REGIONAL HAZARD MITIGATION PLANNING IN SOUTH CENTRAL CONNECTICUT

Association of State Floodplain Managers Conference
June 13, 2013
Hartford, CT
MULTI-JURISDICTION MITIGATION PLAN

- South Central Regional Council of Governments
  - 10 municipalities participating

- Objective
  - FEMA approved multi-jurisdiction mitigation plan.
  - Add value through collaboration and mitigation actions.
  - Never use a “cookie-cutter” approach.
INNOVATION AND ADDING VALUE

- Outreach and Collaboration for 10 distinct communities
  - Advisory Committee
  - Municipality Visits
  - Public Workshops
- Innovative Risk Assessment
  - Climate Change and Sea Level Rise
  - Hazus-MH
  - Problem Statements
- Future Value
  - Community Rating System Participation
  - SCRCOG Providing additional Regional Leadership
- Regional Resources
  - Floodplain Mapping Toolkit
OUTREACH AND COLLABORATION STRATEGY

- Create multiple opportunities to participate
  - 1 Website
  - 2 Public Surveys
  - 4 Public Workshops
  - 8 Advisory Committee Meetings
  - 10 Municipality Meetings
- “Ground-truthing”
- Consensus building
- Building strong partnerships which will create future mitigation opportunities and collaborations.
Regional Hazard Mitigation

The South Central Regional Council of Governments has been awarded a grant from the CT Department of Energy and Environmental Protection (DEEP) to develop a Multi-Jurisdiction Hazard Mitigation Plan for Bethany, Branford, Hamden, Madison, North Branford, North Haven, Orange, Wallingford, West Haven and Woodbridge. The five additional municipalities in the Region (East Haven, Guilford, Meriden, Milford, and New Haven) have completed or are currently working on Hazard Mitigation Plans. They have been invited to participate in this planning process.

The planning process will adhere to Federal Emergency Management Agency (FEMA) standards. The Plan will address possible natural hazards such as flood, wind, earthquake, and winter storms. The purpose of the Plan is to reduce the Region's vulnerability to natural hazards and provide a comprehensive approach to mitigate any potential inter-jurisdictional hazards. The Hazard Mitigation Plan is a prerequisite for the Region's municipalities to apply for federal and state grants to implement the identified mitigation projects.
2 Public Surveys – Participation Matters

"The planning process shall include an opportunity for the public to comment on the plan during the drafting stage and prior to plan approval."
44 CFR §201.6(b)(1)

Ranking Mitigation Activities
#1 Emergency Services
#2 Public Education and Awareness
#3 Prevention and Regulatory Activities

Most effective way to receive information?
Internet web pages

Natural Resources:
- Maintenance or removal of trees
- Improving stormwater management systems

Prevention:
- Improved zoning, planning and wetlands regulations

Structural Projects:
- Burying of power lines

Public Education:
- Increase the amount and frequency of public education on disaster preparedness strategies

Emergency Services:
- Improved methods of communications to citizens
4 Public Workshops

- Majority of participants from coastal communities
- Wealthier communities want coastal hardening – tax base!
  - Working class neighborhoods want buyout
- Networking
  - Connecticut Light and Power Participating
  - Citizen Groups Participating
- Ground-Truthing
  - “Do you have my neighborhood on the map?”
- Communication gap between citizens and local government
  - Value Added: Mitigation Actions to improve communication
10 Municipality Meetings

- **Participants**
  - City Management
  - Emergency Management
  - Fire Department
  - Floodplain Management
  - GIS
  - Planning and Community Development
  - Public Works
  - Stormwater Management
  - City Council Representative
  - School System
  - Chamber of Commerce
  - University Emergency Manager

