

2012

State and Local Responses to Climate Change through Hazard Adaptation Measures: White Paper Synthesizing Innovative State and Local Climate Change Adaptation Strategies

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**STATE AND LOCAL RESPONSES TO CLIMATE CHANGE THROUGH
HAZARD ADAPTATION MEASURES:
WHITE PAPER SYNTHESIZING INNOVATIVE STATE AND LOCAL CLIMATE CHANGE
ADAPTATION STRATEGIES**

January 2012



Marine Affairs Institute



THE
UNIVERSITY
OF RHODE ISLAND

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Introduction

The response time for addressing climate change is today. It is simply undeniable that “communities across the Nation are already experiencing a range of climatic changes, including more frequent and extreme precipitation events, longer wildfire seasons, reduced snowpack, extreme heat events, increasing ocean temperatures, and rising sea levels.”¹ The federal government, “recognizing that most adaptation occurs at the local level,”² provides several financial incentives to state and local governments that are taking affirmative measures to adapt to the reality of climate change. While clearly an issue of national significance, this report will focus on climate change adaptation in the New England coastal states (Maine, New Hampshire, Massachusetts, Rhode Island, and Connecticut).³

One example of these adaptation incentives is found in the Coastal Zone Management Act (CZMA).⁴ In relevant part, the Act provides states with “coastal zone enhancement grants” when the Secretary of the Environmental Protection Agency (EPA) determines that a state’s proposal adequately addresses “coastal zone enhancement objectives,” with a focus on climate mitigation strategies.⁵ In order to receive grants, states submit documents entitled “Assessment and Strategy under Section 309” (hereinafter “309 reports”). Another example, under the National Flood

¹ Climate Change Adaptation Task Force, *Federal Actions for a Climate Resilient Nation 2* (2011), available at http://www.whitehouse.gov/sites/default/files/microsites/ceq/2011_adaptation_progress_report.pdf.

² *Id.* at iv.

³ While the states vary in some of their legal strategies for addressing climate change, it may be valuable to note at the outset the group of strategies identified as common to the subject states: (a) building setbacks/restrictions, (b) repair/rebuilding restrictions, (c) restriction of hard shoreline protection structures, (d) promotion of alternative shoreline protection structures, (e) Permit compliance, (f) hazards education and outreach, and (g) hazards research and monitoring. See each state’s 309 report (cited under each section herein).

⁴ 16 U.S.C. §§ 1451–1464.

⁵ 16 U.S.C. § 1456b.

Insurance Program (NFIP), implemented by the Federal Emergency Management Agency (FEMA), states are also required to submit “Standard State Mitigation Plans” (hereinafter “hazard plans”), in order to receive non-emergency assistance and mitigation grants.⁶ To the extent that the hazard plans address risks exacerbated by climate change, their contents are discussed herein.

These 309 and hazard plans reports document the state’s climate change risks, existing law addressing hazard mitigation, and future goals for dealing with the effects of climate change. While the discussion of the state’s climate change science and its goal-setting process is a valuable exercise for state planners, EPA, and FEMA, the description of existing legal techniques for climate change mitigation and adaption provide the most relevant information as to the current regulatory climate for addressing climate change. Accordingly, this report briefly summarizes the mitigation reports submitted to the federal government and outlines how each state has inventoried its climate change risks, and then proceeds to a more detailed description the existing legal framework for managing these risks.⁷

Because municipalities are also playing critical role in climate change policy, this report also focuses on the legal relationship between state and municipal governments and the unique measures that local governments are employing. “Not only are municipal governments the first responders when disasters strike but their state legislatures have delegated to them the principal legal authority to determine how much

⁶ 44 C.F.R. § 201.4(a).

⁷ Because the state 309 reports and mitigation plans vary in the degree of detail with which the relevant existing state law is described, this report directly references the state laws that the state emphasized in the reports.

and what type of development may be built in disaster-prone areas.”⁸ The selected municipal strategies addressed provide useful examples to inform the discussion of local adaptation. The intent is that the resulting discussions bring to light additional existing examples, as well as inspire new strategies and innovative applications of existing options.

Maine

309 Report Summary

Maine’s Section 309 Report begins with the characterization of the climate change risks it faces according to the level of the risk and its geographic scope (see Risk Inventory below).⁹ The Report details the revision process of the Coastal Sand Dune Rules, as well as highlights revisions to the Mandatory Shoreland Zoning Act to include special coastal bluff protection.¹⁰ It explains the incorporation of new data, including LiDAR and aerial photography in the updated definition of the coastal sand dune area.¹¹ The report also highlights several projects contributing to the built environment’s stability in the face of climate change, including beach nourishment. Other strategies discussed include coordination with the U.S. Army Corps of Engineers in planning for sediment and shoreline monitoring.¹² The Report also stresses Maine’s climate change research efforts, as well as its hazards education and outreach efforts,

⁸ John R. Nolon, *Disaster Mitigation through Land Use Strategies*, 23 PACE ENVTL. L. REV. 959, 963 (2006).

⁹ Maine State Planning Office, *Maine Coastal Plan: Assessment and Strategy under Section 309 of the Coastal Zone Management Act* (2011), available at http://www.maine.gov/spo/coastal/downloads/coastalplans/mcp309plan_may2011.pdf (hereinafter “Maine Coastal Plan”).

¹⁰ *Id.* at 23.

¹¹ *Id.* at 23-24.

¹² *Id.* at 27.

including the Maine Beaches Conference, a documentary entitled “Building a Resilient Coast” and a useful workbook titled “Maine Coastal Property Owner Hazard Guide.”¹³

The second part of the Report discusses the state’s goals and needs with regard to future climate change mitigation action. The document stresses the importance of municipal-level responses to climate change, stating its strategy of “increas[ing] partnerships with local communities and working groups” to accomplish “forward-looking ordinances, adaptation and management programs, and capital improvement efforts.”¹⁴ Maine’s dedication to such efforts is evidenced by its three-year work to establish the Sea Level Adaptation Working Group (SLAWG), which provides recommendations for Saco Bay communities,¹⁵ the lessons from which are “quite transferable for continued and expansion of coastal resiliency efforts” beyond the Saco Bay Region.¹⁶ The Report recognizes that the municipalities must be equipped not only with guidance from state and regional support, but also need reliable mapping to delineate the coastal zone as it changes from sea level rise and increased hazard risks.¹⁷ The mapping strategy would ideally result in more accurate (newer technology) and more recent maps (some maps are as old as the 1970s) being used to redefine shoreland zoning boundaries and better understand the problem of beach erosion.¹⁸

Finally, the Report strategizes that Maine needs to revise the definition of a “erosion hazard area” subject to special regulation under the Coastal Sand Dune Rules, because the current definition is over-inclusive in including areas subject to static

¹³ Id. at 28-29.

¹⁴ Id. at 97.

¹⁵ Id. at 97-98.

¹⁶ Id. at 99.

¹⁷ Id. at 102.

¹⁸ Id. at 102-103.

flooding.¹⁹ The state also seeks to define Future Coastal Wetlands to take into account the predicted two-foot sea level rise in the next 100 years.²⁰ Doing so places these at-risk areas under the protection of Maine’s Natural Resources Protection Act.²¹

Hazard Plan Summary

Maine’s hazard plan details the natural disaster risks the state faces and outlines its strategy for addressing these risks.²² A variety of state actors play a role in disaster preparedness and response. To address flooding, characterized as the “number one” risk in Maine,²³ the Department of Transportation (DOT) provides road repair services following severe flooding events, the State Planning Office’s Floodplain provides model floodplain ordinances and technical assistance to communities,²⁴ and the Department of Environmental Protection (DEP) implements the Stormwater Management, Shoreland Zoning and Dam Licensing statutes.²⁵ To address winter storms, DOT is responsible for clearing snow from roadways.²⁶ Wildfire risks are addressed by the Maine Forest Service with monitoring and voluntary community assessment program.²⁷

Risk Inventory²⁸

The 309 reports require states to categorize the climate change hazard risks it faces, both by severity of the risk and by geographical scope. The two categorizations are synthesized below to provide a list from high-risk wide-spread risks to low-risk geographically-limited risks.

1. Sub-regional High Risk:

¹⁹ Id. at 112-113.

²⁰ Id. at 113.

²¹ Id.

²² Maine Emergency Management Agency, *State of Maine Standard Hazard Mitigation Plan* § 4, p. 5. (2010), available at http://www.maine.gov/mema/mitigation/mema_mit_plans.shtml (hereinafter, “Maine Hazard Plan”).

²³ Id. at § 1, p. 2.

²⁴ Id. at § 4, p. 5.

²⁵ Id. at 6.

²⁶ Id.

²⁷ Id. at § 4, 7.

²⁸ *Maine Coastal Plan*, *supra* note 9, at 15.

