



September 2017

Municipal Issues & Needs for Addressing Climate Adaptation in Connecticut

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This report is a product sponsored by the Connecticut Institute for Resilience and Climate Adaptation (more information about CIRCA can be found at circa.uconn.edu). The work is made possible through a grant from the State of Connecticut Department of Housing CDBG-Disaster Recovery Program and the US Department of Housing and Urban Development.

About this Report

Coastal municipalities are facing a significant number of challenges in planning for, and adapting to, changing weather patterns and climate change. Lack of resources and staff expertise make it more important than ever that research and support designed to assist municipalities with resiliency planning and implementation be something they can truly use. This study, designed to collect information on what exactly coastal communities can “truly use,” was one of ten tasks comprising the *Municipal Resilience Planning Assistance Project*, funded by the U.S. Department of Housing and Urban Development in 2015 and coordinated by the Connecticut Institute for Resilience and Climate Adaptation (CIRCA). All ten tasks were focused on the coastal counties impacted by Storm Sandy in 2012.

From June 2016 to February 2017, officials from twenty municipalities in Connecticut counties impacted by Superstorm Sandy were interviewed to develop a list of their most pressing concerns and needs with respect to climate resiliency. A second objective was to determine what standard of authority and data uncertainty associated with research on sea level rise and floodplain mapping municipal officials are willing to accept, with regard to including this information in their planning and regulatory documents. The information in this report can be used by researchers and state agencies so they can provide resources that municipalities find applicable to their needs and defensible when used.

Task 10: Determination of Municipal Issues and Policy and Research Needs

Scope

The purpose of this task is to understand the most pressing needs facing municipalities with respect to climate change and to develop a list of research questions that municipal officials need answered. These questions/issues will assist CIRCA directors, climate researchers and others to develop practical solutions to municipal climate challenges through applied research. In addition, interviews sought to determine what standard of authority and data uncertainty municipal officials are willing to accept, in terms of research results for sea level rise and floodplain mapping for inclusion in their planning and regulatory documents. This information will guide researchers and state agencies so that they can provide results that municipalities find applicable and defensible when they are used. This project also included coordination with a Legal Research Fellow from the UConn Law School Center for Energy and Environmental Law (Task 9) and appropriate CIRCA Directors on the information gathered. This task was implemented by the Connecticut Sea Grant College Program and the UConn Center for Land Use Education and Research (CLEAR).

Methodology

Municipalities are facing a significant number of challenges in planning for and adapting to changing weather patterns and climate change. Officials from thirteen municipalities in Connecticut counties impacted by Superstorm Sandy were interviewed between June 2016 and February 2017. Interview questions for municipal officials were reviewed by UConn's Institutional Review Board and shared with a CIRCA research director. Interviewees were a mix of municipal officials including elected officials and officials from town departments including public works, planning, conservation, emergency management and health. Also interviewed were engineers contracted by multiple towns to provide engineering services. All interviews were conducted in person. Interview questions are listed in Appendix A.

Presentations and confirmation interviews were conducted with an additional seven municipalities to ensure the findings were valid. A list of municipalities interviewed for each phase can be found in Appendix B. These interviews also consisted of a mix of municipal officials. They were provided with a summary of the findings (See Appendix C) and asked if they agreed, disagreed or had anything to add. The responses received from these interviews have been incorporated into the findings in this report. **To ensure an uninhibited flow of information, all interviewees were assured their responses would be kept confidential.** All participants will receive a copy of the final report.

Regular meetings and calls were conducted with the CEEL Legal Research Fellow and CIRCA Director for Applied Research working on Task 9. Information on municipal priorities was provided as interviews were conducted.

Executive Summary

Information from the interviews was grouped into 17 categories based on issue similarity. In addition, categories were ranked into high, medium and low priorities based on feedback from interviewees. In many areas, the issues overlap categories (and each other), illustrating the complexity of the climate adaptation challenges facing communities.

Categories and a brief discussion of issues follow. More detail is provided in the next section.

HIGH PRIORITY ISSUES

Flooding: Impacts on Infrastructure

- This is the biggest municipal concern based on the number of comments made during the interviews. Concerns with flooding ranged from the need to raise roads that flood during astronomical high tides to protecting wastewater treatment plants and pump stations from flooding during storm events.
- Planning and policy issues come into play when considering the best adaptation strategy to protect infrastructure from future vulnerability. Infrastructure impacts in a broad sense extend to whole neighborhoods as well as to those that are site specific.
- Tight municipal budgets are forcing communities to react to problems rather than address the issue proactively. Most municipalities need assistance determining what infrastructure assets are going to be vulnerable under what flood scenarios, how best to protect them and where to get funding to implement solutions.
- *Note:* While maps are helpful, many municipal officials draw on their years of experience in knowing which areas are most vulnerable to flooding. However, changes particularly in intense precipitation events are causing flooding in areas that previously never flooded before.

