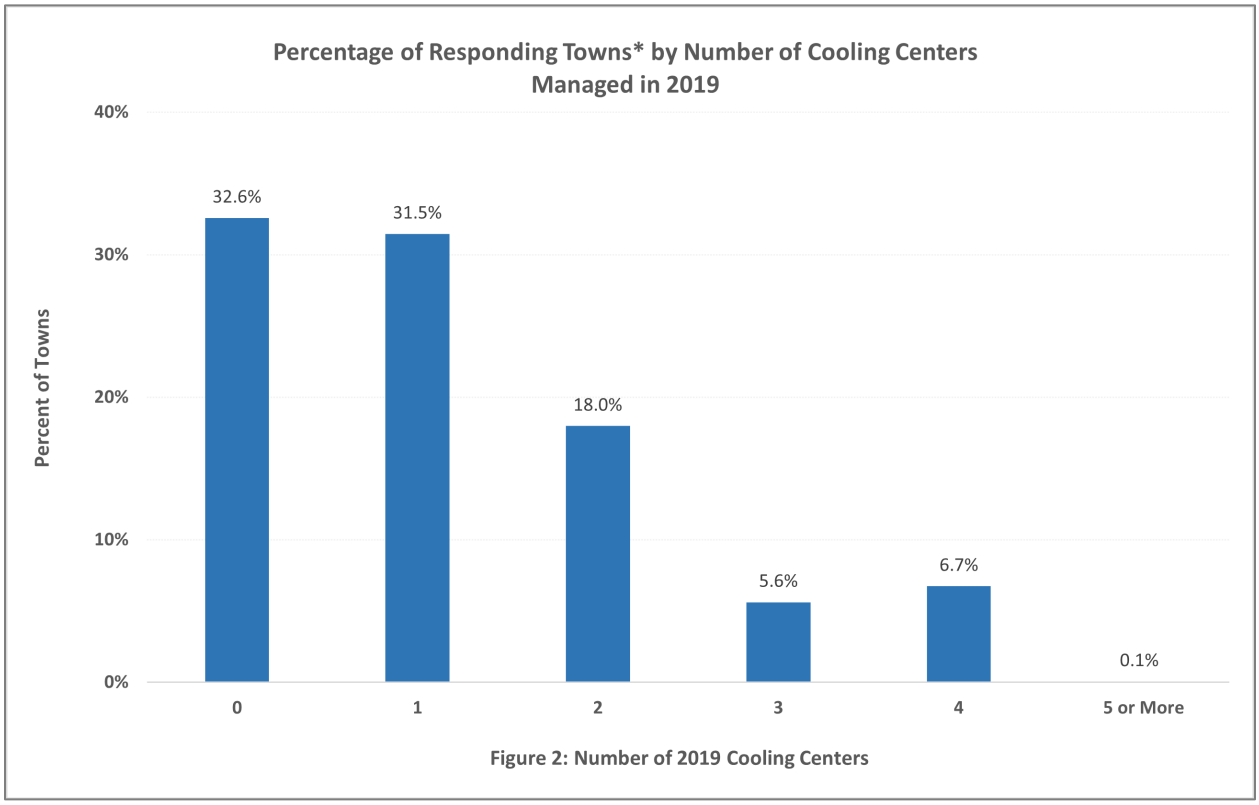

Figure 2: Number of 2019 Cooling Centers

In Connecticut, cooling centers are operated and managed, according to preliminary survey results, predominantly by the local emergency management director and the chief elected official, with less frequent support from employees at the planned shelter and the fire department. The frequency of health department involvement was slightly less than 10%. (Table 2).

Table 2: Support, Advertisement, and Amenities (Cooling Centers)

Organizational Support Types	Methods of Advertisement	Amenities
Local Emergency Management Director	Online	Air-conditioning
First Selectman/Mayor	Social Media	Seating area
Employees at the planned shelter	News/media/press release	Bathrooms
Fire Department		Cold clean drinking water
		Electrical outlets
Entries provided here represent a cumulative 50% of responses after reordering from greatest frequency of responses to lowest. This also included the response that surpassed 50% cumulatively.		

Like emergency shelters, knowledge of types of communication strategies and available amenities can identify how the primary threat (in this case, heat) is being mitigated and how comfortable a cooling center might be to the general public. Often, more amenities will appeal to more people, which can help prevent more heat-related illnesses during an extreme heat event. Greater amenity access at cooling centers can also foster a greater sense of community and social cohesion.[5,13] Social capital and social networks were protective of the elderly during the 1995 Chicago heat wave.[17] Common amenities and types of advertisement/communication for Connecticut cooling centers described by respondent towns are provided in Table 2.