- a) Extra-tropical storms and storm surge
 - b) Shoreline erosion
 - c) Sea level rise
2. Sub-regional Medium Risk Hazards :
- a) Hurricanes/typhoons
 - b) Coastal bluff erosion
 - c) Subsidence
3. Sub-regional Low Risk Hazards:
- a) Geological Hazards Including Earthquakes and Tsunamis
 - b) Landslides

State Mitigation Efforts

Under Maine’s Natural Resources Protection Act, any permanent structure in a coastal dune system must be permitted by DEP.²⁹ In accordance with its statutory permitting responsibility, the DEP promulgated the Coastal Sand Dune Rules³⁰ to delineate the requirements of its permit program administration. The geographical scope of the Rules is Maine coastal sand dune systems, which comprise 2% of Maine’s coast.³¹ Accordingly, any proposal for development in the sand dune that includes a regulated activity must comply with the special requirements set forth in the Rules.³²

Any development that “may reasonably be expected to be eroded as a result of changes in the shoreline” within 100 years may not be permitted.³³ In other, more risky situations, development may be permitted, but is restricted: 60% of the total lot size must remain undeveloped.³⁴ In making this calculation, the total area includes any land

²⁹ 38 M.R.S. § 480.

³⁰ Coastal Sand Dune Rules, Code Me. R. 06-096 Ch. 355 (promulgated pursuant to authority in 38 M.R.S. § 490-AA).

³¹ Id.

³² Id.

³³ Id. at § 5(C).

³⁴ Id. at § 5(B)(1).

area filled for landscaping,³⁵ but excludes any portion of the property located in the most dangerous flood zone category (the V-zone).³⁶

As a condition of development on the sand dune, the DEP may require the landowner to restore dune topography and enhance native vegetation in the 60% of the lot that was not permitted to be covered by the development.³⁷ Areas that were disturbed by construction, though not ultimately becoming part of the 40% of the lot covered by the development, must also be restored.³⁸ Restoration efforts may include planting dune vegetation such as American beach grass, rugosa rose, bayberry, beach pea, beach heather and pitch pine, or other pre-approved planting.³⁹

The Rules prohibit building new seawalls and “similar structures.”⁴⁰ Alteration or replacement of these hardened structures is allowed only if (a) the size remains the same or the replacement structure is moved landward and (b) the DEP determines that “the replacement structure would be less damaging to the coastal, sand dune system, existing wildlife habitat and adjacent properties than replacing the existing structure with one of the same dimension and in the same location.”⁴¹

Serving as an alternative to the hardened shoreline protection, Maine coastal managers find that “the public is generally in favor of beach nourishment.”⁴² By

³⁵ *Id.*

³⁶ *Id.* at § 5(B)(3). The V-zone refers to “[a]reas along coasts subject to inundation by the 1-percent-annual-chance flood event with additional hazards associated with storm-induced waves.” Federal Emergency Management Agency, *Zone V*, NFIP POLICY INDEX, fema.gov/plan/prevent/floodplain/nfipkeywords/zone_v.shtm.

³⁷ *Id.* at § 5(I).

³⁸ *Id.* at 10(C).

³⁹ *Id.* at § 10(C), (D).

⁴⁰ *Id.* at § 5(E).

⁴¹ *Id.*

⁴² E-mail from Malcolm Burson, Office of the Commissioner, Maine Department of Environmental Protection (November 8, 2011, 1:05 PM).

contrast, other states have faced fierce resistance to beach nourishment efforts.⁴³ To implement beach nourishment in Maine, the Rules provide guidelines that such projects must follow. Most important to natural geological climate change resiliency, the beach profile must be compatible with the natural beach profile “to the extent practicable.”⁴⁴ To address wildlife protection concerns associated with beach nourishment projects, the DEP employs timing restrictions,⁴⁵ monitoring authority,⁴⁶ and management easements⁴⁷ to limit the negative effects of the project on existing natural resources. The nourishment regulations also preserve the natural beauty of the beach by requiring use of materials that are texturally and visually compatible with the natural sand.⁴⁸ At the end of the project, the state obtains title or an easement to areas nourished using state funds in order to improve public access for recreational activities.

The State of Maine does not have a special source of funding for beach nourishment projects, but the state does seek to coordinate with the U.S. Army of Corps

⁴³ Strong resistance was evidenced in Florida, for example. One legal commentator explains the seminal case: “In *Stop the Beach Renourishment...*, the Florida Department of Environmental Protection (“FDEP”) issued permits to the city of Destin and Walton County to repair the damage erosion had caused on their beaches.” Derek Leslie, *Did the U.S. Supreme Court Recognize an Elusive or Illusive Judicial Taking in Stop the Beach Renourishment?* 3 KY. J. EQUINE, AGRIC. & NAT. RESOURCES L. 285, 286 (2011). In response, “[b]eachfront landowners formed ‘Stop the Beach Renourishment, Inc.’, a nonprofit corporation through which the landowners sued to stop this action.” *Id.* The case addressed, but did not resolve, the issue of judicial takings. “The project...resulted in the creation of additional dry land between the property owners’ holdings and the ocean--land that was claimed by the state.” Ilya Somin, *Stop the Beach Renourishment and the Problem of Judicial Takings*, 6 DUKE J. CONST. L. & PUB. POL’Y 91, 93 (2011). In response, affected landowners asked for “compensation under the Takings Clause of the Fifth Amendment.” *Id.* In addition to the coastal property rights concerns, environmental criticisms of beach nourishment include “that the newly nourished beach quickly narrows after placement of the sand,” “that the newly placed sand rarely matches characteristics of the native beach sand,” and “compaction of beach sediments.” Matthew Rupert, *Beach Nourishment to the Rescue: through an Extensive Regulatory Review Process, Beach Nourishment Can Restore and Protect Vital Sea Turtle Nesting Habitat*, 19 SOUTHEASTERN ENVTL. L.J. 327, 346-348 (2011).

⁴⁴ Coastal Sand Dune Rules, *supra* note 30, at § 8(B).

⁴⁵ *Id.* at § 8(C).

⁴⁶ *Id.* at § 8(D).

⁴⁷ *Id.* at § 8(F).

⁴⁸ *Id.* at § 8(A).

of Engineers to assist municipally or privately funded projects.⁴⁹ Embodying the policy of beneficial reuse of unused natural materials from other projects, the preferred source for nourishment materials is Army Corps of Engineers' dredged material from federal navigation channel projects.⁵⁰ Both the state and municipalities work with the Corps to obtain these materials, although the least-cost disposal rule often frustrates these efforts.⁵¹

Some agencies and land acquisition programs may have the ability to acquire storm damaged property in vulnerable coastal habitats for open space. These include the Maine Emergency Management Agency (MEMA) and the Land for Maine's Future program.⁵² Such programs rely on the discretionary authority of these groups to acquire land, which is often sold in small parcels at a high cost, and may not be of particular significance outside of hazard-mitigation planning.⁵³ Additionally, the acquisition process is usually too slow to be a viable option for landowners facing the difficult decision of rebuilding immediately after storm damage.⁵⁴

Municipal Mitigation Efforts

The Mandatory Shoreland Zoning Act requires all coastal communities to adopt local shoreland zoning ordinances that meet state minimum standards, incorporated in "model ordinances" drafted by the state.⁵⁵ Accordingly, Maine municipalities must adopt zoning ordinances that protect the shoreline from erosion exacerbated by climate

⁴⁹ Beach Stakeholder's Group to the Joint Standing Committee on Natural Resources: 122nd Maine Legislature, 2nd Regular Session, *Protecting Maine's Beaches for the Future: A Proposal to Create an Integrated Beach Management Program* § IV(A) (2006), available at http://www.maine.gov/dep/blwq/topic/dunes/report06_protect.pdf (hereinafter "Protecting Maine").

⁵⁰ Coastal Sand Dune Rules, *supra* note 30, at § 8(A).

⁵¹ Protecting Maine, *supra* note 49.

⁵² *Id.* at § IV C.

⁵³ *Id.*

⁵⁴ *Id.*

⁵⁵ Code Me. R. 06-096 Ch. 1000.

change. In particular, the ordinance must require applicants to submit erosion and sedimentation control plans to the municipality for any proposed activities that may result in unstabilized soil conditions.⁵⁶ Development plans must reduce potential for erosion by following natural contours and be compatible with natural soil types.⁵⁷ These plans include mulching with a minimum of one bale per five hundred square feet and any necessary netting, temporary runoff control features such as hay bales, silt fencing or diversion ditches, permanent stabilization structures such as retaining walls or rip-rap, or vegetation.⁵⁸ Unfortunately, there is no record of which municipalities have chosen to be more restrictive, have more stringent standards, or zone more areas as resource protection than is necessary” under state law.⁵⁹

Municipalities also adopt floodplain management ordinances based on a series of “models ordinances” drafted by the MEMA, the selection amongst which depends on location’s categorization under the state’s flood hazard map.⁶⁰ Not many municipalities have enacted more protective ordinances, according MEMA, which has credited the limited regulatory responses to Maine’s “history and culture that is steeped in independence, a distrust of big government, a belief in personal responsibility, respect for the property of others, and a tradition of neighbor helping neighbor in times of need.”⁶¹

⁵⁶ *Id.* at § 15(Q)(1).

