

# **Connecticut Hazard Mitigation Plan Update – Cheat Sheet**

For the 2019 update, each chapter was reviewed and reinvigorated to highlight progress since the 2014 plan adoption. Some chapters of the plan were restructured for efficiency. All of the chapters had new data integrated and the overall plan was organized to better meet the needs of the state.

## **1 Introduction and Planning Process - 30**

### *1.1 Purpose of the Connecticut State Hazard Mitigation Plan Update*

- No Changes

### *1.2 Assurances and Adoption*

- No Changes

### *1.3 Planning Team*

- DESPP / DEEP managed plan updates

### *1.4 Overview of Plan*

- No Changes

### *1.5 Planning Process*

- Included more stakeholder touch points

### *1.6 Overview of the Planning Process*

- No Changes

### *1.7 Plan Coordination*

- No Changes

### *1.8 State Hazard Mitigation Planning Team*

- No Changes

### *1.9 Stakeholder Involvement and Meetings*

- No Changes

### *1.10 Public Outreach*

- Public survey was augmented to include additional hazards

### *1.11 Summary of Other Input*

- No Changes

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## **2 Natural Hazard Identification and Risk Assessment - 55**

### *2.1 Introduction*

- Climate change is addressed in detail in Section 2.4, and in each hazard specific section as a hazard risk amplifier.
- In the previous plan, CT DEEP Dam Safety indicated that ice jams had not occurred since 2010 and were subsequently removed as a separate hazard in the HIRA. The project that was completed on the Salmon River aided in the reduction of ice jams on that watercourse. Due to the recent recurrence of ice jams in both 2015 and 2018, the hazard has been included in the Flood portion of the HIRA. Tsunamis have been removed from consideration due to their low probability of occurrence.
- The Hazard Identification, Risk Assessment and Vulnerability Analysis chapter of the 2019 plan update consolidates, updates, and streamlines content from the previous plan. Sections have been reorganized for ease of review for the reader, including alphabetization of hazards. Chapter content was restructured to address a broad range of emerging hazards, vulnerabilities and risk issues.
- In addition, hazard profiles were restructured, and new analyses were performed using updated National Centers for Environmental Information (NCEI) Storm Events data as well as other data sources to capture hazard events that occurred since 2013.
- The analysis of state and critical facilities was updated to reflect additional data provided by the State. Estimates and extrapolation of building and content values for numerous counties were replaced with actual values if available.
- Data was collected from NCEI instead of the old NCDC database
- Data was also collected from CIRCA – a new resource for 2018
- During 2013, the Connecticut GIS Council was dissolved and the Office of Policy and Management (OPM) became the successor to the GIS Council. OPM is responsible for coordinating, within available appropriations, a GIS capacity for the state, regional planning agencies, municipalities, and others as needed. OPM guides and assists state and local officials involved in transportation, economic development, land use planning, environmental, cultural, and natural resource management, public service delivery, and other areas as necessary. For the 2019 plan update, OPM provided updated critical facilities data and assisted in the building and content value updates to state owned facilities.

### *2.2 General Description of Connecticut*

- Local Hazard Mitigation Plan status was updated
- Updated precipitation ranges
- Updated census data
- Updated state infrastructure and facilities
  - New building values and content values
  - New loss estimates for state facilities
    - Loss estimates for Connecticut state facilities were calculated by taking the total building and contents values for each municipality and estimating a

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percentage of loss for each hazard. The full table of loss estimate data by municipality is available in Appendix 2.