V. Key Considerations

In future efforts to collect this information, the team will consider dissemination of initial survey results via formal presentation to stakeholder groups, which should be helpful to increase the response rate for future similarly focused surveys. This has shown to be an effective strategy in a cooling center survey performed in New York State.[6] With the preliminary results, the following recommendations are provided to aid future stakeholder collaboration and resilience planning:

- With a higher response rate, spatial analysis of the locations of cooling centers and emergency shelters could be used to assess access to these sheltering services by vulnerable populations to inform future resilience planning, such as availability along existing transit routes and walkability from affordable and/or senior housing. Such information can inform key statewide assessments and plans, including updates to the 2019 State Hazard Mitigation Plan. The GC3 Public Health and Safety Working Group offered the following recommendation: "PHS – 17: Create an updated Hurricane and

Storm Evacuation Plan for Connecticut...An updated plan is needed to identify and communicate evacuation routes, inland shelters (particularly those for large-scale evacuation events from the coast), critical facilities and housing in flood zones, and to develop a coordinated strategy for safe evacuation of vulnerable populations in flood-prone areas."[14] Regional and state coordination would be necessary to identify inland locations that would be of sufficient size and amenities to serve as regional shelters especially through an accessibility lens. With new flooding and climate vulnerability mapping, evacuation routes in Connecticut could be improved by identifying other places at risk of flood (especially those not already mapped by FEMA), incorporating sea level rise projections, and making them broadly available.

- With a higher response rate, the presence or absence of particular amenities could inform policy or programmatic needs to increase accessibility and address immediate needs for shelter attendees. For example, evacuating pets has been reported as a barrier to Connecticut residents.[15]
- Given the significant usage of public buildings for emergency sheltering and cooling centers, state agencies responsible for capital expenditures such as Department of Administrative Services, Office of Policy and Management, and the Department of Education can collaborate on meeting the multiple purposes that these buildings serve and rectify service challenges such as a lack of air conditioning in a cooling center.
- Future review could articulate the impacts of access barriers such as transportation, language, methods of advertisement and shelter features.
- Given the low prevalence of heat response plans among respondents and the predicted doubling of heat waves by 2050[1], the support of heat response plans under DPH's newly established Office of Climate and Public Health, supported by the CDC BRACE grant will meet an important gap. This action may also address the reduced involvement of health departments in cooling center operations.

Endnotes

Funding statement: The project was partially funded through the Yale Center on Climate Change and Health summer internship program and by the United States Department of Housing and Urban Development through the Community Development Block Grant National Disaster Recovery Program, as administered by the State of Connecticut, Department of Housing. This publication does not express the views of the Department of Housing or the State of Connecticut. The views and opinions expressed are those of the authors.

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Floodplain Building Elevation Standards for Critical Facilities and Activities

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Executive Summary

Flood protection elevations are a critical safety factor for construction in the flood plain as well as a regulatory compliance step in relevant construction.[1] Determining the appropriate flood protection height required for an infrastructure project can be complex. Factors determining the applicable standards can vary depending on location, funding source, construction type and critical/ non-critical designation. To identify the project's base flood elevation, a series of questions must be answered about the project to help guide the regulatory / statutory analysis:

In which FEMA flood zone is the facility located?
What type of facility is being constructed, altered, repaired, or renovated?
What actions or activity currently occur, or will occur, in the facility?
Is this a new facility or a substantial improvement to an existing facility?
How is the project funded?
What state and/ or federal flood protection standards to account for sea level rise apply?

The answers to these questions will help to determine which standards or guidance should be used and if the location and use of the facility calls for the application of a more conservative flood protection approach. It may be necessary to calculate flood protection height using multiple methods and then assess the appropriate flood protection height needed to meet statutory minimums, protect the project from site specific vulnerabilities, and justify funders cost/benefit analysis.