- **Hazards**
  - Trees
  - Flooding
  - Power Outages

- **Generator location determines EOC location**

- **Shelter capacity is limited**
THE NATURE CONSERVANCY: A STRONG PARTNER

- Coastal Resilience
  - Adam Whelchel, Ph.D.
  - Helping to adapt Connecticut’s communities to hazards
  - To help protect People and Nature through hazard mitigation and preparedness.
  - www.coastalresilience.org
INNOVATIVE RISK ASSESSMENT

- Key Steps
  - Data Collection and Analysis
  - Hazard Identification
  - Hazard Profiles and Mapping
  - Inventory of Community Assets
  - Vulnerability Assessment

- Results
  - 10 individual risk analyses using local/municipal data
  - Integration of climate change and sea level rise
  - Problem statements = mitigation opportunities
RISK ASSESSMENT APPROACH

- **Quantitative Analysis**
  - Use of best available data and technology
  - Parcel/building level exposure analysis
  - Deterministic and probabilistic modeling (Hazus-MH and statistical methods)

- **Qualitative Analysis**
  - Local knowledge and stakeholder collaboration
  - Priority Risk Index (PRI)
JURISDICTIONAL RISK ANALYSIS

- Main components for each participating jurisdiction
  - Vulnerable assets
  - Potential impacts
  - Loss estimates
  - Problem statements

### Branford

**Vulnerable Assets—Branford**

Vulnerable assets were identified by intersecting GIS-based asset inventories and demographic data with known hazard boundaries to determine the number of parcels, buildings, critical facilities, historic assets, and populations exposed to each hazard. This results in an estimation of vulnerable assets by hazard as shown in Table 4.27.

#### Table 4.27: Vulnerable Assets by Hazard—Branford

<table>
<thead>
<tr>
<th>Hazard</th>
<th>Number of Parcels(^1)</th>
<th>Number of Buildings(^1)</th>
<th>Number of Critical Facilities(^2)</th>
<th>Number of Historic Assets(^3)</th>
<th>Number of Populations(^4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extreme Temperatures</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>5,387</td>
</tr>
<tr>
<td>Hurricane/Tropical Storm</td>
<td>13,207</td>
<td>26,414</td>
<td>19</td>
<td>969</td>
<td>28,626</td>
</tr>
<tr>
<td>Severe Thunderstorm</td>
<td>13,207</td>
<td>26,414</td>
<td>19</td>
<td>969</td>
<td>28,626</td>
</tr>
<tr>
<td>Severe Winter Storm/Sor'ester</td>
<td>13,207</td>
<td>26,414</td>
<td>19</td>
<td>969</td>
<td>28,626</td>
</tr>
<tr>
<td>Tornado</td>
<td>13,207</td>
<td>26,414</td>
<td>19</td>
<td>969</td>
<td>28,626</td>
</tr>
<tr>
<td>Coastal Erosion(^4)</td>
<td>Unknown</td>
<td>Unknown</td>
<td>Unknown</td>
<td>Unknown</td>
<td>Unknown</td>
</tr>
<tr>
<td>Dam Failure</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High Hazard</td>
<td>1,141</td>
<td>2,190</td>
<td>2</td>
<td>0</td>
<td>3,758</td>
</tr>
<tr>
<td>Significant Hazard</td>
<td>4,576</td>
<td>8,620</td>
<td>10</td>
<td>237</td>
<td>12,447</td>
</tr>
<tr>
<td>Drought</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Flood(^5)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 Percent-Annual-Chance</td>
<td>2,564</td>
<td>2,906</td>
<td>3</td>
<td>321</td>
<td>15,198</td>
</tr>
<tr>
<td>0.2 Percent-Annual-Chance</td>
<td>261</td>
<td>51</td>
<td>0</td>
<td>15</td>
<td>7,099</td>
</tr>
<tr>
<td>Zone VE</td>
<td>968</td>
<td>467</td>
<td>0</td>
<td>160</td>
<td>2,535</td>
</tr>
<tr>
<td>Category 1 Storm Surge</td>
<td>1,015</td>
<td>1,140</td>
<td>1</td>
<td>274</td>
<td>10,256</td>
</tr>
<tr>
<td>Category 2 Storm Surge</td>
<td>2,401</td>
<td>2,350</td>
<td>2</td>
<td>356</td>
<td>12,577</td>
</tr>
<tr>
<td>Category 3 Storm Surge</td>
<td>2,494</td>
<td>2,450</td>
<td>5</td>
<td>415</td>
<td>14,633</td>
</tr>
<tr>
<td>Category 4 Storm Surge</td>
<td>2,704</td>
<td>2,498</td>
<td>3</td>
<td>406</td>
<td>18,211</td>
</tr>
<tr>
<td>Sea Level Rise</td>
<td>2,194</td>
<td>1,299</td>
<td>2</td>
<td>282</td>
<td>11,898</td>
</tr>
<tr>
<td>Earthquake</td>
<td>13,207</td>
<td>26,414</td>
<td>19</td>
<td>969</td>
<td>28,626</td>
</tr>
</tbody>
</table>