- Building and contents values were derived from two methods of calculation. The first was updating values based on JESTIR ID with information from the Office of Policy and Management’s assessment of building values in August 2016.
- The second method was for the facilities without building or contents documented values. The total building and contents values for all 3,823 facilities (\$8.9 billion in building values and \$1.1 billion in contents values) were divided by the total facility count resulting in average building and contents value. These averages were then assigned to the facilities without building and content values.
- Once values for all mapped facilities were updated or assigned, the building and content values were summarized by both county and municipality. Loss estimates were calculated based on a predicted percent loss, and applied to the total building value for each municipality. The percent of loss was assigned by subject matter experts (SMEs) based on their New England and Connecticut experience with hazard occurrence and magnitude. Estimated losses varied by hazard and by hazard extent. Drought was not included in this analysis, as damage from drought occurs primarily to agricultural areas rather than buildings. The following is a description of the loss percentage for each hazard:
  - Dam Failure: The total loss for all structures in dam inundation areas was assigned by SMEs.
  - Earthquake: SMEs assigned estimated losses of 15 percent to the total building value for each municipality. Higher magnitude earthquakes uncommon in Connecticut would not create uniform damages.
  - Flood: SMEs assigned a loss estimation of 35 percent considering initial losses for buildings within the 100-500 year floodplains.
  - Erosion: Erosion prone areas range from steep slopes to highly erodible soil. A loss estimation of 20 percent was assigned by SMEs to compensate for these variations which can range from topsoil loss to total building destruction.
  - Sea Level Rise: A total loss for all structures in areas prone to sea level rise was assigned by SMEs.
  - Thunderstorm: Thunderstorm risk is universal statewide, so total values for all facilities in all municipalities were used. Since storm intensity varies widely, SMEs assigned a loss estimation of 15 percent. Percentage points were added to include damage from downed trees, debris and fires due to lightning strike along with flooding.
  - Tornado: The density of historic tornado tracks was calculated for Connecticut so that areas with the highest population density were assigned a loss estimation by SMEs of 30 percent. Tornado intensity was considered, as well as how tornadoes damage manifests in communities.

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- Tropical Cyclone: Tropical Cyclones potentially impact all state facilities. However, there is a difference between the effect on a coastal county and an inland county. For inland counties, a loss estimation of 35 percent was assigned by SMEs. Coastal county values were assigned a loss estimation of 50 percent by SMEs due to the effects of storm surge along the coast.
- Wildland Fire: Two types of Wildland-Urban Interface (WUI) zones were used in loss estimation: intermix and interface. Intermix WUI zones are areas where housing and vegetation intermingle; interface WUI zones are areas with housing near large tracts of forests. Each zone features a high, medium, and low density monikers. SMEs assigned a 50 percent loss to high and medium density intermix and interface areas. . A 25 percent loss was assigned to low density intermix and interface areas. When combined, the community's total loss estimate resulted for Wildland Fire state facilities.
- Updated critical and state facility maps
  - In addition to the 1,846 facilities provided by OPM, 94 WPCFs were provided by CT DEEP Bureau of Water Protection and Land Reuse and are included as critical facilities. The WPCFs, while included in the critical facility count, did not contain geospatial data and therefore were not included in the impact analysis and intersection with hazards.
- Updated land use and development data from CLEAR
- Updated building permit data
- Updated housing units and inventory

### 2.3 *Connecticut History of Natural Disasters*

- Two new disaster declarations
- New NCEI statistics and data pulled for updated severe weather counts
  - NCEI Storm Events Database provides information about events from 1950 to December 31st, 2017. Records for most weather events were reported starting in 1996, with the exception of tornado (reports date to 1950), thunderstorm winds (reports date to 1955), and hail (reports date to 1955).

### 2.4 *Climate Change*

- Entirely new section which includes global trends, regional trends, local trends
- Added new CT climate change initiatives happening at the state and regional level

### 2.5 *Local Plan Hazard Identification and Integration*

- Updated local plan hazard identification and ranking
- Updated loss estimates

### 2.6 *Public Survey Results*

- Updated to include additional hazards and references to climate change / sea level rise

### 2.7 *Hazard Analysis and Ranking Methodology*

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- Updated ranking methodology was utilized
  - A standardized methodology was developed to compare different hazards' risk on a jurisdiction (County) scale, as decided by the Mitigation Planning Team. This method prioritizes hazard risk based on quantitative factors extracted from NCEI and other available data sources.
  - In order to compare NCEI data values, events and damages were annualized. This was accomplished by taking the parameter of interest and dividing by the length of record for each hazard. Annualizing the data provides an estimate of how many hazard occurrences can be expected from each hazard annually.
  - Nine ranking parameters were used to determine jurisdiction risk based hazard rankings.
    - Each parameter was rated on a scale of 1 through 5, with those rated 5 considered high risk and those rated at 1 considered low risk. Population density and building permits were each given a weight of 0.5 relative to all other parameters. While building permit data and housing stock changes showed consistent results when evaluating construction trends, building permit data was used instead of housing stock changes to better capture additional growth activity not captured by new structures alone. Hazard Concern Ranking and Local Plan Hazard Ranking were each given a weight of one relative to all other parameters.
    - Geographic extent was weighted at 1.5. Annualized events, annualized losses, death/injuries count as well as critical infrastructure exposure were each given a weight of 1. Scores were summed by jurisdiction for each hazard separately, allowing for impartial comparison between jurisdictions for each hazard. A summation of all the scores for all stated hazards in each jurisdiction provides a composite risk rank useful in prioritization.
    - Critical facility exposure was added into ranking methodology
- Probability of future events
  - Calculated off of NCEI data