⁵⁷ *Id.* at § 15(Q)(2).

⁵⁸ *Id.* at § 15Q(1).

⁵⁹ E-mail from Deirdre Schneider, Shoreland Zoning Coordinator in the Bureau of Land & Water Quality, Maine Department of Environmental Protection (Nov. 11, 2011).

⁶⁰ Maine State Planning Office, Floodplain Ordinances & Permit Forms, <http://www.maine.gov/spo/flood/ordinances/index.htm> (last visited Nov. 29, 2011).

⁶¹ Maine Hazard Plan, *supra* note 22, at § 4, p. 15.

MEMA has recognized “increasing instances of local communities responding effectively with a high level of sophistication to emergency needs.”⁶² While “[t]here were very few ordinance-related mitigation measures” identified by the Maine Hazard Mitigation Team in communities in York County, the municipalities did show improvement in structural changes, public education, and emergency planning efforts.⁶³ Similarly, in Cumberland County, education, rather than ordinance review, was ranked “at or near the top of the list in all hazard categories.”⁶⁴ Also, the Waldo County Hazard Mitigation Planning Team determined that ordinance-related mitigation action were “not necessary,” and, moreover, that they are not “popular in small Maine towns.”⁶⁵ These community responses demonstrate that most municipal mitigation actions in Maine are primarily educational or structural improvements that do not require ordinance or comprehensive plan revision.⁶⁶ Beyond being “unnecessary” and “unpopular” hazard mitigation ordinances in Maine may be extremely difficult to enact because some local governance structures in Maine require a “town meeting vote of the general populace.”⁶⁷

An example of structural mitigation projects in Maine coastal communities include the reconstruction of seawalls with more advanced designed once older ones are damaged by a destructive storm. For example, in 2010, Scarborough received federal funding to reconstruct a 550-foot sea wall with larger stones and more secure concrete

⁶² Maine Hazard Plan, *supra* note 22, at § 4, p. 5.

⁶³ York County Emergency Management Agency & Southern Maine Regional Planning Commission, *York County, Maine Hazard Mitigation Plan*, § 6, p. 4 (2011), available at <http://www.smrpc.org/EMA/2011%20York%20County%20Hazard%20Mitigation%20Plan/Complete%20York%20County%20Hazard%20Mitigation%20Plan%20-%202011.pdf>.

⁶⁴ Cumberland County Emergency Management Agency & Cumberland County Soil and Water Conservation, *Cumberland County, Maine Hazard Mitigation Plan* 103 (2004), available at http://www.raymondmaine.org/sites/default/files/webfm/town_office/documentation/mitigation_final_report.pdf.

⁶⁵ Waldo County Emergency Management Agency, *Hazard Mitigation Plan for Waldo County, Maine*, 121 (2011), available at http://www.uninets.net/~dsrowley/2011_Waldo_Mitigation_Plan.pdf.

⁶⁶ *Id.*

⁶⁷ Cumberland County Emergency Management Agency, *supra* note 63.

component.⁶⁸ In addition to education and structural projects, some Maine communities are responding with acquisition of storm-prone properties. For example, in 2007, Kennebunk acquired and demolished three houses in a neighborhood that had suffered six devastating floods within 50 years.⁶⁹

New Hampshire

309 Report Summary

New Hampshire's Section 309 Report relies on the state wide Hazard Mitigation Plan to assess the climate change risks the state faces.⁷⁰ Referring to the Plan as a "living document," the Report explains the plan is amended in order to maintain compliance with changes in federal law.⁷¹ The Report also cites to Executive Order Number 2007-3 in which the Climate Change Policy Task Force was created.⁷² The Task Force "identified ten overarching strategies necessary to reduce New Hampshire's annual greenhouse gas emissions" in the 2009 Climate Action Plan.⁷³

Discussing the measures that New Hampshire is still working on, the Report lists a state-wide hazard plan as top priority.⁷⁴ The NH Coastal Adaptation Workgroup (NHCAW) is under executive order to "develop a Climate Change Adaptation Plan for the State of New Hampshire."⁷⁵ The Report predicts the likely success of the project based on the experience that "[i]t is through participation on regional councils and

⁶⁸ Edward Murphy, *Scarborough Gets a Break on Sea Wall*, PORTLAND PRESS HERALD (March 13, 2010), available at http://www.pressherald.com/archive/scarborough-gets-a-break-on-sea-wall_2008-11-30.html.

⁶⁹ Federal Emergency Management Agency, *Kennebunk Acquisition, Demolition, and Elevation* (2007), <http://www.fema.gov/mitigationbp/briefPdfReport.do?mitsslId=6537>.

⁷⁰ New Hampshire Department of Environmental Services & New Hampshire Coastal Program, *Coastal Zone Management Act Section 309 Enhancement Grants Program Assessment and Strategy* 18 (2010), available at <http://coastalmanagement.noaa.gov/mystate/docs/nh3092011.pdf> (hereinafter "309 report").

⁷¹ *Id.* at 19.

⁷² *Id.* at 20.

⁷³ *Id.*

⁷⁴ *Id.* at 66.

⁷⁵ *Id.* at 66-67.

working groups that issues are raised, partnerships are built and policy changes are identified.”⁷⁶

Hazard Plan Summary

The New Hampshire hazard plan explains that while the state is held to NFIP standards under an executive order, other development restrictions are left to local zoning ordinances.⁷⁷ In addition to summarizing applicable FEMA programs, the Plan also highlights New Hampshire’s use of Comprehensive Emergency Management Planning for Schools,⁷⁸ Hurricane Tracking Chart Program, Family Preparedness Presentations⁷⁹, and Dam Safety Program.⁸⁰ In addition to federal post-disaster relief programs, the Plan highlights the state’s Disaster Relief Funding program⁸¹ and the New Hampshire Mutual Aid for Public Works, which “facilitate[s] quick response to public works emergencies by creating an intercommunity cooperative.”⁸²

Risk Inventory⁸³

The 309 reports require states to categorize the climate change hazard risks it faces, both by severity of the risk and by geographical scope. The two categorizations are synthesized below to provide a list from high-risk wide-spread risks to low-risk geographically-limited risks.

1. Coast-wide High Risk Hazards:
 - a) Flooding
 - b) Severe winter weather
 - c) Wildfire
 - d) Hurricane
2. Sub-regional Medium Risk Hazards:
 - a) Coastal storm and storm surge

⁷⁶ Id. at 67.

⁷⁷ New Hampshire Department of Safety Homeland Security and Emergency Management, State of New Hampshire Multi-Hazard Mitigation Plan § V, p. 3 (2010), *available at* http://www.nh.gov/safety/divisions/hsem/HazardMitigation/haz_mit_plan.html (hereinafter “New Hampshire Hazard Plan”).

⁷⁸ Id. at § V, p. 4.

⁷⁹ Id. at § V, p. 5.

⁸⁰ Id. at § V, p. 11.

⁸¹ Id. at § V, p. 21.

⁸² Id. at § V, p. 20.

⁸³ 309 Report, *supra* note 70, at 18.

- b) Shoreline erosion (bluff and dune erosion)
- c) Sea level rise and other climate change
- 3. Coast-wide Medium Risk Hazards:
 - a) Geological hazards (tsunami, earthquakes)
 - b) Dam failure
 - c) Drought
 - d) Radon
 - e) Tornado/downburst
 - f) Lightning
- 4. Coast-wide Low Risk Hazards:
 - a) Land subsidence

State Mitigation Efforts

The Shoreland Water Quality Protection Act is the regulatory protection for sensitive coastal areas, implemented by the rulemaking authority of the Commissioner of the NH Department of Environmental Service (DES).⁸⁴ The Act provides minimum development standards for “land located within 250 feet of the reference line of public waters”⁸⁵ in order to “protect buildings and lands from flooding and accelerated erosion.”⁸⁶ New development requires a DES permit for construction, excavation, or filling within vulnerable shoreland areas.⁸⁷ DES provides for “permit by notification” for projects of limited size,⁸⁸ environmental projects,⁸⁹ and public infrastructure maintenance.⁹⁰ Applications for existing structures to be “reconstructed in place, altered, or expanded” must demonstrate that the project causes “no expansion or relocation of the existing footprint within the waterfront buffer.”⁹¹ While there are some

⁸⁴ N.H. Rev. Stat. § 483-B:17.