I. Definitions

Federal and state regulations and guidance use related language to describe structures and the actions that occur within. To avoid confusion between similar terms, clear definitions are crucial to navigate the design standards applicable to structures involved in essential functions. As an example, definitions below are provided as applied to wastewater facilities:

Critical Action (FEMA):

Any action[2] for which even a slight chance of flooding is too great.[3] It may or may not be associated with a critical facility. For projects funded by Hazard Mitigation Assistance grants, FEMA is responsible for determining if an action is a critical action. If a critical action is identified, FEMA must evaluate potential harm to the action from the 500-year-flood.[4]

Critical Facilities (FEMA):

> Are structures and institutions that are deemed by the local community and other jurisdictions as critical to the continuity of the community before, during, and after an event. Although the affected jurisdiction has the primary responsibility for determining what structures and institutions are critical facilities, FEMA reserves the right to make a final determination as needed to support the review and approval of an HMA project application.[5]

Critical Activity (CT DEEP Municipal Wastewater Section):

> For state funded projects, any activity deemed to be vital to the core operation of wastewater facilities or that will prevent a facility to return to full function as safely and quickly as possible after a flood event.[6]

Critical Activity (DEEP Land and Water Resource Division):

> Per CGS § 25-68b, this means any activity, including, but not limited to, the treatment, storage and disposal of hazardous waste and the siting of hospitals, housing for the elderly, schools, or residences, in the 0.2 per cent floodplain in which the commissioner determines that a slight chance of flooding is too great.[7]

II. Introduction

The threat of coastal flooding on Connecticut shoreline communities and infrastructure is growing. Sea level rise from increasing global temperatures exacerbates coastal flooding during storm events leading to inundation of areas historically not prone to flooding.[8] Hurricanes have increased in intensity during the last century[9] and storm tracks are predicted to continue to shift northward[10] leading to increased probability of harm to people and property from storm surge.[11] More homes, roads, businesses, and critical infrastructure are now vulnerable to coastal flooding. Current modeling suggests a prudent planning strategy should anticipate sea level rise in Long Island Sound of 0.5 m (1.8 ft) by 2050.[12] Connecticut state and local governments have taken steps to incorporate best evidence into policy for mitigating coastal flooding damage by creating standards for building elevation and floodproofing.[13] At the federal level, the Federal Emergency Management Agency (FEMA) requires projects to meet standards as a condition of receiving federal funding.

The National Flood Insurance Program (NFIP) was created to provide affordable insurance to owners of property in designated floodplains and to encourage communities to adopt and enforce floodplain management regulations.[14] While federal NFIP requirements for buildings and structures are essentially unchanged since the 1970's and function as minimums, FEMA has issued guidance[15] directing use of the latest International Building Code (IBC) and

American Society of Civil Engineers (ASCE) standards regulating building elevation height in coastal flood hazard areas.[16] Communities incorporating higher standards into state and local regulations, ordinances, and codes can benefit from NFIP Community Rating System incentives through discounted flood insurance premiums.[17] However, coordination during planning between federal, state and local building elevation standards can cause confusion.

Critical and non-critical structures are subject to different standards regarding flood protection measures. Currently, Connecticut has 1,940 "critical" facilities[18] and 133 are within the FEMA Special Flood Hazard Area (SFHA).[19] This number does not include 94 Water Pollution Control Facilities (i.e. wastewater treatment plants, pumping stations, etc.) in the state because mapping data for these facilities were not available at the time the State Hazard Mitigation Plan report was written.[20] However, water pollution facilities are a good illustration of how federal and state standards interact when upgrades to critical facilities are planned. For example, Connecticut DEEP Municipal Water Section has developed a process for critical wastewater infrastructure to undergo resiliency evaluation and improve flood protection to the maximum extent feasible when new facilities are planned, or existing facilities modified, in addition to applicable federal standards.[21] Other types of critical activities may be subject to different state standards. To add clarity to this process and provide an update to Rath *et al.* 2018, we provide a review of current federal and state building height elevation standards for critical activities and infrastructure in coastal flood hazard zones with a focus on water pollution control facilities.

III. Federal Flood Elevation Standards

The National Flood Insurance Program (NFIP) managed by FEMA provides a federal framework for flood risk analysis and mitigation.[22] The NFIP provides flood insurance to property owners, businesses, and renters in areas prone to flooding determined by mapping flood risk.[23] FEMA produces Flood Insurance Rate Maps (FIRM) and Flood Insurance Studies (FIS) used by communities to determine flood risk areas divided into flood risk zones. Connecticut municipalities have adopted flood management regulations as a condition of participation in NFIP.[24] Communities with flood prone areas are required to adopt and enforce regulations for management of floodplains designed to mitigate the impact of flood events.[25] Municipalities, states, and the federal government have standards for flood elevation of structures in different flood risk zones. However, the flood height elevation standards mandated in the federal NFIP are minimums and have not been substantially updated since the 1970's.[26] But, FEMA has continually issued updated guidance documents designed to improve structural integrity and prevent loss during flood events by encouraging use of design best practices and standards.[27] FEMA's 2007 Design Guide for Improving Critical Facility Safety from Flooding and High Winds uses the American Society of Civil Engineers (ASCE) critical facility category system

based on occupancy found in ASCE 7-05.[28] The most current version of the ASCE classification system was updated in ASCE 24-14: Flood Resistant Design and Construction.[29]