### 2.8 *HIRA Hazard Specific Sections*

- No change

### 2.9 *Dam Failure Hazard Profile*

- The hazard profile has been significantly enhanced to include a detailed hazard description, location, extent, previous occurrences, probability of future occurrence, and potential change in climate and its impacts on the drought hazard is discussed
- New and updated figures from federal and state agencies are incorporated
- State and federal agencies responsibilities for oversight of Connecticut dams were incorporated
- Previous occurrences were updated with events

### 2.10 *Dam Failure Vulnerability Assessment*

- Assessed off of updated critical facilities and state owned facility data

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- For the purposes of this 2019 Plan update, all State buildings and local assets located in the dam failure inundation areas will be exposed to a dam failure event.
- For this 2019 Plan, 199 combined dam failure inundation areas were used to define the extent of the dam failure hazard area.
- While many inundation areas may be coincident with the available data used in the 2013 State HMP, certain inundation areas may differ or be absent from this dataset and result in dissimilar totals for at-risk assets.

### *2.11 Winter Weather Hazard Profile*

- Previous Occurrences of winter weather
- FEMA disaster declarations
- Extent, Severity, and Primary and Secondary Impacts of Winter Weather
- Climate change impacts
- The definitions of Winter Storm and Blizzard were updated with recent information
- Geospatial analysis of Winter Weather was updated
- Analysis of State and Critical Facilities intersected with average annual total snow-depth
- Addition of NESIS

### *2.12 Winter Weather Vulnerability Assessment*

- Assessed off of updated critical facilities and state owned facility data

### *2.13 Flood-Related Hazard Profile*

- Updated the hazard profile to add a discussion about Ice Jams (previously discussed in the 2010 plan exclude from 2014 plan update).
- Updated the National Flood Insurance Program (NFIP) section to include a discussion about Connecticut Community Rating System communities.
- Updated NFIP section to include a discussion about Coastal Barrier Resource Areas.
- Updated the Previous Occurrences and Losses section to include recent storm events.
- Added a section that discusses Flood Impacts (Severity, Warning Time, and Secondary Impacts).
- Removed 2000 AAL Comparison.
- Ran both 100-year and multi-frequency flood scenarios for vulnerability analysis.
- Average Annualized Losses calculated for multi-frequency scenarios.

### *2.14 Flood-Related Hazards Vulnerability Assessment*

- Assessed off of updated critical facilities and state owned facility data

### *2.15 Sea Level Rise Hazard Profile*

- Expectations of sea level rise from the Connecticut Institute for Resilience & Climate Adaptation
- The hazard profile has been updated to included location, extent, severity, warning time and secondary impacts
- Gage readings from The Center for Operational Oceanographic Products and Services water level stations in Bridgeport and New London
- Local planning and adaptation for sea level rise

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### *2.16 Sea Level Rise Vulnerability Assessment*

- Assessed off of updated critical facilities and state owned facility data

### *2.17 Earthquake Hazard Profile*

- Updated the Connecticut seismic hazard map
- Updated the Northeast Seismicity graph
- Updated the Earthquake epicenters near Connecticut (1976– 2016) map
- Added Climate Change Impacts, Primary and Secondary Impacts, Extent, and Severity
- Updated loss estimates for earthquake scenarios
- Updated hazard rankings and risk assessments