\(^1\) Based on data provided by the Town of Branford.
\(^2\) Based on data provided by the Town of Branford.
\(^3\) Based on data provided by the Town of Branford.
\(^4\) Based on data provided by the Town of Branford.
\(^5\) Based on population numbers from 2010 census data.
\(^6\) Data does not currently exist to determine vulnerable assets to the coastal erosion hazard.
\(^5\) Numbers and values of assets for events of increasing magnitude should be read as "in addition to" the preceding magnitudes.
**INTEGRATION OF CLIMATE CHANGE**

- **Why?**
  - Identified early by Advisory Committee as issue of concern
  - Priority for State – addressed in State Hazard Mitigation Plan; Governor's Steering Committee on Climate Change
  - Recent extreme weather events = increased public interest/awareness (Irene, Alfred, Sandy, Nemo, etc.)

- **How?**
  - Assess the anticipated effects of climate change on all natural hazards
  - Include *Sea Level Rise* as distinct hazard
## Integration of Climate Change

- Hazard identification / classification

<table>
<thead>
<tr>
<th>ATMOSPHERIC</th>
<th>HYDROLOGIC</th>
<th>GEOLOGIC</th>
<th>OTHER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extreme Temperatures</td>
<td>Coastal Erosion</td>
<td>Earthquake</td>
<td>Wildfire</td>
</tr>
<tr>
<td>Hurricane/Tropical Storm</td>
<td>Dam Failure</td>
<td>Landslide</td>
<td></td>
</tr>
<tr>
<td>Nor’easter</td>
<td>Drought</td>
<td>Soil Hazards <em>(includes expansion, subsidence, and sinkholes)</em></td>
<td></td>
</tr>
<tr>
<td>Severe Thunderstorm <em>(includes high winds, hail, and lightning)</em></td>
<td><strong>Flood</strong> <em>(includes coastal, riverine and flash flooding. Also includes ice jams and storm surge)</em></td>
<td>Tsunami</td>
<td></td>
</tr>
<tr>
<td>Severe Winter Storm <em>(includes snow and ice)</em></td>
<td>Sea Level Rise</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tornado</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## Integration of Climate Change