Recently, under Executive Order 14030 Climate Related Financial Risk, FEMA reintroduced the Federal Flood Risk Management Standard (FFRMS) for certain non-critical actions concerning structures in the 100-year floodplain/ Special Flood Hazard Areas.[30] In August 2021, FEMA issued interim FFRMS policy, FEMA Policy FP-206-21-0003, as a partial implementation applying only to certain non-critical actions concerning structures in the 100-year floodplain/ Special Flood Hazard Areas. Critical actions in Special Flood Hazard areas remain subject to minimum elevation requirements broadly described in 44 CFR § 9.11.(c)(1) "The Agency shall minimize: Potential harm to lives and the investment at risk from the base flood, or, in the case of critical actions, from the 500-year flood." Further guidance updates from FEMA covering critical actions may be forthcoming. Until then, the agency relies on non-binding guidance documents to encourage more rigorous standards.

After Hurricane Sandy caused extensive coastal flooding in the Northeast, FEMA issued a recovery advisory addressing the need to reduce flood effects on critical facilities citing ASCE 7-05 standards.[31] Critical facilities and activities are those essential to community function where "even a slight chance of flooding is too great a threat"[32] including hospitals, fire and police stations, power generation, schools, drinking and wastewater treatment. Facilities dealing with toxic, flammable, or reactive substances are also considered critical.[33] Best practices design standards for critical activities are higher than for residential structures or those deemed non-critical.[34]

In 2019, FEMA issued a guidance document comparing standards of the NFIP and International Codes (I-Codes) as flood provisions meet or exceed NFIP requirements in I-Codes from 2012 on.[35] All 50 states have adopted or use at least one I-Code.[36] The International Building Code (2015 and later) references ASCE-24-14 requirements for siting, design, and construction in flood hazard zones.[37] FEMA has explicitly said that ASCE 24 standards meet or exceed minimum NFIP requirements.[38] In ASCE 24, Flood Design Classes replace Occupancy/ Risk Categories for determining a structure's minimum elevation in combination with location in a flood hazard zone. The four Flood Design Classes have detailed definitions and structures falling under the FEMA definition of "critical facility" are mainly in Flood Design Class 4, though facilities handling toxic materials, and buildings associated with utilities are in Flood Design Class 3.[39] FEMA notes that in ASCE 24 standards, "Essential facilities (Flood Design Class 4) must be elevated or protected to the BFE +2 or 500-year flood elevation, whichever is higher."[40]

IV. Connecticut Building Height Elevation Standards

The Connecticut Flood Management Act governs siting of structures such as wastewater treatment facilities in floodplains.[41] The Act defines "base flood" as "flood which has a one per cent chance of being equaled or exceeded in any year, as defined in regulations of the National Flood Insurance Program (44 CFR 59 et seq.), or that flood designated by the commissioner pursuant to section 25-68c."[42] Base flood for a critical activity " means the flood that has at least a .2 per cent chance of being equaled or exceeded in any year."[43] CT DEEP's Municipal Facilities Section has determined critical activities for wastewater treatment facilities to be "[a]ny activity deemed to be vital to the core operation of wastewater facilities or that will prevent a facility to return to full function as safely and quickly as possible after a flood event."[44]

The State DEEP issued guidance in 2017 covering flood height elevation requirements for wastewater treatment and collection system facilities funded through the state Clean Water Fund (CWF).[45] Projects funded through the state CWF are required to adhere to design guidelines found in *Technical Report No.16 Guides for the Design of Wastewater Treatment* Works (T-16).[46] Municipalities planning or designing new wastewater infrastructure construction or improvements located in flood prone areas are directed by the state to conduct a "resiliency evaluation" that considers sea level rise over the life span of the wastewater infrastructure or equipment.[47] Resiliency evaluation allows for assessment of the impact of flood on the facility or equipment, including potential worst-case severe weather events and climate change which may be exacerbated by unique site-specific conditions. In particular, a resiliency evaluation should consider the effects of sea level rise on vulnerable infrastructure located in coastal and tidal areas of the State.[48] Municipalities have flexibility in choosing an evaluation method allowing for determination of the appropriate site-specific protective elevation. One or more of the following approaches can be used to determine flood height elevation:

- Freeboard Value Approach (FVA): Freeboard (100-year base flood elevation + X, where X is 3 feet for critical actions and 2 feet for other actions);
- Climate-Informed Science Approach (CISA): Utilizing the best-available, actionable hydrologic and hydraulic data and methods that integrate current and future changes in flooding based on climate science;
- 0.2 percent annual chance Flood Approach: 0.2 percent annual chance flood (also known as the 500-year flood); or
- The elevation and flood hazard area that result from using any other method identified in an update to the Federal Flood Risk Management Standard (FFRMS).[49]

In Public Act 18-82, floodproofing minimums were established for

> "…water and sanitary facilities… 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 [.] "

It is important to note that *BFE +2 feet* is considered a statutory *minimum* flood protection elevation in Connecticut for non- critical structures in the coastal boundary.[50] Critical infrastructure, critical activities and actions, or sites with unique vulnerabilities may necessitate higher flood protection elevations.[51]

For Connecticut municipalities to be compliant with floodplain building elevation requirements, they must consider NFIP requirements, the requirements of the Connecticut State Building Code, and local requirements.[52] All Connecticut municipalities have enacted floodplain regulations and/or ordinances that meet or exceed NFIP requirements.[53] Although state building code standards for floodplain building elevation take precedence, municipalities do have authority to enact higher design standards through municipal ordinances or zoning regulations.

V. Conclusions

Current FEMA guidance for siting, design, and construction of structures in flood hazard zones references best practice standards (IBC, ASCE) that are periodically updated and revised to reflect the current level of knowledge available to prevent future hazard losses.[54] But, FEMA regulations themselves have not been substantially modified to reflect this which can lead to confusion when projects are proposed. FEMA periodically evaluates NFIP requirements to determine if standards for construction and design are adequate and sufficiently rigorous to avoid or minimize loss on a cost/ benefit basis.[55] For residential buildings, in 2007, NFIP building standards were found to reduce flood loss in new construction. But these standards

> "…are implemented in conjunction with the Flood Insurance Rate Map (FIRM), which does not account for increasing flood hazards in the future. Thus, while NFIP building standards may be generally effective today, their future effectiveness will be reduced as the FIRM becomes obsolete due to changing flood conditions. Revising building standards may be one way to compensate for changing flood conditions in the future."[56]

In May 2021, FEMA issued a fact sheet summarizing flood provisions in the NFIP in comparison to higher or more specific standards found in 2021 I-Codes and ASCE 24-14.[57] In particular, the Fact Sheet again reproduced tables from ASCE 24 of minimum elevation requirements by flood design class and definitions of flood design classes.[58] These tables are unchanged from those included in the 2015 factsheet highlighting new provisions of ASCE-24.[59] Additionally, FEMA produces documents every three years itemizing changes to I-Codes related

to flood resistant provisions.[60] While future modifications of regulations to incorporate best practices standards may occur, FEMA guidance now explicitly endorses use of ASCE-24 standards as cited in I-codes. The potential for a regulatory gap exists, but states or municipalities seeking approval for construction of critical facilities in flood hazard zones are encouraged to meet the stricter minimums set forth in the ASCE-24 standards. Because FEMA and Connecticut use different guidance and evaluations to determine the appropriate flood protection elevation, multiple methods may be used to calculate the height for a particular project. The complex decision-making process for determining flood height protection elevations including flood risk, federal and state statutes, regulation, and guidance is summarized in Figure 1.