Flooding: Predicting Inundation Levels

- Municipal officials want to know what areas of their community are going to flood, when and how deep when a storm is forecast. They need to be able to accurately identify areas that will be impacted by a particular event. This information is used to determine when and where to issue evacuation orders, deploy emergency operations equipment like fire and ambulance, and protect vulnerable infrastructure.
- Some communities need maps that combine storm surge with riverine flooding, particularly during heavy precipitation events.

- Desirable areas for development may lie within areas that will be prone to flooding or be impacted by future sea level rise. Given the financial situation in Connecticut towns it is very difficult to not allow any development in these areas, so towns need to know what development alternatives they might have. (e.g. Should all structures be elevated?)
- This category also includes the increasing frequency of residents being isolated by higher tides not related to storm events (“sunny day flooding”). As this situation becomes more common, municipalities need help to address this issue.
- Towns are particularly concerned that retaining the character of their communities may become more and more difficult as homes and roads are elevated and other roads are abandoned due to flooding and (future) retreat.

Stormwater Management/Extreme Precipitation

- How to cope with increasing frequency of intense precipitation events also ranked high on the list of climate related concerns facing municipalities. Most municipal stormwater systems were developed 40-50 years ago and are straining to handle the new precipitation levels (in combination with, in most cases, the increase of impervious surfaces related to development). This has caused an increase in street flooding in urban areas.
- Municipalities need design and financial assistance to: 1) develop a comprehensive analysis of municipal stormwater systems; 2) determine priorities for replacement, and; 3) determine how to cost effectively retrofit existing stormwater infrastructure and how to better manage increased stormwater flows.

Coastal Erosion

- Municipalities are concerned about protection of private residents, commercial structures, beaches, dunes, and bluffs from erosion caused by coastal storms. The potential loss of town tax base if retreat becomes necessary was mentioned by several municipalities.
- Other issues include the most cost effective way to prevent erosion, restoration of breached dunes, and exposure of septic systems on coastal properties.

MEDIUM PRIORITY ISSUES

Emergency Operations and Storm Events

- Downed wires during storm events were one of the major issues for towns. How to better manage municipal response before, during and after a storm event was mentioned.

CT DEEP

- While DEEP personnel are well liked as individuals, there is a general perception that DEEP has not been helpful when it comes to assisting towns with climate related matters.
- One community mentioned that there were a lot of regulatory problems with DEEP not embracing resiliency projects that are in a coastal resource area, i.e. below the coastal jurisdiction line.
- Some communities feel DEEP is difficult to work with, needs to streamline the permitting process and has a credibility problem. Part of this may be related to the way DEEP is structured with enforcement and planning being within the same unit. Some communities mentioned that enforcement actions contributed to the overall negative view of DEEP.
- One community suggested looking to other states to see how they organize their “DEEP responsibilities” and how they assist municipal efforts aimed at addressing climate issues.
- Communities would like the State to be a leader with regard to climate.

Policy/Planning/Zoning

- Municipal policy, planning and regulatory efforts relative to climate adaptation are inconsistent from town to town. Some elected municipal officials are supporting efforts to incorporate climate adaptation actions into their municipal plans and policies and others are not.
- Municipal staff are the driving force behind moving these efforts forward and they must fit these efforts into existing responsibilities. Additional guidance and support is needed with the weight of the State behind it.
- Related to communications, municipal staff need an outside agency to provide public education about local (municipal level) climate change impacts.

Budget/Costs/Taxes

- Municipalities are concerned about the impacts of climate change on their tax base if retreat becomes necessary.
- In one community, the assessor is getting appeals of tax bills from some residents claiming that their property is worth less due to sea level rise or coastal erosion.
- Municipalities need to know what to do about vulnerable neighborhoods. The high cost of flood insurance may contribute to decreasing property values in the future.

Communications—Public

- Municipalities need assistance communicating climate challenges and adaptation actions to local boards and the public. For example, getting people to understand what

1 ft. of SLR really means and risks associated with sea level rise and extreme precipitation events is needed.

- As one municipality put it, “public outreach is tough, it takes money.” There is a need to strengthen emergency preparedness communications with residents.