- **Hazards affected by climate change**

<table>
<thead>
<tr>
<th>HAZARD</th>
<th>ANTICIPATED EFFECT(S) OF CLIMATE CHANGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extreme Temperatures</td>
<td>Increase in the frequency, duration and intensity of extreme heat events; decrease in frequency of extreme cold events.</td>
</tr>
<tr>
<td>Hurricane/Tropical Storm</td>
<td>Insufficient evidence, but assumption is future storms will be of a greater intensity.</td>
</tr>
<tr>
<td>Severe Winter Storm/Nor’easter</td>
<td>Winters to be shorter in duration with fewer cold days and more precipitation, but less precipitation falling as snow and more as rain. Reduced snowpack, earlier breakup of winter ice on lakes and rivers, and earlier spring snowmelt will result in earlier peak river flows.</td>
</tr>
<tr>
<td>Coastal Erosion</td>
<td>Increase in the extent of coastal erosion, exacerbated by sea level rise.</td>
</tr>
<tr>
<td>Drought</td>
<td>Increase in the frequency, duration and intensity of drought events.</td>
</tr>
<tr>
<td>Flood</td>
<td>Increase in the frequency of urban flooding due to more heavy downpours. Increase in the extent and frequency of storm surge and coastal flooding.</td>
</tr>
<tr>
<td>Wildfire</td>
<td>Increase in the frequency and intensity of wildfire events, exacerbated by increase in frequency of prolonged drought conditions and dieback of mature trees.</td>
</tr>
</tbody>
</table>
SEA LEVEL RISE

- Planning scenario = 1 meter increase by Year 2080 (no storm)
### SEA LEVEL RISE

- **Exposure analysis**

<table>
<thead>
<tr>
<th>Jurisdiction</th>
<th>Number of Parcels</th>
<th>Value of At-Risk Parcels</th>
<th>Number of Buildings</th>
<th>Critical Facilities</th>
<th>Value of At-Risk Critical Facilities</th>
<th>Historic Assets</th>
<th>Value of At-Risk Historic Assets</th>
</tr>
</thead>
<tbody>
<tr>
<td>Branford</td>
<td>2,194</td>
<td>$441,271,525</td>
<td>1,299</td>
<td>2</td>
<td>$135,200</td>
<td>282</td>
<td>$214,493,120</td>
</tr>
<tr>
<td>Hamden</td>
<td>91</td>
<td>$268,984,000</td>
<td>57</td>
<td>0</td>
<td>$0</td>
<td>N/A</td>
<td>Unknown</td>
</tr>
<tr>
<td>Madison</td>
<td>968</td>
<td>$641,899,000</td>
<td>2,830</td>
<td>0</td>
<td>$0</td>
<td>N/A</td>
<td>Unknown</td>
</tr>
<tr>
<td>North Haven</td>
<td>183</td>
<td>$181,166,800</td>
<td>662</td>
<td>0</td>
<td>$0</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>West Haven</td>
<td>979</td>
<td>$164,380,510</td>
<td>640</td>
<td>2</td>
<td>$15,868,860</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>4,415</strong></td>
<td><strong>$1,697,701,835</strong></td>
<td><strong>5,488</strong></td>
<td><strong>4</strong></td>
<td><strong>$16,004,060</strong></td>
<td><strong>282</strong></td>
<td><strong>$214,493,120</strong></td>
</tr>
</tbody>
</table>

- **Greatest concern** associated with sea level rise is the increased severity of episodic coastal flooding and storm surge events
## Conclusions on Hazard Risk

<table>
<thead>
<tr>
<th>HIGH RISK</th>
<th>Severe Winter Storm/Nor’easter</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Hurricane/Tropical Storm</td>
</tr>
<tr>
<td></td>
<td>Coastal Flood</td>
</tr>
<tr>
<td></td>
<td>Riverine Flood</td>
</tr>
<tr>
<td>MODERATE RISK</td>
<td>Tornado</td>
</tr>
<tr>
<td></td>
<td>Coastal Erosion</td>
</tr>
<tr>
<td></td>
<td>Sea Level Rise</td>
</tr>
<tr>
<td></td>
<td>Extreme Temperatures</td>
</tr>
<tr>
<td></td>
<td>Severe Thunderstorm</td>
</tr>
<tr>
<td></td>
<td>Urban Flood</td>
</tr>
<tr>
<td>LOW RISK</td>
<td>Wildfire</td>
</tr>
<tr>
<td></td>
<td>Dam Failure</td>
</tr>
<tr>
<td></td>
<td>Drought</td>
</tr>
<tr>
<td></td>
<td>Earthquake</td>
</tr>
</tbody>
</table>
Our Approach:

- Run separate Level 2 analysis for *each* municipal jurisdiction
- Replace national default inventory data with best available local data
- Adjusted to account for changes from Census 2000 to 2010

Results:

- Losses for various return period events
- Annualized loss figures
  - *Direct and indirect losses*
PROBLEM STATEMENTS

- Designed to provide linkage between *Risk Assessment* and *Mitigation Strategy*

- Derived from Municipality Meetings, Advisory Committee Meetings, Public Meetings, and GIS analysis

- Statements were developed to address:
  - Primary hazards of concern
  - Geographic areas of concern
  - Vulnerable community assets

- Potential solutions / mitigation actions may also be captured
PROBLEM STATEMENTS

- Examples

<table>
<thead>
<tr>
<th>Primary Hazards of Concern</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Tree-related hazards are among the Town’s most significant recurring and widespread issues, particularly the downing of electric and communication lines during <em>hurricane/tropical storm</em> and <em>severe winter storm</em> events.</td>
</tr>
<tr>
<td>➢ Potential solutions/mitigation actions:</td>
</tr>
<tr>
<td>• Coordinate with local businesses to acquire backup generators so they can stay open following hazard events.</td>
</tr>
<tr>
<td>• Prioritize areas for power restoration through the development of microgrid distributed energy generation.</td>
</tr>
<tr>
<td>• Conduct survey and develop inventory of hazard trees, and prepare long-term maintenance plan for trees owned by the Town.</td>
</tr>
</tbody>
</table>

- **Severe winter storms** have caused many concerns with regard to roof collapses. The Town does not have resident engineering expertise with regard to snow loads. |
  ➢ Potential solutions/mitigation actions: educational material for building owners on steps to be taken with regard to assessing and minimizing threats to roofs from snow loads.
**Problem Statements**

- **Examples**

<table>
<thead>
<tr>
<th>Geographic Areas of Concern</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Old Grassy Hill Road</strong> – frequent flooding of roadway @ bridge over Wepawaug River, especially following heavy rains (depths of up to 3-4” observed in past). Existing culvert pipe under roadways is deemed inadequate, making the roadway act as a dam, causing recurring scouring/flooding issues.</td>
</tr>
<tr>
<td>- Potential solutions/mitigation actions:</td>
</tr>
<tr>
<td>- Culvert widening</td>
</tr>
<tr>
<td>- Upstream sediment control</td>
</tr>
<tr>
<td>- Dredging / sediment removal</td>
</tr>
<tr>
<td>- The best solution is raising the roadway.</td>
</tr>
<tr>
<td><strong>Litchfield Turnpike (Route 69) @ Warren Road</strong> – floodwaters from Konolds Pond reach roadway during severe rainfall events. Approximately 5 residential properties are considered by Town to be potentially at risk.</td>
</tr>
<tr>
<td>- Potential solutions/mitigation actions: sediment removal from lake to increase storage capacity.</td>
</tr>
</tbody>
</table>
FUTURE VALUE

- **Community Rating System (CRS)**
  - Design Mitigation Planning Process to maximize CRS credit for floodplain management
  - Worksheet 1.1 in Local Planning Guide
    - Comparison of mitigation planning and CRS requirements

- **Mitigation Actions**
  - Looking beyond individual municipality projects
  - SCRCOG Leadership
  - Multi-Jurisdiction Project
  - Regional Collaboration
REGIONAL RESOURCES – FLOODPLAIN MAPPING TOOLKIT

- New Resources for Public Education
  - Fact Sheet
  - PowerPoint Presentation

- Non-technical Information
  - About the NFIP
  - FEMA floodplain maps
  - Floodplain mapping process
  - Risk MAP
  - Procedures for map changes

- Target audience
  - Property owners
  - To be distributed or delivered by local community officials
THANK YOU

Jamie Caplan and Darrin Punchard

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