⁸⁵ *Id.* at B:4(XV).

⁸⁶ *Id.* at B:2(V).

⁸⁷ *Id.* at B:5(l)(a).

⁸⁸ *Id.* at B:5(l)(a)(1).

⁸⁹ *Id.* at B:5(l)(a)(2).

⁹⁰ *Id.* at B:5(l)(a)(3).

⁹¹ *Id.* at B:11(l)

exceptions for forestry and agriculture,⁹² development lots in the sensitive coastal area remain limited to 30% coverage with impervious surfaces.⁹³

Under state law, there is a 50-foot setback for primary structures, defined as permanent structures “central to the fundamental use of the property.”⁹⁴ The area between the setback line and the water serves as a “waterfront buffer” in which rocks, stumps, roots, and natural ground cover must either remain intact or be replaced with plantings that improve runoff control.⁹⁵ This policy is implemented using a “tree, sapling, shrub, and groundcover point score” system developed by the state.⁹⁶ The coast line is also protected by a 150-foot natural woodland buffer area. These buffer areas serve to “moderate the impact of heavy rains” and “protect people and property from flood damage by slowing a storing flood waters.”⁹⁷

New Hampshire also has the authority to acquire storm-prone land for additional buffering. The Shoreland Water Quality Protection Act allows DES “to solicit, receive, and expend any gifts, grants, or donations” to support its efforts under the statute.⁹⁸ This includes “gifts of land”, which are assigned to the Department of Resources and Economic Development for management.⁹⁹

Municipal Mitigation Efforts

Municipalities assist the state in implementing the Shoreland Water Quality Protection Act by issuing cease and desist orders. The state incentivizes local

⁹² New Hampshire Department of Environmental Services et. al., *Innovative Land Use Planning Techniques: a Handbook for Sustainable Development* 241 (2008), available at http://des.nh.gov/organization/divisions/water/wmb/repp/documents/ilupt_complete_handbook.pdf (hereinafter “Innovative Land Use”).

⁹³ N.H. Rev. Stat. § 483-B:9(V)(g).

⁹⁴ *Id.* at B:9(II)(b).

⁹⁵ *Id.* at B:9(V)(a)(2).

⁹⁶ *Id.* at B:9(V)(a)(2)(D).

⁹⁷ *Innovative Land Use*, *supra* note 92, at 239 (2008).

⁹⁸ N.H. Rev. Stat. §. 483-B:15.

⁹⁹ *Id.*

participation with its policy that “any civil penalties and fines collect by the court, can be remitted to the treasurer of the municipality prosecuting violations, for use of the municipality.”¹⁰⁰ DES also has the statutory authority to “devise a system whereby municipal officials may voluntarily assist with the permitting process.”¹⁰¹ In return, the state’s office of energy and planning “may assist municipalities with the implementation of local ordinances.”

The state provides communities with a series of model ordinances designed for different areas of the National Flood Insurance Program (NFIP) map.¹⁰² Some, if not most, communities adopt the same or substantially similar language into their code of ordinances. This system ensures compliance with the executive order requiring compliance with NFIP standards.¹⁰³

Municipalities may, but are not required to, include a natural hazards section in their Master Plans.¹⁰⁴ While municipalities also submit Local Hazard Mitigation Plans to Homeland Security and Emergency Management, the recommendations are helpful, but not enforceable.¹⁰⁵ New Hampshire municipalities are also “encouraged” to use their statutory grant of authority to “adopt land use control ordinances...more stringent than the minimum standards” under state law.¹⁰⁶

Unfortunately, there is no precise record maintained by the state to document municipal efforts that go above and beyond state minimum requirements. One official

¹⁰⁰ Innovative Land Use, *supra* note 92, at 241.

¹⁰¹ N.H. Rev. Stat. § 483-B:7.

¹⁰² New Hampshire Office of Energy and Planning, NH Model Floodplain Ordinances, http://www.nh.gov/oep/programs/floodplainmanagement/regulations/model_ordinances.htm (last visited Nov. 29, 2011).

¹⁰³ Hazard Plan, *supra* note 77, at § V, p. 3 (2010).

¹⁰⁴ *Id.* at §VI, p.1.

¹⁰⁵ *Id.*

¹⁰⁶ N.H. Rev. Stat. § 483-B:8.

cited policy concerns surrounding unfunded mandates for the lack of pressure on local governments to take action in hazard mitigation.¹⁰⁷ This policy is part of New Hampshire's constitutional framework,¹⁰⁸ and enforced by New Hampshire courts, which "have recognized the unfairness of certain state mandates, realized the severe financial burden being placed upon local governments, and upheld the spirit of anti-mandate provisions."¹⁰⁹

Despite the inability of the state to force climate change mitigation measures without providing additional funding, the state has continued to support municipalities as they voluntarily address climate change mitigation needs in their communities. Recognizing that "[m]ost communities in New Hampshire do not have the staff and resources available to develop a Plan," the state encourages reliance on the State Hazard Mitigation Officer, the National Flood Insurance Program Coordinator, and the Regional Planning Commissions' resources.¹¹⁰ The state also provides guidance documents for communities in a document entitled Hazard Mitigation Planning Guide for New Hampshire Communities.¹¹¹

Unlike the situation in some other states,¹¹² New Hampshire municipalities *do* have authority to amend the standard building code to provide greater restrictions on flood plain development.¹¹³ Therefore, some towns have implemented the requirement

¹⁰⁷ Telephone Interview with Darlene Forst, Shoreland Section Supervisor, New Hampshire Department of Environmental Services, Wetlands Bureau. (November 2011).

¹⁰⁸ N.H. Const. Pt. 1, Art. 28-a.

¹⁰⁹ Robert M. M. Shaffer, *Unfunded State Mandates and Local Governments*, 64 U. CIN. L. REV. 1057, 1080 (1996).

¹¹⁰ Hazard Plan, *supra* note 77, at § VI, p. 2.

¹¹¹ *Id.*

¹¹² For example, communities in Rhode Island and Massachusetts are pre-empted from requiring more stringent building requirements such as higher freeboard. This issue is discussed in each state's titled sub-section herein.

¹¹³ N.H. Rev. Stat. § 155-A:3.

that all new development receive a certification of flood-proofing.¹¹⁴ For example, while FEMA coverage only requires the certificate for nonresidential structures,¹¹⁵ the Rye, NH ordinance also applies to vulnerable residential structures.¹¹⁶

The Town of Exeter has also adopted more stringent standards for protecting its shoreland area. While the state defines its protected shoreland as extending 250 feet from the reference line, Exeter expands the area to 300 feet.¹¹⁷ The town's 10% limit on impervious lot surface¹¹⁸ is also more protective than the state's general 30% standard. The 10% rule is favored because it corresponds with studies that indicate the levels at which wildlife are affected and stream quality decreases.¹¹⁹

Exeter's ordinance also requires a minimum setback of 150 feet in some areas and up to 300 in others.¹²⁰ By contrast, the maximum the statute imposes is 125 feet in some areas. While the state minimum standards prohibit the establishment or expansion of salt storage yards, auto junk yards, solid waste and hazardous waste facilities, Exeter also prohibits buried petroleum storage, dumping snow containing de-icing chemicals, commercial animal feedlots, automotive service and repair shops, dry cleaning establishments, and certain laundry and car wash operations.¹²¹

¹¹⁴ Rye, for example. Floodplain Development and Building Ordinance.

http://www.town.rye.nh.us/Pages/RyeNH_Flood/Ordinance.pdf (last visited Nov. 29, 2011).

¹¹⁵ Federal Emergency Management Agency, Floodproofing Certificate, NFIP Policy Index, *available at* http://www.fema.gov/plan/prevent/floodplain/nfipkeywords/floodproofing_certificate.shtml (last visited Nov. 29, 2011).

¹¹⁶ Rye, *supra* note 114.

¹¹⁷ Town of Exeter Zoning Ordinance § 9.3.3 (2004), *available at* <http://town.exeter.nh.us/ZBA/zoneord.pdf>.

¹¹⁸ *Id.* at 9.3.4(B).

¹¹⁹ Innovative Land Use, *supra* note 92, at 242.

¹²⁰ Exeter, *supra* note 117, at § 9.3.4.

¹²¹ *Id.* at 9.3.4(F).