Septic System Failure

- Storm surge, high water tables and heavy precipitation events are increasingly causing septic systems to fail.
- During storm events, coastal septic systems have been uncovered and in some cases, physically moved.
- Septic system failure on the coast can cause a reduction in water quality, environmental damage and potentially contaminate water supply systems. This is of concern not just during storm events, but as groundwater levels rise and with possible saltwater intrusion.

LOW PRIORITY ISSUES

FEMA

- Some communities expressed concern and frustration over FEMA storm damage reimbursement procedures and changes to these procedures between Storms Irene and Sandy.

Communications—Utilities/Amtrak

- Although it was generally felt that utility companies and Amtrak have done a better job communicating with local officials, there is still room for improvement. Communication problems are most apparent during storm events when both utilities and municipalities are working to manage their own storm responses.

Budget/Capital Improvement Plan

- With few exceptions, communities are not budgeting for climate adaptation in either their Capital Improvement Plan or annual budget.
- Climate is not really an “immediate” issue and so is not included in capital programs. Other capital needs are taking priority.
- Some municipalities are starting to look at their capital budgets in terms of climate change. One problem is that funding sources may not allow upgrading in consideration of climate change.
- Municipal officials are reluctant to support anything that increases the budget and raises taxes.

- Some municipalities are considering climate change impacts for site-specific projects like raising or replacement of bridges and roads.

Water Supply and Quality

- While some municipalities have had issues with saltwater intrusion into drinking water, most are on municipal water systems.
- One community mentioned having major issues with road salt in water systems. Although one municipality said that this was one of their five most pressing issues, there does not appear to be a significant problem at the present time.
- Shoreline agriculture, while small, is growing with numerous Community Supported Agriculture farms (CSA's) and legacy agriculture. There are growing concerns related to salt water intrusion and the water supply needed to maintain these farms, particularly during periods of drought.

Post Storm and Debris Management

- A number of municipalities mentioned dealing with debris resulting from a storm as a problem. Issues with finding a site to stockpile debris, what can be done with certain types of debris, permitting and the FEMA reimbursement process were raised.
- A priority for municipalities after a storm is to clear the roads to allow for emergency vehicle access and residents to return to their home. Sand is often pushed up onto roads and, in some cases, mixed with glass and other debris so cannot be put back on beaches.

Environment

- The impact of a changing climate on the environment received little mention. Impacts of salt on vegetation and salt water intrusion with regard to agriculture were raised.
- Concern was raised about impacts of SLR and storms on town beaches as well as impacts of warmer temperatures on the water quality of Long Island Sound, and consequences of this on tourism and swimming in the Sound.

Health

- Several climate change related health issues were raised by municipalities, particularly as many communities have an aging population. There was some concern expressed about vector borne diseases, prolonged heat waves, and the need to ensure that at-risk populations have needed medical supplies and appliances during storm events.
- Mold following flood events is of concern.
- Other concerns were associated with water quality in Long Island Sound and the ability to swim in public beaches.

Municipal Climate Adaptation Needs and Questions

A more detailed account of municipal adaptation needs and questions is provided below. This information can be used by researchers, engineers, regulators and others to focus their efforts on the areas of highest priority for municipalities, such that towns can better plan for and implement adaptation measures.

Flooding-Impacts on Infrastructure

1. Assistance determining what will be vulnerable and under what conditions. Municipalities need this to prepare for climate related impacts, and they must have an accurate assessment for inclusion in a municipal CIP and other budgets. Of particular concern is how to protect municipal wastewater systems—treatment plants, pump stations and collection systems—from flooding caused by storm surge and sea level rise. Wastewater systems that span multiple communities need a coordinated effort – not just resilience for the wastewater treatment plant itself.
2. Design assistance for site-specific projects and funding sources to build new infrastructure or solve an existing problem. How should a road through a wetland that floods be redesigned to account for climate related changes, have the least environmental impact and be most cost effective? How can flooding caused by rail line embankments be mitigated? What does a municipality need to do to its wastewater treatment system to protect it from the impacts of climate change? Wastewater treatment plants and pump stations on the shore are particularly vulnerable. Sewer lines are subject to infiltration during periods of heavy precipitation.
3. Updated design standards and procedures related to rebuilding stormwater systems, culverts and bridges after damage from storms or when replacing older infrastructure are needed. Municipalities would like to see updated design standards that take into account changes in precipitation patterns and frequency of events. They want to know if they should be designing for more extreme weather events. Until there is a new design standard adopted by the state or federal government, some municipalities are unlikely to change from the TP 40 standards. Some communities indicated that they do take into account new precipitation rates for site-specific projects such as increasing culvert size when replacing one.
4. Several municipalities mentioned that current FEMA regulations only allow for replacement in kind when reimbursing a municipality for repairs related to storm damage. This results in newly constructed infrastructure that may be as inadequate for current and future conditions as what was damaged. One community suggested allowing for a rebuild of 1.2 X the original size similar to what is done in Massachusetts.
5. Often times, an entire stormwater system does not need to be replaced, but rather, key locations. Modeling of stormwater systems is needed to determine the most cost

effective way to improve drainage to minimize flooding due to undersized systems given current/predicted precipitation levels.

