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ARTICLES

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**INTRODUCTION TO THE SPECIAL ISSUE ON RESILIENCE AND THE BIG PICTURE:
GOVERNING AND FINANCING INNOVATIONS FOR LONG ISLAND SOUND AND
BEYOND**

Syma A. Ebbin¹

I. A SYMPOSIUM FOCUSED ON RESILIENCE

Resilience denotes one end of a range or continuum marking a system's capacity to cope with change or adverse events -- demarcated on the opposing end by the inability to cope which is termed vulnerability. Resilient systems are able to adapt and persist in dynamic environments while retaining critical functions. They are flexible, able to regroup or recover, assess, plan and be proactive in addressing short, medium and longer-term changes. Resilience spans different scales or levels of organization and is a characteristic that may be associated with a variety of systems: ecological, biological, social, economic, legal, and governance. Resilience has become embedded in discussions surrounding efforts

¹ Syma A. Ebbin, Research Coordinator of Connecticut Sea Grant and Associate Professor in Residence in the Department of Agricultural and Resource Economics at the University of Connecticut (Ph.D., M.E.M., M.S., M.Ph, Yale University, M.S. University of Alaska, Juneau, B.A. Williams College) co-organized the *Resilience and the Big Picture: Governing and Financing Innovations for Long Island Sound and Beyond* symposium along with Joe MacDougald, Director of the Center for Energy and Environmental Law at the UConn School of Law. I extend a hearty thanks to my co-organizer Joe MacDougald, as well as all of the members of the Symposium Steering Committee who helped in the development and organization of the conference, which, in addition to the myself and Joe, included Peter Kochenburger, Associate Clinical Professor of Law, Deputy Director of the Insurance Law Center, University of Connecticut School of Law, Nathan Frohling, Director Connecticut Coastal & Marine Initiatives, The Nature Conservancy, Catherine Janasie, Research Counsel for the National Sea Grant Law Center, Kristie Beahm a law student at the UConn School of Law, Professor Sara Bronin of the University of Connecticut School of Law and Faculty Director of the Center for Energy & Environmental Law, and David Blatt, Supervising Coastal Planner in the Connecticut Department of Energy and Environmental Protection Office of Long Island Sound Programs. The author thanks the organizations whose support, financial and other, made this conference, and therefore, this special issue of collected papers possible. Foremost is the National Sea Grant Law Center, which provided the core funding for this initiative. This was matched with support from Connecticut Sea Grant and the University of Connecticut School of Law's Center for Energy and Environmental Law. Finally, I thank the members of the discussion panels and the authors of the papers who contributed to this special issue of the SEA GRANT LAW & POLICY JOURNAL along with the supportive journal editor Catherine Janasie.

to adapt to a changing climate. As an end-goal, however, it can be focused on a suite of changes broader and more diverse than simply climate change -- although this looms large in the future of coastal and marine social-ecological systems.

The symposium presentations and discussions explored the policy and legal challenges of planning, implementing and financing resilient futures on both sides of the high tide line as well as the complexities of distributing and coordinating the governance of shared resources among multiple authorities, with a focus on marine spatial planning efforts. The symposium was composed of two sections: 1) Big Picture Planning in Long Island Sound and Beyond and 2) Achieving Resilience through Insurance and Finance. The papers included in this special issue cluster in each of these areas. The papers and presentations were solicited from legal and policy academics, practitioners, regulators, law and graduate students and others via a competitive call for papers. Abstracts were evaluated and selected for inclusion in the symposium on the basis of responsiveness to the call, relevance to the symposium themes, substantive merit, and analytical rigor. The first of two parallel sessions which produced papers for this special issue included two papers focused on marine spatial planning. The second session included three papers² on ways to finance innovations to enhance resilience to climate change impacts. Complementing each contributed paper session was a policy discussion panel comprised of a mix of practitioners, academics and policy-makers. Two keynote addresses provided by Connecticut Governor Dannel Malloy and U.S. Senator Richard Blumenthal capped the event.