Massachusetts

309 Report Summary

Massachusetts's Section 309 Report details the role of FEMA in the state's hazard planning and its use of a statewide Storm Team and StormReporter programs to assess risks.¹²² While acknowledging the overall lack of sufficient inundation mapping, the report highlights the town of Hull's LiDAR data and resulting models assisting local officials.¹²³ The report highlights the enactment of the state Global Warming Solutions Act, which includes an adaption strategy report to the legislature.¹²⁴ In terms of hazards research and monitoring, the Report refers to the Massachusetts Coastal Hazards Commission and its efforts to inventory coastal structures such as seawalls.¹²⁵ In its education and outreach highlights, the Report credits the StormSmart Coasts website with providing communities with "extensive technical, legal, planning, and regulatory information."¹²⁶

The "strategy" portion of the report expresses the goal of expanding the StormSmart Coasts program.¹²⁷ The program will seek to empower local efforts with an "expanded StormSmart Coasts toolkit."¹²⁸ The Report identifies how critical the state-local official interactions are and the importance of "regional coordinators who build trust and maintain momentum in the coastal cities and towns."¹²⁹

¹²² Commonwealth of Massachusetts Executive Office of Energy and Environmental Affairs & Office of Coastal Zone Management, Section 309 Assessment and Five-Year Strategy for CZM Program Enhancement 19 (2010), *available at* <http://coastalmanagement.noaa.gov/mystate/docs/ma3092011.pdf> (hereinafter "Massachusetts 309 report").

¹²³ *Id.*

¹²⁴ *Id.* at 22.

¹²⁵ *Id.*

¹²⁶ *Id.*

¹²⁷ *Id.* at 82.

¹²⁸ *Id.* at 83.

¹²⁹ *Id.*

Hazard Plan Summary

Massachusetts's hazard plan focuses on "flooding, severe storms, and winter events," the three risks of the greatest concern to the Commonwealth.¹³⁰ The Plan explains that these risks are addressed by the coordination of two components of its state government: the Massachusetts Emergency Management Agency (MEMA) and the Department of Conservation and Recreation (DCR).¹³¹ Some of the most important vulnerability assessments contained in the Plan include flooding vulnerability by jurisdiction,¹³² as well as the vulnerability of state facilities to a range of potential weather risks.¹³³ The Plan also catalogs state goals, local needs, funding resources, and outlines the process by which the Plan is implemented and updated.

Risk Inventory¹³⁴

The 309 reports require states to categorize the climate change hazard risks it faces, both by severity of the risk and by geographical scope. The two categorizations are synthesized below to provide a list from high-risk wide-spread risks to low-risk geographically-limited risks.

1. Coast-wide High Risk Hazard:
 - a) Flooding
 - b) Coastal storms, including associated storm surge
 - c) Shoreline erosion (including bluff and dune erosion)
 - d) Sea level rise and other climate change impacts
2. Coast-wide Moderate Risk Hazards:
 - a) Geological hazards (tsunamis, earthquakes)
 - b) Land subsidence

State Mitigation Efforts

The Massachusetts Basic Building Code requires that all new development in either high risk zones or in the important coastal dune areas are accompanied by

¹³⁰ Massachusetts Emergency Management Agency & Department of Conservation and Recreation, *Commonwealth of Massachusetts State Hazard Mitigation Plan 11* (2010), available at http://www.mass.gov/Eeops/docs/mema/disaster_recovery/mass_haz_mit_plan2010_official.pdf (hereinafter Massachusetts Hazard Plan).

¹³¹ Id.

¹³² Id. at 126.

¹³³ Id. at 128-135.

¹³⁴ Massachusetts 309 Report, *supra* note 122, at 17.

approved plans prepared by a “qualified registered professional engineer” in order to assure compliance with the flood zone requirements.¹³⁵ In areas having a “1% or greater chance of flooding in any given year,” such plans are required not only for any new construction, but also for “substantial improvement[s],”¹³⁶ which is defined as “involving changes to the foundation.”¹³⁷

The building code places restrictions on areas that are “subject to wave heights in excess of three feet.”¹³⁸ Construction in these “high hazard zones must meet a two-foot freeboard standard,¹³⁹ unless the area below is free from human habitation.¹⁴⁰ If a project located on a coastal dune, the elevation standard is determined by an Order of Conditions issued by the Conservation Commission.¹⁴¹ The Order also determines elevations necessary for the protection of mechanical and electrical equipment in the coastal dune.¹⁴²

In addition to the specific restrictions, Massachusetts has a “compensatory storage” policy¹⁴³ for coastal areas defined as “bordering land subject to flooding”¹⁴⁴ “This is a performance standard under the Wetlands Regulations for inland wetlands,”¹⁴⁵ requiring the developer do engage in floodplain restoration projects that would bring the net impact of the proposed project on flood storage capacity to net zero. “The

¹³⁵ 780 CMR 120.G501.1.

¹³⁶ Id.

¹³⁷ Id. at G501.6.

¹³⁸ Id. at G601.1.

¹³⁹ Id. at G601.2.

¹⁴⁰ Id. at G601.3.

¹⁴¹ Id. at G801.4.

¹⁴² Id. at G801.9.

¹⁴³ 310 CMR 10.57(4).

¹⁴⁴ Id. at (1)(a).

¹⁴⁵ Email from Julia Knisel, Coastal Resilience Specialist, Massachusetts Office of Coastal Zone Management (Nov. 9, 2011, 2:55 PM).

performance standards for coastal wetlands are more stringent, so compensatory storage doesn't apply."¹⁴⁶

Municipal Mitigation Efforts

Recognizing that “most communities in Massachusetts do not have the existing staff capacity to develop hazard mitigation plans without funding or technical assistance,” the state provides some funding for development.¹⁴⁷ DCR also provides guidelines for municipalities in a document titled “Natural Hazards Mitigation Guidebook: A Community Guide.”¹⁴⁸ As a result of both the funding and guidance, “as of December 2009, 163 communities ha[d] approved hazard mitigation plans.”¹⁴⁹ Of those, 139 plans are multi-jurisdictional.¹⁵⁰

Massachusetts towns are preempted from changing any standards codified under the state's uniform building code. “This has resulted in towns and cities...having to come up with creative forms of incentives to encourage the addition of enhanced building techniques.”¹⁵¹ There are several examples of Massachusetts municipalities that have imposed higher standards than the state minimums already discussed. However, these additional restrictions must be in the form of zoning ordinances rather than building codes. For example, while the state building code protects sand dunes by limiting development, Ipswich's Zoning Bylaw further protects sands in high hazard

¹⁴⁶ Id.

¹⁴⁷ Massachusetts Hazard Plan, *supra* note 130, at 190.

¹⁴⁸ Massachusetts Department of Conservation and Recreation, *Natural Hazards Mitigation Guidebook: A Community Guide*, <http://www.mass.gov/dcr/stewardship/mitigate/guide.htm> (last visited Nov. 29, 2011).

¹⁴⁹ Massachusetts Hazard Plan, *supra* note 130, at 189.

¹⁵⁰ Id.

¹⁵¹ Federal Emergency Management Agency, *High Marks for Building Higher: Hull's Freeboard Incentive Program*, Full Mitigation Best Practice Story (Nov 09, 2010), available at <http://www.fema.gov/mitigationbp/bestPracticeDetailPDF.do;jsessionid=0969A8CF80225435679FA0B879281E00.WorkerTheCage?mitsId=7671> (hereinafter “High Marks”).

areas against any “man-made alterations” “which would increase potential flood damage,”¹⁵² regardless of their compliance with the state building code.

One specific way of imposing restrictions on flood-prone areas already treated in another zone is through “overlay zoning.” “An overlay zone is regulated simultaneously by two sets of zoning regulations: the underlying zoning district provisions and the overlay zoning requirements.”¹⁵³ An overlay zone plan allows the community to address flood risks in certain areas without re-writing the entire zoning code. In the Town of Orleans, MA, “Floodplain District F” overlay zone receives additional protection from development.¹⁵⁴

Another strategy, the Town of Oak Bluffs has also promulgated “Rules and Regulations for the Floodplain Overlay Zoning District.” The Rules are more protective in that the Board of Appeals, in making a decision on a special permit in the overlay district, has discretion to consider whether an applicant’s proposed project in the overlay district “may become storm debris.”¹⁵⁵ Accordingly, a permit can be denied based on reasonable concern that “permeable pavers,”¹⁵⁶ “fencing,”¹⁵⁷ “small retaining walls,”¹⁵⁸ or other materials could exacerbate flood damage.

In addition to restrictions on development, communities may wish to develop incentives for developers to use building techniques and specifications that protect structures against the hazards of climate change. The Hull Board of Selectmen

¹⁵² Town of Ipswich Zoning Bylaw, p. 70 (updated Oct. 26, 2010).

¹⁵³ John R. Noland, *In Praise of Parochialism: the Advent of Local Environmental Law*, 26 HARV. ENVTL. L. REV. 365, 391 (2002).

¹⁵⁴ Town of Orleans General Code § 164-19(F)(2), available at http://www.town.orleans.ma.us/Pages/OrleansMA_Planning/zoning-ch164-april2010.pdf.