Flooding-Predicting Inundation Levels

1. Information is needed to allow municipal officials to determine impacts from a particular storm. As far in advance as possible, they need to know what areas of their community are going to flood, when and how deep. This information is critical to municipal decision making in an emergency situation. They need to decide when and where to issue evacuation orders, deploy emergency operations equipment such as fire and ambulance, and protect vulnerable infrastructure.
2. Mapping to identify areas isolated by locally flooded roads that are vulnerable to sea level rise and planning assistance for how to best address the site-specific situations.
3. More accurate information about inundation probability to maintain credibility. There is a concern about ordering evacuations or taking some other action based on predictions and the storm intensity/inundation levels turn out to be significantly less than predicted. When this occurs more than once, residents tend to be skeptical of future warnings.
4. Accurate mapping and elevation data which show flood levels from all combined sources—precipitation, tides, storm surge, sea level rise, and river flooding.
5. Installation of high watermark signs to inform residents of the potential for flooding in a particular area. However, there are pros and cons to this: these signs may get taken down by people trying to sell homes.

Stormwater Management/Extreme Precipitation (some of these issues are related to infrastructure impacts)

1. Municipalities are experiencing an increase in flooding during periods of extreme rainfall. Guidance on how best to manage short duration, high intensity storms and their impacts on stormwater systems is needed. How can a municipality identify choke points in an existing stormwater system and design a solution in the most cost effective way? How to best assist municipalities to address stormwater management in their regulations?
2. Update, using the best source of data, the Connecticut Stormwater Quality Manual to reflect the new precipitation realities. Many municipalities are waiting for this to happen before they replace or build new infrastructure.
3. What authority do municipalities have to require maintenance of privately owned detention basins to ensure they are functioning as designed? Also there are concerns related to vector borne diseases in detention ponds.
4. What is the impact on septic systems and municipal infrastructure of supersaturated soils during major storm events?
5. Determine the relationship between SLR and groundwater levels and future impacts on groundwater.

Coastal Erosion

1. During recent storm events, many municipalities experienced dune blowouts. Research on the most cost effective methods of protecting dunes from erosion before it is too late to recover is needed.
2. Engineering design and financing options for protecting roads leading to residences that are subject to erosion during storm events.
3. As noted in the Issues/Septic System section, erosion from storm events has uncovered and, in some cases, washed away septic systems. Developing alternatives to placement of on-site systems in areas subject to erosion will help to reduce this vulnerability.

Emergency Operations and Storm Events

1. Develop best practices for better communications between utilities and municipalities before, during and after storm events.
2. Development of apps (and other technologies) to better manage emergency situations (e.g. real time feedback on clearing of downed trees and wires).
3. Best management practices for how to address Emergency Operations issues, such as firefighting, when residences are elevated.
4. Information on what to do about fire hydrants being impacted by sea level rise.
5. Assistance for vulnerable businesses with planning for storm events. Some large manufacturers in vulnerable areas need to have a plan in place for what to do when power goes out, evacuations, etc.
6. Need guidance on planning for emergency shelter operations during storm events. Need more guidance of how to fund shelters. Need planning for long-term shelters and pet accommodations.
7. Need to develop better communications to tell residents of available resources to help them prepare their home for storm events and possible evacuation.

CT DEEP

1. Need to develop more reasonable regulations re: removing rubble after it is deposited in the water after a storm. Provide clarification (better wording) when an Emergency Authorization is issued so people understand what they are authorized to do. Coordination needed between DEEP and ACOE when an EA is issued.
2. Need support from DEEP in enforcement when people repair their property after storms.
3. Need DEEP to embrace resiliency projects that are in a coastal resource area, i.e. below the coastal jurisdiction line, rather than establish regulatory hurdles. The permitting process needs to be streamlined for repairs.
4. Need for DEEP to better relate to municipalities and their needs to regain trust. Some of the comments received included DEEP “needs to be educated in a lot of areas” and DEEP “needs to understand the science.”