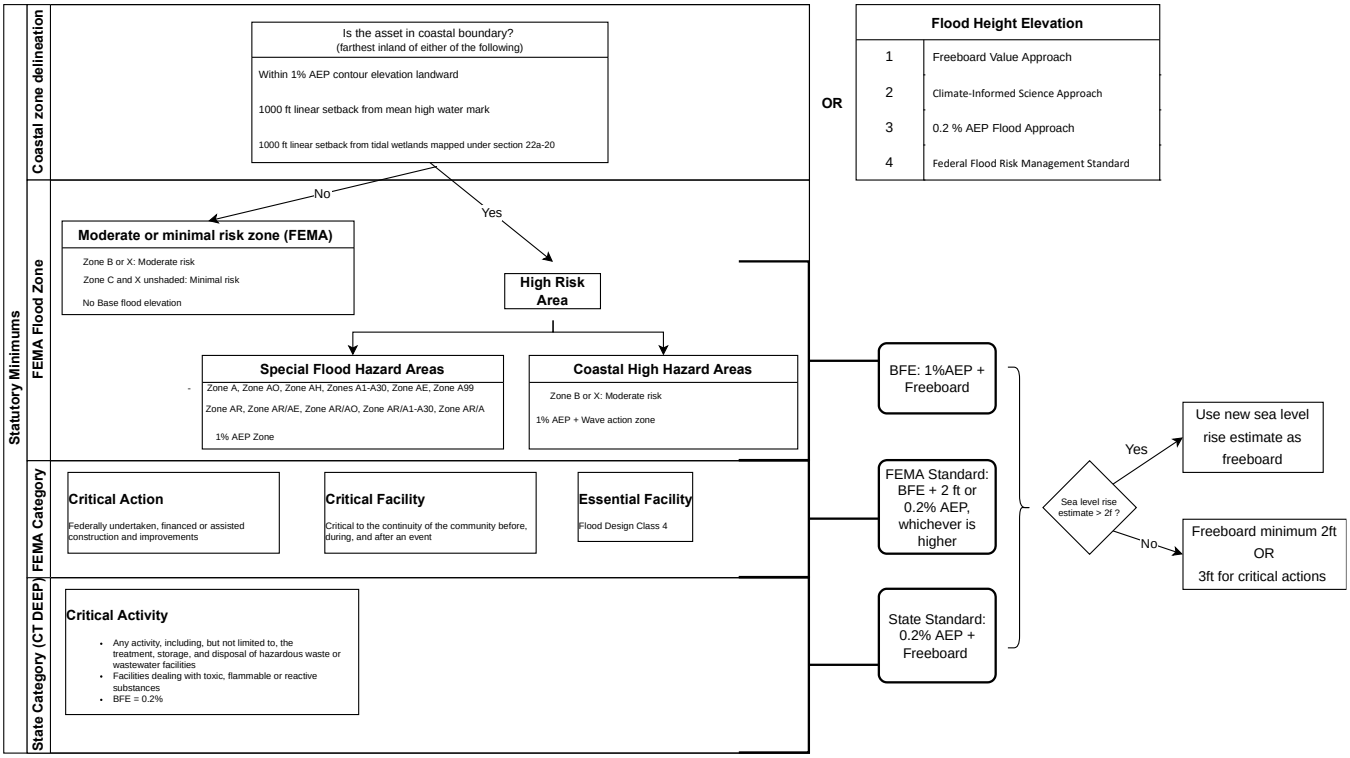

Figure 1. Flowchart for statuary minimums for flood height elevation including federal and state guidance, climate and flood risks, and characterization of infrastructure category. A separate full page version of the figure can be found at https://resilientconnecticut.uconn.edu/wp-content/uploads/sites/2761/2022/03/Statutory-flowchart-for-flood-height-elevation.pdf.

The minimum flood protection elevation for a project must take into consideration the different state and federal statutes, standards, and guidance that may be applicable to the project, the funding source, and the different methodologies available for establishing flood protection elevations. The best justifiable choice between differing flood protection elevation calculations may be to adopt the most conservative elevation.

Endnotes

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Helpful comments and advice on the white paper were provided by CT DEEP Municipal Wastewater Section, CIRCA staff, and Connecticut municipal planers and engineers.