¹⁵⁵ The Town of Oak Bluffs, Rules and Regulations for the Floodplain Overlay Zoning District § 6(A)(2).

¹⁵⁶ *Id.* at § 6(A)(2)(a).

¹⁵⁷ *Id.* at § 6(A)(2)(b).

¹⁵⁸ *Id.* at § 6(A)(2)(c).

approved a program that provides a \$500 credit toward permitting costs for developers who elect to incorporate two feet of freeboard into the construction plans.¹⁵⁹ The program was well-received due to its eligibility for Community Rating System credit,¹⁶⁰ which reduces flood insurance rates under the NFIP for communities that exceed minimum FEMA standards.¹⁶¹ The freeboard incentive program was a success, with approximately 80% of eligible projects expressing intent to take advantage of the incentive by incorporating a 2-3 foot freeboard.¹⁶²

Sometimes adopting climate change adaptation measures requires adjusting other existing policies that interfere with implementation. In Hull, this meant developing a bylaw that would allow existing properties to apply for a variance in height restrictions in order to incorporate higher freeboard without violating city zoning provisions.¹⁶³ Hull also requires developers to address how climate change will impact their projects when the matter is before city planning officials.¹⁶⁴

Rhode Island

309 Report Summary

Rhode Island's Section 309 Report cites the state's reliance on FEMA flood zone maps, the US Army Corps of Engineers' hurricane inundation maps, and forthcoming US Geographical Survey Regional LiDAR project data coordinated with the Environmental Data Center at University of Rhode Island (URI), as well as the state's

¹⁵⁹ High Marks, *supra* note 151.

¹⁶⁰ Telephone Interview with Anne Herbst (Nov. 28, 2011).

¹⁶¹ Samuel Goldberg, *Falling into the Pacific: California Landslides and Land Use Controls*, 16 S. CAL. REV. L. & SOC. JUST. 95, 157-158 (2006).

¹⁶² Anne Herbst, *supra* note 160. 15/18 project developers indicated plans to incorporate freeboard.

¹⁶³ Id.

¹⁶⁴ Id.

own Shoreline Change Maps.¹⁶⁵ The Coastal Resources Management Council (CRMC), Economic Development Corporation, URI Coastal Resources Center, the Nature Conservancy, and Statewide Planning are collaborating “to create frameworks for assessments that can be easily updated when better-quality elevation data become available.”¹⁶⁶

One particular aspect of the CRMC’s work highlighted in the Report is the development of Special Area Management Plans (SAMPs) in Rhode Island. Encouraged by the federal government under the CZMA, SAMPs “increase policy specificity, and improve predictability of government decision making” by tailoring policies to specific geographic regions within the state.¹⁶⁷ The RI Metro Bay SAMP includes a section on Coastal Hazards affecting Providence, East Providence, Pawtucket, and Cranston, entitled “Natural Hazards: Hurricanes, Floods, and Sea Level Rise, including Social, Economic and Critical Facilities Risk Exposure.”¹⁶⁸ The Coastal Resources Management Program regulations (CRMP), which cover all regions in the Rhode Island Coastal Zone, were also updated to include climate change and sea level rise.¹⁶⁹

The Report also summarizes the setback provisions of the CRMP and its prohibition on “construction or expansion of public infrastructure and shoreline

¹⁶⁵ Rhode Island Coastal Resources Management Council, *Program Assessment and Strategy for Enhancement* (2010), available at <http://coastalmanagement.noaa.gov/mystate/docs/ri3092011.pdf> (hereinafter Rhode Island 309 Report”).

¹⁶⁶ *Id.* at 25.

¹⁶⁷ National Oceanic and Atmospheric Administration (NOAA), Office of Ocean and Coastal Resource Management, *In Depth: Understanding Special Area Management Plans*, http://coastalmanagement.noaa.gov/issues/special_indepth.html (last visited Nov. 28, 2011).

¹⁶⁸ CRMC, Metro Bay Special Area Management Plan, available at http://www.crmc.ri.gov/samp_mb.html.

¹⁶⁹ Rhode Island 309 Report, *supra* note 165, at 5.

protection structures on barriers.”¹⁷⁰ The Report cites the establishment of the Shoreline Adaptation Working Group to study the potential of “living shorelines” in Rhode Island.¹⁷¹ CRMC also sponsors public workshops and participates in a coalition of agencies known as the Rhode Island Flood Awareness and Climate Change Taskforce.¹⁷²

Turning to strategies and goals, the Report indicates Rhode Island’s intent to amend portions of the CRMP to take sea level rise into account.¹⁷³ The discussion pays particular attention to the need to amend the Coastal Buffers provisions consistently with predicted change in shoreline and coastal hazard risks.

Hazard Plan Summary

The Rhode Island State Hazard Mitigation Plan describes Rhode Island’s Dam Safety Program implemented by the Department of Environmental Management,¹⁷⁴ the Drought Management Plan implemented by the Water Resources Board¹⁷⁵ and makes brief mention of other state programs that may have a connection to future climate change adaptation measures. The majority of the Plan is dedicated to explaining the science of the inventoried climate change risks, which were ranked by frequency, the history of severe weather events in Rhode Island, and their future projections, where available. Finally, the Report provides an assessment of vulnerabilities based on

¹⁷⁰ *Id.* at 29.

¹⁷¹ *Id.* at 28.

¹⁷² *Id.* at 31-32.

¹⁷³ *Id.* at 35-36.

¹⁷⁴ Rhode Island Emergency Management Agency, Rhode Island State Hazard Mitigation Plan 32 (2008), available at <http://www.riema.ri.gov/preparedness/preparenow/RI%20Hazard%20%20Mitigation%20Plan%20Final.pdf> (hereinafter “Rhode Island Hazard Plan”).

¹⁷⁵ *Id.* at 67.

Critical Facilities,¹⁷⁶ social exposure,¹⁷⁷ and environmental¹⁷⁸ and economic¹⁷⁹ vulnerability.

Risk Inventory¹⁸⁰

The 309 reports require states to categorize the climate change hazard risks it faces, both by severity of the risk and by geographical scope. The two categorizations are synthesized below to provide a list from high-risk wide-spread risks to low-risk geographically-limited risks.

1. Coast-Wide High Risk Hazard:
 - a) Flooding
 - b) Coastal storms and storm surge
 - c) Sea level rise and other climate change impacts
2. Sub-regional High Risk Hazard:
 - a) Shoreline erosion (localized to barrier headlands)
3. Sub-regional Medium Risk Hazards:
 - a) Land subsidence
 - b) Shoreline erosion (areas outside barrier headlands)
4. Coast-wide Low Risk Hazards:
 - a) Geological hazards (tsunami, earthquake)

State Mitigation Efforts

CRMC is the state agency with the duty to manage and protect the state's coastal resources, which requires giving due consideration to the impacts of climate change and the need to maintain coastal resiliency.¹⁸¹ Setback requirements promulgated by the CRMC are directly related to climate change adaptation, being defined at "30 times the calculated average annual erosion rate," with a 50-foot minimum.¹⁸² The 50-foot setback is consistent with the scientific literature that the

¹⁷⁶ Id. at 84.

¹⁷⁷ Id. at 88.

¹⁷⁸ Id. at 92.

¹⁷⁹ Id. at 95.

¹⁸⁰ Id. at 22.

¹⁸¹ Coastal Resource Management Program, Coastal Resources Management Program § 145(C) (hereinafter CRMP).

¹⁸² Id. at § 140(C).

undeveloped area provides 60% sediment removal “while providing minimal general wildlife and avian habitat value.”¹⁸³

The State Building Code also incorporates mitigation techniques. It implements a one-foot freeboard and heightened standards for structures in locations subject to “wave heights of 1.5 or more.”¹⁸⁴ “Freeboard is a factor of safety usually expressed in feet above a flood level for purposes of floodplain management,” tending to “compensate for the many unknown factors that could contribute to flood heights greater than the height calculated for a selected size flood and floodway conditions.”¹⁸⁵ While “the additional costs of going up another foot or two is usually negligible,” “doing so results in significantly lower flood insurance rates due to lower flood risk.”¹⁸⁶ The savings pass on to future owners, which could prove to be a marketable feature as real estate consumers become more and more aware of the accelerating dangers of climate change.¹⁸⁷ The CRMC also has the authority to require a freeboard higher than one foot.¹⁸⁸

Coastal barrier islands and spits receive special protection because they protect “the mainland from storms and hurricanes.”¹⁸⁹ CRMC expressed its goal of “ensur[ing] the risks of storm damage and erosion for the people inhabiting these features are minimized.”¹⁹⁰ Some of the strongest protections include the prohibition of hard

¹⁸³ Innovative Land Use, *supra* note 92, at 256.