5. Dam safety is a concern in several municipalities. The DEEP Dam Safety Inspection Program is understaffed. A BMP guide for maintaining the safety of municipal and private dams, including recognizing indicators of dam failure, should be developed.
6. After major coastal storms, repairs to sea walls on neighboring properties were not always coordinated, so there were different types of solutions.
7. Municipalities have ideas for solutions to road flooding but DEEP regulations are a problem when resilience solutions go into tidal wetlands. There is a need to streamline or override the regulatory process and better balance resources and resilience solutions.
8. DEEP assistance is needed to help communities develop design solutions for sewer lines that go through sensitive areas like marshes.

Zoning/Planning/Policy

1. Municipalities that have not been fortunate enough to receive grant assistance to hire a consultant need assistance preparing municipal climate adaptation assessments and plans. This should include choices about what to rebuild or redesign infrastructure with limited resources.
2. Assistance with rewriting municipal plans and regulations that address climate adaptation actions. Before enacting regulations as a response to climate related threats, municipalities need to know about any conflicts between private property rights and regulatory controls.
3. Research to determine what the impact on municipalities would be if the Federal Government were to no longer subsidize the National Flood Insurance Program. How will the increase in premiums affect property values and tax bases?
4. Need to determine new building code standards so structures are more resistant to wind and wave damage.
5. Can a municipality adopt a policy that would allow the creation of special taxing districts in flood hazard zones where there is municipal infrastructure? Can they use funds for the protection of the district, like a TIP for climate adaptation?
6. Municipalities need guidance from state or federal government about what data to use in plans and regulations. Several communities mentioned the need for consistency of data in planning documents from one town to the next. Currently some climate action plans use data from one source and others from another. Other states benefit from a State Planning office to coordinate climate adaptation efforts.

Budget/Cost/Taxes

1. Municipalities need to understand the possible impacts of sea level rise on the municipal tax base when/if retreat becomes necessary.
2. Municipalities need financial resources to implement some of the known solutions to problems.

3. Municipalities need to address the question of what to do about vulnerable neighborhoods. There are many issues municipalities may be facing when considering the impacts of climate change related events on neighborhoods. How to address road flooding, septic tank failure, water supply, emergency services and possible loss of structures are already issues in some municipalities.
4. How does a municipality respond to a property owner who is appealing his/her tax assessment claiming that the property is worth less due to loss of property with sea level rise or coastal erosion?

Communications—Public

1. Municipalities need help communicating the climate adaptation challenges they are facing to the public, such as getting people to understand what 1 ft of SLR really means in terms of impacts. Often someone from the outside has a better opportunity to communicate this than municipal staff.
2. Resilience education is needed. Most people on the coast recognize the need to elevate homes. Riverine systems residents have less understanding of climate issues. They need information on what they need to do to protect themselves.

Septic System Failure

1. Septic system failure due to intense rainstorms or coastal flooding is becoming more common. Municipalities need information on impacts of SLR on ground water levels—septic tank failure and how to deal most economically address the problem.
2. During some storm events, coastal erosion results in the exposure of on-site systems. Design solutions to address this issue are needed as this problem will only get worse.

FEMA

1. Many communities would like FEMA to amend storm related reimbursement procedures to be clearer and so that infrastructure can be upgraded to take into account new precipitation standards.
2. Most municipalities are concerned over the accuracy of FEMA Flood Insurance Rate Maps. Recent revisions to the maps resulted in a number of residents needing to obtain flood insurance. Municipalities need more accurate maps that are approved by FEMA for the purposes of the National Flood Insurance Program.

Communications—Utilities/Amtrak

1. Better communication between Amtrak and local residents is needed. There is concern that projects Amtrak undertakes are not done in consultation with municipalities and do not consider local impacts.
2. Municipalities want to work with Eversource to establish a list of critical facilities to prioritize for restoration of electrical service.
3. Need better communication from utilities.

Budget/Capital Improvement Program

1. Many communities are not considering climate change impacts when budgeting for new infrastructure. They would like the State to take the lead in encouraging municipalities to use updated information when designing capital investments. Need a cost/benefit analysis taking climate adaptation into account when making capital investments. Funding sources are needed to help communities invest in climate adaptation.

Water Supply

1. While many communities have community water systems, salt water intrusion into drinking water supplied through individual or community wells is becoming more of a concern. Sea level rise, storm surge and road salt application are contributors to the problem. The issue also extends to salt water intrusion on water supply for agricultural interests. Research into the best method of protecting water supply from salt water intrusion is needed.