II. BIG PICTURE PLANNING IN LONG ISLAND SOUND AND BEYOND

The two panels devoted to the theme of *Big Picture Planning in Long Island Sound and Beyond* introduced and engaged the audience in a discussion regarding marine spatial planning (MSP) efforts within the social, legal, and political context of Long Island Sound (LIS), the northeast region of the United States, and neighboring states. Framing this conversation was the newly passed Connecticut Blue Plan law (PA 15-66), which became effective July 1, 2015. This new law seeks to create a resource and use inventory for LIS and develop a spatially-based marine plan which will enhance stewardship of LIS, promote science-based management, take into account the natural, social, cultural, historic

² A fourth paper was presented at the symposium but the author did not wish to submit it as a paper for publication.

and economic characteristics of the Sound, and protect traditional water-dependent uses and activities. This legislation, however, cannot be fully or successfully implemented unless and until the state of New York becomes an active partner in these planning and management efforts. The symposium organizers sought to create a forum to explore the legal models which could best serve the needs of New York, Connecticut, and the LIS ecosystem. Although representatives of New York Departments of State and Environmental Conservation were invited to participate in this symposium, they were unable to, indicating the potential for challenges to creating a bi-state marine spatial planning approach.

Landward of the high tide line, there are ample examples of interstate cooperation and coordination of management efforts, but fewer exist below and fewer yet involving the interplay of municipal and state governance. Comprehensive marine spatial plans have recently been adopted in the neighboring states of Rhode Island and Massachusetts and these may supply useful lessons and cases amenable to comparative analyses. The two papers presented at the symposium, and included in this special edition, focused on a range of legal and policy questions – both theoretical and empirical - regarding the implementation of MSP. The paper authored by John Duff from the University of Massachusetts, Boston examines arenas and imperatives for the participation of local jurisdictions in MSP efforts. The second paper, authored by Nathaniel Trumbull and Syma Ebbin of the University of Connecticut, reports results of their survey of practitioners engaged in developing and implementing MSP in LIS. The research findings provide an assessment of the consistency or conflict between the regulatory approaches taken by New York and Connecticut with respect to a suite of marine-based activities in LIS.

These scholarly presentations were enhanced by a panel discussion among policy-level stakeholders involved in LIS and regional MSP efforts. The panel, moderated by Brian Thompson, Director of the Office of Long Island Sound Programs in the Connecticut Department of Energy and Environmental Protection, included: Betsy Nicholson, Northeast Regional Director of the National Oceanic and Atmospheric Administration (NOAA) Office for Coastal Management; Grover Fugate, Executive Director of the Rhode Island Coastal Resources Management Council; Nathan Frohling, Director Connecticut Coastal & Marine Initiatives of The Nature Conservancy; and Shelby Green, Professor of Law at Pace University. This panel examined policies and issues that have arisen

from MSP implementation efforts from a boots-on-the-ground perspective. A digital archive of this panel and the entire symposium can be viewed at: https://www.youtube.com/playlist?list=PL9wCpXrRsuXPbatrH_-242njjTBLAe1qs.

III. ACHIEVING RESILIENCE THROUGH INSURANCE AND FINANCE

The two panels which focused on the theme of *Achieving Resilience through Insurance and Finance* examined a suite of financial and insurance strategies aimed at fostering and realizing resilient communities.³ The focus was broad and included presentations on the use and development of public and private sector financial tools, programs, and strategies aimed at providing incentives to promote resilient development, specifically focusing on the role of the insurance and reinsurance industries, businesses, and cooperative state financing structures in modifying behaviors to enhance resilience.

Addressing these themes, four contributed papers were presented, however, only three are included in this special issue. Emmeline Harrigan gave an oral presentation (not included as a paper) on her work as Program Manager of the Shore Up Connecticut program, which is aimed at enhancing the resilience of coastal communities and residents to coastal hazards. The state created the Shore Up Connecticut program, a revolving loan fund, after weathering the destructive storms Irene and Sandy, which made landfall in Connecticut in 2011 and 2012. The program, comprised of short term, low interest loans available to residential and commercial property-owners aims to enhance the resilience of their properties by elevating, building or retrofitting structures to be better able to withstand storms and flooding events. Rebecca French of the Connecticut Institute for Climate Resilience and Adaptation, Wayne Cobleigh of GZA GeoEnvironmental Inc., Jessica LeClair of the Connecticut Institute for Climate Resilience and Adaptation, and Yi Shi of the Yale School of Forestry and Environmental Studies present an overview of options, including existing and model programs and opportunities, which could be instituted in Connecticut to finance efforts to enhance resilience. The paper authored by John Ryan-Henry, a student at the Roger Williams University School of Law, focuses on the potential to use reforms