¹⁸⁴ See Metro Bay, *supra* note 168, at § 5.1.

¹⁸⁵ Federal Emergency Management Agency, Freeboard, NFIP Policy Index, available at <http://www.fema.gov/plan/prevent/floodplain/nfipkeywords/freeboard.shtm> (last visited Nov. 28, 2011)

¹⁸⁶ Innovative Land Use, *supra* note 92, at 6-17.

¹⁸⁷ *Id.*

¹⁸⁸ R.I. Gen Laws § 23-27.3-100.1.5.5.

¹⁸⁹ CRMP, *supra* note 181 § 210.2(C)(1).

¹⁹⁰ *Id.* at 210.2(C)(2).

shoreline protection structures,¹⁹¹ plastic snow-fencing,¹⁹² and vehicle access across back barrier flats¹⁹³ and vegetated areas.¹⁹⁴ Another protective rule prevents rebuilding structures that are “physically destroyed 50 percent or more by storm-induced flood, wave or wind damage,” “regardless of the insurance coverage carried.”¹⁹⁵

Another critical coastal feature for climate change mitigation are dunes. The CRMC’s regulations “protect the public from dangerous storm forces,” by “enhanc[ing] the ability of dunes to serve as a natural storm buffer.”¹⁹⁶ There are at least three regulatory tools Rhode Island uses to restrict dune alterations and protect their storm buffer capacity. First, vehicles are prohibited within 75 feet of the dune crest.¹⁹⁷ Second, with the exception of non-structural efforts to protect the feature itself, “alteration of the foredune zone adjacent to [conservation areas and low-intensity use] waters is prohibited.”¹⁹⁸ Third, following a dramatic weather event, “CRMC can mandate a moratorium on all coastal redevelopment activities to ensure that all construction is in accordance with state building regulations” after a “severe coastal storm in which damage and destruction has occurred.”¹⁹⁹ Rhode Island has “not had a storm severe enough to invoke this regulation,” however.²⁰⁰

Rhode Island law also incorporates its concerns with climate change into the legal system by enabling Rhode Island citizens to make a “substantive objection” to any

¹⁹¹ *Id.* at 210.2(C)(4).

¹⁹² *Id.* at 210.2(D)(1).

¹⁹³ *Id.* at 16-2-1:210.2(D)(2).

¹⁹⁴ *Id.*

¹⁹⁵ *Id.* at 210.2(C)(7).

¹⁹⁶ *Id.* at 210.7(C)(1).

¹⁹⁷ *Id.* at 210.7(D)(1).

¹⁹⁸ *Id.*

¹⁹⁹ Rhode Island Hazard Plan, *supra* note 174, at 138.

²⁰⁰ E-mail from Grover Fugate, Executive Director, Rhode Island Coastal Resources Management Council (Nov. 14, 2011).

proposed development where “evidence is presented which demonstrates that the proposed activity or alteration has a potential for significant adverse impacts on shoreline erosion and flood hazards.”²⁰¹ Such an objection “triggers full Council review and a public hearing.”²⁰² The process “improve[s] the attention paid to these issues and often is the turning point in [storm prone area] applications for many council members.”²⁰³

Municipal Mitigation Efforts

Because of Rhode Island’s “strong home rule,” “all local land use decisions” affecting development in the floodplain “are made by volunteer boards and commissions” “appointed by the CEO of each municipality.”²⁰⁴ Therefore, municipalities play a role in climate change mitigation through local Planning Boards, Conservation Commissions, Zoning Boards, Harbor Management Commissions, etc. Communities also receive state funding under the Pre-Disaster Mitigation Program to “develop[] specific local hazard mitigation strategies and identify[] specific mitigation measures, such as non-structural measures and projects that address the highest natural hazard risks within their community.”²⁰⁵ Despite the authority for municipalities to offer additional climate change mitigation measures, state authorities remarked that “generally the strategies proposed in the local plans and in the State plan are very similar.”²⁰⁶

²⁰¹ Rhode Island Hazard Plan, *supra* note 174, at 138.

²⁰² *Id.*

²⁰³ Grover Fugate, *supra* note 200.

²⁰⁴ Rhode Island Hazard Plan, *supra* note 174, at 19.

²⁰⁵ *Id.* at 154.

²⁰⁶ *Id.*

One limit on municipal efforts is that the State Building Code pre-empts municipalities from taking measures such as increasing the freeboard requirement.²⁰⁷ Rhode Island coastal managers recognize that “[w]hile it would be nice for municipalities to adopt more protective standards,” uniformity in the building code is an important goal.²⁰⁸ Indeed, legal scholars have recognized that “uniformity is a worthwhile aim.”²⁰⁹ “[G]reater uniformity in building codes would lower the costs of construction without compromising housing quality and safety, would facilitate the mass production of housing components, and would provide stronger incentives for research and development.”²¹⁰ Furthermore, even if municipalities did have the legal ability to adopt measures like higher freeboard, municipalities might otherwise be deterred from doing so because of “conflict with their height standards in zoning,” builders’ resistance based on concerns about the effects on marketability” of higher-freeboard lots, and “most municipalities[’] lack [of] expertise to provide the technical background for adopting these standards.”²¹¹

One way in which Rhode Island municipalities have given extra protection to their coastal areas is prohibition on altering sand dunes in flood hazard overlay districts. While state law allows structural alteration of dunes that are adjacent to lower quality water bodies,²¹² Providence has completely prohibited the alteration of sand dunes in high hazard areas.²¹³

²⁰⁷ R.I. Gen Laws § 23-27.3-101.2-.3.

²⁰⁸ Grover Fugate, *supra* note 200.

²⁰⁹ Sara C. Galvan, *Rehabilitating Rehab through State Building Codes*, 115 YALE L.J. 1744, FN 162 (2006).

²¹⁰ Sharon M. Oster & John M. Quigley, *Regulatory Barriers to the Diffusion of Innovation: Some Evidence from Building Codes*, 8 BELL J. ECON. 361, 365 (1977)

²¹¹ Grover Fugate, *supra* note 200.

²¹² CRMP, *supra* note 181, at § 210.7(D)(2).

²¹³ City of Providence Zoning Ordinance § 423.6(L)(1).

The state Soil Erosion and Sediment Control Act also responds to climate change hazard mitigation by requiring drainage to “be directed away from structures intended for human occupancy.”²¹⁴ Some municipalities have responded to the issue by stating the policy more strongly.²¹⁵ For example, South Kingston established an affirmative duty to maintain “adequate drainage paths” “to guide floodwaters around and away from proposed structures.”²¹⁶ Warren has also clarified its soil erosion and sediment control policies by defining the state-imposed “steep slopes” standard as one greater than 10%.²¹⁷

Connecticut

309 Report Summary

Connecticut’s Section 309 Report cites the Governor’s formation of a Steering Committee for Climate Change as the leading source of recommendations to the legislature for addressing climate change adaptation.²¹⁸ On a regional level, the state is involved with the Sentinel Monitoring for Climate Change Strategy for Long Island Sound with New York.²¹⁹ The Report also highlights the availability of the Adaptation Resource Toolkit for local communities, as well as the workshops provided through the Groton Coastal Climate Change Adaptation project.²²⁰ Ongoing hazards research and monitoring have been used to inform state planning, including the state-wide coastal

²¹⁴ R.I. Gen. Laws § 45-46-5.

²¹⁵ Municipalities have authority to do so under R.I. Gen. Laws § 45-46-2.

²¹⁶ South Kingston Code of Ordinances, Ch. 21, § 21-5.

²¹⁷ Warren Town Code § 17-6, *available at* municode.com.

²¹⁸ Connecticut Department of Environmental Protection, Updated Assessment and Strategy of the Connecticut Coastal Management Program 17 (2010), *available at* http://www.ct.gov/dep/lib/dep/long_island_sound/coastal_management/2010_assessment_and_strategies_notice_draft.pdf (hereinafter “Connecticut 309 report”).

²¹⁹ *Id.*

²²⁰ *Id.*

park vulnerability assessment utilized by the Department of Environmental Protection (DEP).²²¹

In its discussion of strategy, the Report addresses both Coastal Storm Event Response measures²²² and Shoreline Change Guidelines measures.²²³ The Report contemplates issuing a general permit for reconstruction in the event of predicted storms and developing a system for speedy authorization of storm damage reconstruction for circumstances outside the terms of the general permit.²²⁴ To address longer-term effects of climate change, the Report expresses the goal of developing a policy guidance document that would help “incorporate the existing and potential effects of shoreline change in adaptive regulatory and planning decisions.”²²⁵ The report also recognizes the need to reconsider the statutory definition of high-tide line to address the effect of sea level rise on this legally-significant boundary.²²⁶ Both categories of strategies also address the need for public outreach, calling for publically-accessible information about “how the various regulatory tools for preparing for and recovering from a significant hurricane work together to cover the needs of the regulated community”²²⁷ and for the development of a “easy to read guideline” that explains the nature of shoreline erosion and different options for its management.²²⁸

²²¹ Id. at 18.