Post Storm and Debris Management

1. Municipalities need a standard set of procedures for how to deal with debris management, especially when it comes to environmental regulations and reimbursement procedures. Several municipalities felt that procedural changes need to be made well in advance of a storm so there is time to understand them. These standards should address securing debris during a storm event as well as disposal after it.
2. If the National Guard is called in during an emergency event, they will do things their way. Because their reporting structure is totally different from municipal ones, it can be difficult to work with them. How can this issue be addressed by municipalities?

Environment

1. Follow up on research that identifies the impact of sea level rise on marsh migration and flood storage capacity. Looking for innovative ways to duplicate marsh flood storage capacity when it is lost to sea level rise.

Health Issues

1. A few municipalities raised concerns about health issues in the future especially from vector borne diseases and extreme temperatures. During storm events there is a need to identify at risk populations that need power for medical appliances. Some municipalities need assistance with the logistics of establishing shelters for residents, particularly the elderly, during storm events and heat waves.
2. Need to address the issue of old sanitary lines and the backup of sewage into people's homes. There is also the need to address the issue of sewer lines in tidal wetlands.

Next Steps

It is clear that municipalities have many needs that could be addressed by researchers to help them address the impacts of climate change on municipal operations. Not funded as part of this task but a necessary next step is comparing municipal needs to existing research efforts. For each of the needs identified, what is the current status of research, if any, that addresses those needs? Has it been peer reviewed and published? What research being conducted at UConn is similar to research at other institutions or in the private sector? How does it compare to current research efforts?

For example, the Town of Stonington used consultants to prepare a resiliency plan. The consultants developed models that show inundation levels for the town taking into account sea level rise, storm surge and intense precipitation events. How does ongoing modeling research done at UConn compare to this modeling effort. It would be helpful if there was a standard model that was approved by the State and used in the future by all municipalities so there is consistency from municipality to municipality. A review of the status of research which meets identified municipal climate adaptation needs is necessary to gain an understanding of where future research should focus.

It should be noted that research needs to meet certain standards for municipalities to be comfortable using it in official documents. A discussion of those standards can be found in the next section of this report, *Standards of Authority for Data*.

Task 10 Standard of Authority for Data Sources

Summary

Municipalities were adamant about using data that had a state or federal stamp of approval in their regulatory documents. Every municipality except one stated that they need to have some form of official endorsement of data from the state or federal government for use in certain municipal documents. For planning documents the standard was less stringent: peer reviewed data from universities or information developed by NGO's was acceptable to some municipalities, while others would only use that which was approved by the state or federal government. Municipal officials are concerned about justifying data sources to both citizens and to town boards and commissions in the event the data are challenged. Chief elected officials, town councils, finance boards, etc. generally do not have the expertise to justify the use of specific data so they need to rely on a "higher authority" such as a state or federal agency.

The following list of comments made by municipal officials during the interviews is the best way to illustrate their concerns.

Comments made by municipal officials with respect to regulatory documents include:

1. Need to be able to point to something and say, "They made me do it" when it comes to using data. Even with using it for a plan, one will need backing of the town council and they will ask where the data came from.
2. Need to have official approval for data to be useful. Want to be absolved of responsibility for accuracy of data by passing the buck to the state.
3. Concerned about the potential for legal challenges for different sources of data in planning and regulatory documents.
4. Data needs to be defensible in court. Would be nervous about using anything other than FEMA data even in planning documents.
5. Need maps to be certified by federal agencies or state.
6. If data from a university professor is wrong, is he going to pay for the consequences?
7. Data that are peer reviewed are considered "good data."

There were a limited number of comments that showed more flexibility when it comes to planning documents:

1. Universities are a great source of science if it comes from more than one place and is peer reviewed. The question is how do you get it to be more generally accepted?
2. No concerns about using data from Universities, NGOs, etc. in planning documents.
3. If using other data (other than federally or state approved sources), the question of qualifications to do the modeling comes up and a host of issues can result afterwards.

Appendix A – Interview Questions for Municipal Officials

Climate Change in Connecticut’s Coastal Communities – Municipal Assessment

Target Audience: Municipal Officials (both elected and staff), Regional Planning Agency Officials

Identification of Needs: Questions will focus on community needs to respond to extreme weather events in the short term as a result of more intense precipitation and storm events, as well as adaptation efforts for the long term challenges of climate change.