### *2.18 Earthquake Vulnerability Assessment*

- Updated scenarios were run in HAZUS

### *2.19 Drought Hazard Profile*

- The hazard profile has been significantly enhanced to include a detailed hazard description, location, extent, previous occurrences, probability of future occurrence, and potential change in climate and its impacts on the drought hazard is discussed
- New and updated figures from federal and state agencies are incorporated
- U.S. 2010 Census data was incorporated, where appropriate
- Previous occurrences were updated with events that occurred between 2013 and 2017
- Incorporation of information from the 2017 Connecticut State Water Plan

### *2.20 Drought Vulnerability Assessment*

- No changes

### *2.21 Thunderstorm Related Hazards Profile*

- The hazard profile has been significantly enhanced to include a detailed hazard description, location, extent, impact (severity, warning time, and secondary impacts), previous occurrences, probability of future occurrence, and potential change in climate and its impacts on the thunderstorm hazard is discussed
- Previous occurrences were updated with events that occurred between 2013 and 2017
- Events reported in this update include Hail, High wind, Lightning, Strong Wind, and Thunderstorm Wind. Hail events were not reported in the 2014 update

### *2.22 Thunderstorm Vulnerability Assessment*

- Assessed off of updated critical facilities and state owned facility data

### *2.23 Tornado Hazard Profile*

- The hazard profile has been significantly enhanced to include a detailed hazard description, location, extent, impact (severity, warning time and secondary impacts), previous occurrences,

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probability of future occurrence, and potential change in climate and its impacts on the tornado hazard is discussed

- New and updated figures from federal and state agencies are incorporated. U.S. 2010 Census data was incorporated, where appropriate
- Previous occurrences were updated with events that occurred between 2013 and 2018

### *2.24 Tornado Vulnerability Assessment*

- Assessed off of updated critical facilities and state owned facility data

### *2.25 Tropical Cyclone Hazard Profile*

- The hazard profile has been significantly enhanced to include a detailed hazard description, location, extent, impact (severity, warning time, and secondary impacts), previous occurrences, probability of future occurrence, and potential change in climate and its impacts on the tropical cyclone hazard is discussed.
- Previous occurrences were updated with events that occurred between 2013 and 2017.
- Included increase in surge information including difference between storm surge and storm tide
- Included reference to similar impacts from sub-tropical, extra-tropical, and post-tropical cyclones
- Included updated historic hurricane track map for the State of Connecticut

### *2.26 Tropical Cyclone Vulnerability Assessment*

- Assessed off of updated critical facilities and state owned facility data

### *2.27 Wildland Fire Hazard Profile*

- The wildland fire hazard profile has been significantly enhanced to include a detailed hazard description, location, extent, impact (severity, warning time and secondary impacts), previous occurrences, probability of future occurrence, and potential impacts of climate change
- New and updated figures from state agencies are incorporated
- Potential change in climate and its impacts on the wildland fire hazard is discussed.
- Previous occurrences were updated with events that occurred between 2013 and 2017

### *2.28 Wildland Fire Vulnerability Assessment*

- Assessed off of updated critical facilities and state owned facility data

## **3 Capability Assessment – 350**

- The focus of State Agencies has been to further develop their programs as related to hazard mitigation, which has included some internal changes in divisions. Furthermore, the Connecticut Institute for Resilience and Climate Adaptation (CIRCA) was formed as a partnership between DEEP and UConn.
- Aside from internal state agency changes and the formation of CIRCA, a number of other changes in capabilities have been underway such as Risk MAP progress, updates to the State Building Code, updates to the State Conservation and Development Policies Plan, and development of the State Water Plan. Although they do not represent new capabilities, this



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section of the plan describes the planning and technical assistance services provided by DCS Technical Services, the University of Connecticut, The Nature Conservancy, and other organizations that work with Connecticut's community leaders and officials.

- Local capabilities are largely the same as they were in 2014. However, with the recognition that local communities have a significant role in disaster preparedness and implementation of hazard mitigation measures, this update to the plan provides more detail about these local capabilities.

### **4 Local Planning Coordination – 445**

- Local HIRA was updated with NCEI data

### **5 Hazard Mitigation Strategy for 2019 –2024 – 457**

- Updated to reflect the new mitigation strategies
- Cancelled and deferred strategies from 2014 were removed
- Progress table is updated

### **6 Plan Monitoring, Maintenance, Evaluation & Revision - 493**

- No changes