²²² Id. at 73.

²²³ Id. at 76.

²²⁴ Id. at 73-74.

²²⁵ Id. at 76.

²²⁶ Id.

²²⁷ Id. at 74.

²²⁸ Id. at 76.

Hazard Plan Summary

Connecticut's hazard plan explains that DEP is the agency with primary responsibility over flood management²²⁹ but the planning responsibility is a coordinated effort amongst a variety of state actors, whose roles are detailed in the plan.²³⁰ The Plan also includes a section on strategies that engage the private sector in mitigation efforts.²³¹ In its capability assessment, Connecticut highlights its State Floodplain Management Act as the major mitigation tool.²³² The Plan also gives attention to interstate efforts and the role of municipalities, the latter of which includes local land use control, NFIP compliance, and the creation of Flood and Erosion Control Boards.²³³

Risk Inventory²³⁴

The 309 reports require states to categorize the climate change hazard risks it faces, both by severity of the risk and by geographical scope. The two categorizations are synthesized below to provide a list from high-risk wide-spread risks to low-risk geographically-limited risks.

1. Coast-wide High risk Hazards:
 - a) Flooding
 - b) Coastal storms and storm surge
2. Sub-Regional High risk Hazards:
 - a) Shoreline erosion (sandy beaches, 8% coastline)
3. Coast-wide Medium risk Hazards:
 - a) Sea level rise and other climate change
4. Coast-wide Low Risk Hazards:
 - a) Land subsidence

State Mitigation Efforts

The Connecticut Floodplain Management Act “outlines the flood management responsibilities of DEP and lays out the rules and regulations to be used by all state

²²⁹ Department of Environmental Protection, Connecticut's Natural Hazard Mitigation Plan Update 3 (2010), available at http://www.ct.gov/dep/lib/dep/water_inland/hazard_mitigation/2010_nhmp.pdf (Hereinafter “Connecticut Hazard Plan”)

²³⁰ *Id.* at 186-206.

²³¹ *Id.* at 15.

²³² *Id.* at 184 *et. seq.*

²³³ *Id.* at 222-226

²³⁴ 309 Report, *supra* note 218, at 13.

agencies when undertaking activities within a floodplain area.”²³⁵ Its efforts exceed the minimum requirement under the NFIP.²³⁶ State activity within the floodplain requires an application to the Commissioner. The application must show that the activity does not “obstruct flood flows,” “significantly affect the storage or flood control value of the floodplains,”²³⁷ and that it “promotes long-term non-intensive floodplain uses and has utilities located to discourage floodplain development.”²³⁸ For a state activity to move forward, it must also have a flood preparedness plan tailored to the proposal.²³⁹ The state is required to “use to the extent feasible flood-proofing techniques.”²⁴⁰ Less sustainable hazard protection methods such as dikes, dams, channel alterations, seawalls, breakwaters are only allowed “where there are no practical alternatives.”²⁴¹ Additional requirements are set forth in regulations adopted by the Commissioner pursuant to the rule-making authority set forth in the Floodplain Management Act.²⁴² Finally, the Green Plan guides Connecticut’s efforts to acquire and protect land for a variety of purposes.

Municipal Mitigation Efforts

All Connecticut communities are required to implement land use policies to direct development away from hazard areas in planning and zoning, but these plans are not formally “approved” by the state, but are not required to define specific setback, buffer, or other restrictions.²⁴³ While the state provides an Adaptation Resource Toolkit for to

²³⁵ Connecticut Hazard Plan, *supra* note 229, at 184.

²³⁶ *Id.*

²³⁷ Con. Gen. Stat. § 25-68d(b)(1).

²³⁸ *Id.* at § 25-68d(b)(4).

²³⁹ *Id.* at § 25-68d(b)(6).

²⁴⁰ *Id.* at § 25-68d(b)(5).

²⁴¹ *Id.* at § 25-68d(b)(6).

²⁴² Con. Gen. Stat. § 25-68h.

²⁴³ Connecticut 309 report, *supra* note 218, at 18.

assist municipalities seeking to address climate change and hazard adaptation techniques, “local governments are the primary decision-makers for land use.”

Under the Floodplain Management and Mitigation Act, the Commissioner of Environmental Protection is required to “develop guidelines to be used by municipalities in revising ordinances restricting flood storage and conveyance of water for floodplains.”²⁴⁴ However, guidelines have not been developed since the mandate was enacted in 2004. Changes are not mandated until the municipality undertakes an ordinance revision for some other purpose.²⁴⁵ Though not directly mandated, municipalities are incented by a floodplain management grant program implemented by the state for municipal hazard mitigation actions.²⁴⁶

Finally, municipalities are given the ability, if they choose, to establish a “municipal flood and erosion control board” by vote of the city legislative branch.²⁴⁷ The Board is authorized to plan, construct, and manage any flood and erosion control “structure or facility” such as a “dike, berm, dam, piping, groin, jetty, sea wall, embankment, revetment, tide-gate, water storage area, ditch, drain...”²⁴⁸ The Board can implement these measures using takings of property²⁴⁹ and by accepting gifts of land or money.²⁵⁰

One Connecticut municipality taking action under this authority is Norwich, Connecticut, where “the flood of 1982 is well known in this small community” for causing

²⁴⁴ Con. Gen. Stat. § 25-68i.

²⁴⁵ Connecticut Hazard Plan, *supra* note 224, at 185.

²⁴⁶ Con. Gen. Stat. § 25-68j.

²⁴⁷ *Id.* at § 25-84. See, e.g., Old Lyme Flood and Erosion Control Board's website at http://www.oldlyme-ct.gov/Pages/OldLymeCT_BComm/flood.

²⁴⁸ *Id.* at 25-85.

²⁴⁹ *Id.* at 25-86.

²⁵⁰ *Id.* at 25-98.

“4 or 5 feet of water in their homes and businesses.”²⁵¹ Likely a direct or indirect response to this disaster, there is now a protective Floodplain and Floodway Zoning ordinance that prohibits the storage or processing of salt,²⁵² as well as materials that are (a) buoyant in times of flooding, (b) flammable, (c) explosive,²⁵³ (d) hazardous,²⁵⁴ or otherwise “injurious to human, animal or plant life.”²⁵⁵ This covers a wide variety of materials in the flood hazard zone that are not regulated in the same manner under state minimum requirements.

Conclusion

While this report indicates that states have a number of measures in place for climate change adaptation and mitigation, the fact that municipalities are often on the front lines of climate change impacts requires further exploration of municipal efforts. While 309 reports and hazard plans do detail the ways in which the states incentivize municipalities, the success of those incentives is difficult to measure without a full record of municipal efforts. Collecting examples to form a clearer picture of options for municipalities desiring to address climate change mitigation is the critical next step to inform this coastal resiliency discussion.

As this discussion continues, another issue to address is how state laws, while in some ways incentivizing municipal measures, are possibly hindering their environmental protection efforts. Therefore, the role of home rule and state preemption doctrines in

²⁵¹ Monica Buchanan, *Norwich Braces for Record Flooding*, NBC Connecticut (Mar 30, 201), available at <http://www.nbcconnecticut.com/news/local/Norwich-Braces-For-Record-Flooding-89484412.html>.

²⁵² The Code of Ordinances, City of Norwich, Connecticut, Appendix A, § 14.4.1(c), available at municode.com.

²⁵³ *Id.* at 14.4.1(a).

²⁵⁴ *Id.* at 14.4.1(b).

²⁵⁵ *Id.* at 14.4.1(a).

the ability or willingness of municipalities to adopt and create innovative mitigation measures should also be explored. If equipped with the necessary authority and resources, “governments can create disaster resilient communities that have increased capacity to adapt to the effects of natural disasters, resulting in less property damage, environmental impact, and loss of life.”²⁵⁶

The time for continued legal research for the development of hazard adaptation and mitigation techniques is now. “[P]lanning for [climate] events is likely to become more important as the effects of climate change continue to alter weather patterns in the coming years, with resultant increases in flooding, droughts, fires, and coastal land erosion.”²⁵⁷

²⁵⁶ John R. Nolan, *Disaster Mitigation through Land Use Strategies*, 23 PACE ENVTL. L. REV. 959, 963 (2006).

²⁵⁷ Patricia E. Salkin, *Sustainability and Land Use Planning: Greening State and Local Land Use Plans and Regulations to Address Climate Change Challenges and Preserve Resources for Future Generations*, 34 WM. & MARY ENVTL. L. & POL’Y REV. 121, 132 (2009).