Methods/Structure of Interviews

The pool of interviewees included chief elected officials, town planners, zoning officers, wetlands or conservation officers, environmental planners, engineers, public works and health officials and consultant engineers. It should be stressed that information collected in the interviews was limited to opinions of the individuals, and do not necessarily reflect the perception of all the towns’ staff and/or officials.

Each interview ranged from approximately 1 to 2 hours in length. During these conversations, we used a “semi-structured” interview approach. Interviews were loosely structured conversations focused on the questions found below, along with impromptu follow-up questions based on individuals’ responses. Verbal responses were categorized by question with hand written notes.

Current Climate Related Issues and Needs

1. Remembering the challenges your town went through during recent storms over the past 5 years, Sandy, Irene, October snowstorm and other heavy wind, rain and snow events. What were the biggest challenges you faced, how did you deal with those challenges and what information or resources would have helped you better meet those challenges?

This question is designed to get the respondent thinking about a real event and give them a frame of reference rather than hitting them right away with something abstract (What do you think the effects of climate change will be on your community in the future?). Also it will help to raise addressing of short-term issues.

Prompts: permitting issues, infrastructure issues (what was damaged or vulnerable), street flooding, post storm clean-up, flooding predictions v. reality, stormwater management

2. Thinking back to Irene, Sandy and the October Snowstorm, what impacts do you think a Category 2 or 3 hurricane (with major rain/wind inland) would have on your community?

Prompt: what infrastructure or critical assets were damaged or in danger of being damaged that would be impacted more severely by a larger storm?

For inland communities – think about power outages and stormwater flooding; potential for dams to give out.

3. If a storm was headed your way, what information do you need to make emergency management decisions?

Prompts: evacuations, inundation levels (tide stage plus surge) and areas predicted to flood, when it will hit, what to protect.

4. FOR COASTAL COMMUNITIES---If NOAA predictions of SLR (approx. 3 ft by 2085) hold true, what impact in terms of erosion, flooding, damage, etc. would that have on (name of Community)? What information do you need to help prepare for SLR and reduce risk vulnerable assets?

Future Climate Change Issues

1. What do you feel will be the biggest municipal management challenges you will face from:

- a. Sea level rise
- b. Changes in precipitation events flooding, infrastructure vulnerability, stormwater management, etc.
- c. Erosion (coastal)
- d. Aging infrastructure (including dams)
- e. Drought conditions—reservoirs depleted, lack of water for irrigation
- f. Prolonged heat waves
- g. Vector born diseases (mosquitoes)

2. As part of the preparation of your municipal budget and capital improvements plan, have you started to consider the impacts of climate adaptation needs?

- a. *Prompts: need to increase culvert size or other stormwater considerations, use of Green Infrastructure*

Climate Adaptation Planning and Policy

The purpose of these questions is to explore what municipalities are doing to address climate adaptation on the planning/policy level.

1. What is the political environment in your town toward taking action to address climate change?
2. What do you need to help you move adaptation efforts along?
3. What do you feel are the 5 most pressing climate adaptation challenges that will be facing your town in the next 25 years? What information or data do you need to address those challenges?
4. What research projects would help you address climate adaptation challenges?
5. In general, what would be most helpful to you to address climate adaptation challenges that will be facing your community now and in the next 5, 10, 25 years?
6. Is there anything that we haven't discussed that you would like to bring up related to how your municipality is addressing climate adaptation issues?

*Prompts: Do you address climate adaptation in your POCD or other land use documents?
Has your town established policy or regulations to address climate adaptation issues?
Would it help to have sample regulations and/or policies that you can modify to suit your needs?*

Standard of Authority Questions for Climate Change in Connecticut's Coastal Communities

1. How concerned are you about the sources of the data you use in your planning documents?
2. How concerned are you about the sources of the data you use in regulatory documents?
3. Are you concerned about potential legal challenges to your official town documents or decisions based on the source of data used?
4. Do you require data, for example flood maps, sea level rise projections, used in your official documents to be accepted, certified or approved by a state or federal agency.

Appendix B– List of Municipalities Interviewed

Initial Interviews

Branford
City of Groton
East Lyme
Greenwich
Madison
Milford
North Branford
Old Lyme
Old Saybrook
Stratford
Waterford
Westbrook
Jacobson Engineering

Confirmation Interviews

Clinton
East Haven
Guilford
New London
Stonington
Town of Groton
Fairfield

Appendix C—Summary sheet provided to municipalities for the confirmation interviews

Municipal Needs to Address Climate Adaptation Issues

High Priority

Flooding-Impacts on Infrastructure

Most municipalities need assistance determining what infrastructure assets are going to be vulnerable, when they will be vulnerable, how best to protect them and where to get funding to implement the solution.