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[1] William R. Rath, Christopher P. Kelly, & Kristie A. Beahm, *Floodplain Building Elevation Standards: Current Requirements & Enhancement Options for Connecticut Shoreline Municipalities* (2018), https://circa.uconn.edu/wp-content/uploads/sites/1618/2018/03/Floodplain-Building-Elevation-Standards.pdf.
[2] "Action" is defined in 44 CFR 9.4 (b) as any action or activity "providing federally undertaken, financed or assisted construction and improvements."
[3] 44 CFR § 9.4.
[4] FEMA, *Hazard Mitigation Assistance Guidance* (2015), https://www.fema.gov/sites/default/files/2020-07/fy15_HMA_Guidance.pdf at 48.
[5] *Id.*
[6] CT DEEP Municipal Wastewater Section, (2022), personal communication.
[7] CT DEEP, *Clean Water Fund Memorandum (2017-001) Storm Resiliency of Municipal Wastewater Infrastructure* (2017). Note the critical activity definition employed by DEEP's municipal facilities section is more comprehensive as it relates to municipal wastewater infrastructure compared to the one provided in Section 25-68B of the general statutes which is enforced by DEEP Land and Water Resources Section. When there is overlap, particularly as it applies to the storage of hazardous materials at wastewater treatment facilities or pump stations (e.g., diesel fuel for the operation of emergency generators), the most conservative state standard applies.
[8] CAROLYN KOUSKY, BILLY FLEMING, & ALAN M. BERGER, A BLUEPRINT FOR COASTAL ADAPTATION: UNITING DESIGN, ECONOMICS, AND POLICY (2021).
[9] Kieran T. Bhatia et al., *Recent increases in tropical cyclone intensification rates*, 10 NATURE COMMUNICATIONS 635 (2019), https://doi.org/10.1038/s41467-019-08471-z.
[10] Anji Seth et al., *Connecticut Physical Climate Science Assessment Report (PCSAR): Observed trends and projections of temperature and precipitation* (2019), https://circa.uconn.edu/wp-content/uploads/sites/1618/2019/11/CTPCSAR-Aug2019.pdf. at 54.
[11] SAMANTHA MONTANO, DISASTEROLOGY: DISPATCHES FROM THE FRONTLINES OF THE CLIMATE CRISIS (2021).
[12] James O'Donnell, *Sea Level Rise in Connecticut Final report February 2019* (2019), https://circa.uconn.edu/wp-content/uploads/sites/1618/2019/10/Sea-Level-Rise-Connecticut-Final-Report-Feb-2019.pdf.
[13] C.G.S. § 25-68o ; *See* Appendix A, William R. Rath, Christopher P. Kelly, and Kristie A. Beahm, *supra* note 1. for building standards of Connecticut shoreline towns as of early 2018.
[14] FloodSmart | The National Flood Insurance Program, https://www.floodsmart.gov/ (last visited Sep 10, 2021).
[15] Note that "guidance" is non-binding but in many cases, is often relied on in enforcement actions. Guidance clarifies and explains how an agency interprets legally enforceable regulation. Guidance documents are not subject the APA rulemaking process but provide a mechanism to convey current agency policy and expectations. Regulations are legally binding and subject to APA rulemaking procedures. Regulations have the force of law and are created under delegated legislative authority to interpret, implement, or specify statutes.
[16] REDUCING FLOOD LOSSES THROUGH THE INTERNATIONAL CODES, COORDINATING BUILDING CODES AND FLOODPLAIN MANAGEMENT REGULATIONS 5TH ED., (2019), HTTPS://WWW.FEMA.GOV/SITES/DEFAULT/FILES/2020-07/FEMA_REDUCING_FLOOD_LOSSES_RFL_5TH-ED.PDF.
[17] NATIONAL FLOOD INSURANCE PROGRAM COMMUNITY RATING SYSTEM | FEMA.GOV, HTTPS://WWW.FEMA.GOV/FLOODPLAIN-MANAGEMENT/COMMUNITY-RATING-SYSTEM (LAST VISITED JUL 14, 2021).

[18] DESPP, *2019 Connecticut Natural Hazards Mitigation Plan Update* (2019) at 126.
[19] *Id.* at 192.
[20] *Id.* At 52-53. Note that Latitude and Longitude information on WWTP locations is available with DEEP's Municipal Wastewater Program. Not all WWTP are located within AE or VE special flood hazard zones.
[21] CT DEEP, *supra* note 7.
[22] Flood Insurance | FEMA.gov, https://www.fema.gov/flood-insurance (last visited Sep 10, 2021).
[23] Flood Maps | FEMA.gov, https://www.fema.gov/flood-maps (last visited Sep 10, 2021).
[24] William R. Rath, Christopher P. Kelly, and Kristie A. Beahm, *supra* note 1.
[25] FloodSmart | The National Flood Insurance Program, https://www.floodsmart.gov/ (last visited Sep 10, 2021).
[26] Reducing Flood Losses Through the International Codes, Coordinating Building Codes and Floodplain Management Regulations 5th Ed., *supra* note 16.
[27] FEMA, *Partial Implementation of the Federal Flood Risk Management Standard for Hazard Mitigation Assistance Programs (Interim)*, FEMA POLICY FP-206-21-0003 (2021). https://www.fema.gov/sites/default/files/documents/fema_policy-fp-206-21-0003-partial-mplementation-ffrms-hma-programs-interim.pdf.
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[29] AMERICAN SOCIETY OF CIVIL ENGINEERS, ASCE 24: FLOOD RESISTANT DESIGN AND CONSTRUCTION (2014).
[30] FEMA, *supra* note 27.
[31] REDUCING FLOOD EFFECTS IN CRITICAL FACILITIES: HURRICANE SANDY RECOVERY ADVISORY RA2, (2013), HTTP://CORE-ES.COM/WP-CONTENT/UPLOADS/FEMA-RA2-REDUCING-FLOOD-EFFECTS-IN-CRITICAL-FACILITIES.PDF.
[32] CRITICAL FACILITY | FEMA.GOV, HTTPS://WWW.FEMA.GOV/GLOSSARY/CRITICAL-FACILITY (LAST VISITED JUL 14, 2021).
[33] FPM_1_PAGE_CRITICALFACILITIES_AND_HIGHER_STANDARDS.PDF, HTTP://DATA.WVGIS.WVU.EDU/PUB/RA/_RESOURCES/CF/FPM_1_PAGE_CRITICALFACILITIES_AND_HIGHER_STANDARDS.PDF (LAST VISITED JUL 14, 2021).
[34] Reducing Flood Effects in Critical Facilities: Hurricane Sandy Recovery Advisory RA2, *supra* note 34.
[35] Reducing Flood Losses Through the International Codes, Coordinating Building Codes and Floodplain Management Regulations 5th Ed., *supra* note 16.
[36] *Id.*
[37] FEMA, *Highlights of ASCE 24-14 Flood Resistant Design and Construction* (2015), https://www.fema.gov/sites/default/files/2020-07/asce24-14_highlights_jan2015.pdf.
[38] Reducing Flood Losses Through the International Codes, Coordinating Building Codes and Floodplain Management Regulations 5th Ed., *supra* note 16.
[39] FEMA, *supra* note 37. *See* ASCE 24-14 Table 1-1 Flood Design Class of buildings and Structures reproduced on page 5 for detailed Flood Design Class definitions.
[40] *Id. See* table on page 3 for flood height elevation standards by Flood Design Class, flood zone and specific building requirements.
[41] C.G.S. § 25-68.
[42] *Id.* at 25-68b(2).
[43] *Id.*
[44] CT DEEP, *supra* note 7.
[45] *Id.*
[46] NEIWPCC, TR-16 GUIDES FOR THE DESIGN OF WASTEWATER TREATMENT WORKS • NEIWPCC (2016), https://neiwpcc.org/learning-center/tr-16-guides-design-wastewater-treatment-works/ (last visited Sep 18, 2021) stating that "Until FEMA or ACOE flood criteria are amended to include the impact of climate change, a greater level of flood protection may be warranted." And, the level of protection is dependent on how critical a component is to function of facility. Critical equipment should be elevated to 100-yr-flood elevation + 3.
[47] CT DEEP, *supra* note 7.
[48] *Id.*
[49] *Id.*
[50] At this time, the most recent sea level change scenario calls for 20 inches of freeboard which is still encompassed within the statutory minimum of 2 feet. When the sea level rise scenario adopted by CT DEEP becomes greater than 2 feet, the additional freeboard over 2 feet will need to be added to *BFE + 2ft* to calculate the appropriate flood

protection elevation. It should be noted that P.A. 18-82 has sometimes been interpreted as *BFE +2ft +20 in.* We believe this conservative interpretation is not the statutorily correct minimum flood protection elevation, but as has been noted, sites with unique vulnerabilities may necessitate higher than statutorily minimum flood protection elevations.

[51] CT DEEP, *supra* note 7; NEIWPCC, *supra* note 46.

[52] William R. Rath, Christopher P. Kelly, and Kristie A. Beahm, *supra* note 1.

[53] *Id.*

[54] Reducing Flood Losses Through the International Codes, Coordinating Building Codes and Floodplain Management Regulations 5th Ed., *supra* note 16.

[55] Christopher P Jones, William L. Coulbourne, Jamie Marshall, Spencer M. Rogers *Evaluation of the National Flood Insurance Program's Building Standards* (2006). American Institutes for Research, https://www.fema.gov/sites/default/files/2020-07/fema_nfip_eval_building_standards.pdf.

[56] *Id.*at 90.

[57] FEMA, *FEMA Fact Sheet: Building Code Requirements That Exceed or Are more Specific Than the National Flood Insurance Program* (2021), https://www.fema.gov/sites/default/files/documents/fema_building-code-exceed-nfip-complete_2021.pdf.

[58] Note, FEMA fact sheets are considered *guidance documents* and do not have force of law.

[59] FEMA, *supra* note 37.

[60] Flood Building Codes | FEMA.gov, https://www.fema.gov/emergency-managers/risk-management/building-science/building-codes/flood (last visited Jul 31, 2021).