Flooding-Predicting Inundation Levels

Municipal officials want to know what areas of their community are going to flood, when and how deep when a storm is forecast. They need to be able to accurately identify impacted areas arising from a particular event.

Flooding—Isolate residents/businesses

Related to predicting inundation levels during storm events, this category also includes the increasing frequency of residents being isolated by higher tides not related to storm events.

Stormwater Management/Extreme Precipitation

Municipalities need design and financial assistance to determine how to cost effectively retrofit existing stormwater infrastructure and how to better manage increased stormwater flows.

Coastal Erosion

Municipalities are concerned about protection of private residents, commercial structures, beaches, dunes, and municipal facilities from erosion caused by coastal storms. Potential loss of tax base if retreat becomes necessary was mentioned by several municipalities. Other issues included the most cost effective way to prevent erosion, restoration of breached dunes, and exposure of septic systems.

Medium Priority

Emergency Operations and Evacuation Routes

How to better manage municipal response before, during and after storm events was mentioned. For example: need for more efficient emergency operations systems, shelter operations, and evacuation routes.

DEEP

There is a general perception that DEEP has not been helpful when it comes to assisting towns with climate related matters. One community mentioned that there were a lot of regulatory problems with DEEP not embracing resiliency projects that are in a coastal resource area, i.e. below the coastal jurisdiction line. While individual DEEP employees are well liked, some communities feel DEEP is difficult to work with, needs to streamline the permitting process and has a credibility problem.

Policy/Planning/Zoning

Municipal policy, planning and regulatory efforts relative to climate adaptation are inconsistent from town to town. Municipal staff is the driving force behind moving these efforts forward and they must fit these efforts into existing responsibilities. Additional guidance and support is needed with the weight of the state behind it.

Budget/Costs/Taxes

Municipalities are concerned about the impacts of climate change on their tax base if retreat becomes necessary. In one community the assessor is getting appeals of tax bills from some residents claiming that their property is worth less. Municipalities need to know what to do about vulnerable neighborhoods. The cost of flood insurance may contribute to decreasing property values in the future.

Communications—Public

Municipalities need assistance communicating climate challenges and adaptation actions to local boards and the public. Municipalities also need assistance communicating to residents what to do before, during and after a storm.

Septic System Failure

Municipalities need assistance to determine the most cost effective way to address on-site septic system failure. Storm surge, high water tables and heavy precipitation events are increasingly causing septic systems to fail. Septic system failure on the coast can cause a reduction in water quality, environmental damage and potentially contaminate water supply systems.

Low Priority

FEMA

Some communities expressed concern and frustration over FEMA storm damage reimbursement procedures. There is also dissatisfaction with the FIRMs.

Communications—Utilities/Amtrak

Although it was generally felt that utility companies and Amtrak have done a better job communicating with local officials there is still room for improvement. Communication

problems are most apparent during storm events when both utilities and municipalities are working to manage their own storm response.

Budget/CIP

With a few exceptions, communities are not budgeting for climate adaptation in either their Capital Improvement Plan or annual budget. Other capital needs take priority. Some municipalities are considering climate change impacts for site-specific projects such as raising roads or replacement of bridges.

Water Supply

While some municipalities have had issues with saltwater intrusion into drinking water most are on municipal water systems. There does not appear to be a significant problem at the present time.

Environment

The impact of a changing climate on the environment received little mention. Impacts of salt on vegetation and agriculture were raised but do not appear to be of major concern at the present time.

Debris Management

A number of municipalities mentioned dealing with debris resulting from a storm as a problem. Issues with finding a site to stockpile debris, what can be done with certain types of debris, permitting and the FEMA reimbursement process were raised.

Health

Climate related health issues were not a pressing need for municipalities. There was some concern expressed about vector borne diseases and ensuring at risk populations had needed medical appliances during power outages.

Standard of Authority for Data Sources

Almost every municipality stated that it needs to have some form of official endorsement of data from the state or federal government for use in municipal documents; Less so for planning documents but municipalities (with one exception) were adamant about using only data that had a state or federal stamp of approval in their regulatory documents. However, there is concern about the potential for legal challenges for different sources of data in planning and regulatory documents. Municipal officials are concerned about justifying data sources to both citizens and to town boards and commissions in the event the data are challenged. Chief elected officials, town councils, finance boards, etc. generally do not have the expertise to justify the use of specific data so they need to rely on a "higher authority" such as a state or federal agency.