³ See CERES, BUILDING CLIMATE RESILIENCE IN CITIES: PRIORITIES FOR COLLABORATIVE ACTION (2013), available at <http://www.ceres.org/resources/reports/building-climate-resilience-in-cities-priorities-for-collaborative-action/view>.

of the National Flood Insurance Program to enhance municipal resilience to climate change impacts. Finally, Porter Hoagland and student Michael Graikoski, with the Marine Policy Center within the Woods Hole Oceanographic Institution, present a paper on their research efforts, funded by the Northeast Sea Grant Consortium, which examines the potential to use market-based rolling easements to enhance the resilience of coastal communities in Massachusetts.

Similar to the Big Picture Planning topic, the discussion on Insurance and Finance was capped by a policy discussion, moderated by Peter Kochenburger, Director of the Insurance Law Center at the University of Connecticut School of Law. The panel included a diversity of policy-makers and practitioners including Connecticut Insurance Commissioner Katharine Wade, Rhode Island Superintendent of Insurance Elizabeth Dwyer, Brian Farnen, Chief Legal Officer with the Connecticut Green Bank, and Eric Nelson, Senior Vice President of Catastrophe Underwriting Risk, Strategy and Analysis, at Travelers Insurance. Again, the digital archive of these panels can be viewed at:
https://www.youtube.com/playlist?list=PL9wCpXrRsuXPbatrH_-242njjTBLAe1qs.

Feedback from the conference was positive and efforts to enhance Connecticut's resilience both at sea and on land continue. The ability to communicate, cross-fertilize and share ideas, report on the efficacy and performance of existing programs, and borrow working solutions in use in other areas, are important activities if we are to achieve resilient human-natural systems on both sides of the high tide line. The organizers hope that their 2016 *Big Picture* symposium has made a contribution in all these areas.

**THE VOICE OF LOCAL AUTHORITIES IN COASTAL AND MARINE SPATIAL
PLANNING IN THE NORTHEAST: INSIGHTS FROM THE REGIONAL OCEAN
PLANNING PROCESS**

John Duff¹

“Plans are worthless, but planning is everything.”²

I. INTRODUCTION

In the northeastern United States, recent efforts to employ planning principles to improve coastal and ocean resource stewardship suggest an important attribute of such efforts: the consideration of local concerns and the integration of local perspectives. Yet the precise manner and degree to which such “local voice” can play a role in coastal and marine spatial planning (CMSP) remains elusive. Just as U.S. coastal waters may become crowded with a variety and intensity of uses, so too can those waters seem sometimes crowded with varying levels of government jurisdiction. Municipal boundaries may occupy expanses of ocean areas that constitute the sovereign space and proprietary interests of states. States in turn, though holding primacy in nearshore ocean waters, may be preempted by constitutionally authorized federal laws. And even as U.S. ocean waters extend beyond state boundaries, federal authorities recognize the political clout that state and local stakeholders may employ to influence the manner in which federal entities manage those areas.

This article examines two recently certified regional ocean plans to see whether and how local authorities have been afforded a voice as those efforts moved from ideals articulated by President Obama in July 2010 to final plans

¹ J.D., LL.M.; Associate Professor, School for the Environment, University of Massachusetts Boston. This research was supported in part by the U.S. Department of Commerce via the Northeast Sea Grant Consortium and administered by the Massachusetts Institute of Technology under NOAA Grant NA10OAR4170086. The author thanks Hannah Dean, J.D., M.S. and Victoria LaBate, J.D. for their respective efforts related to this project.

² President Dwight D. Eisenhower, Remarks at the National Defense Executive Reserve Conference (Nov. 14, 1957) (transcript available online, *The American Presidency Project* <http://www.presidency.ucsb.edu/ws/?pid=10951>).

certified and published six years later. The topic is ocean management and planning. The lens of this article is predominantly one of intergovernmental relations.

Various analyses of local-state-federal relations have been conducted over the years.³ Yet little, if any, legal research has been conducted to examine the role of local governments as comprehensive ocean management and planning efforts develop. Where such analysis does exist, it highlights the need to address questions such as those at the heart of this assessment.⁴ Researchers have noted that marine area management must reflect natural systems and be accommodated by appropriate scale authority.⁵ But healthy skepticism exists about the prospect of intergovernmental CMSP.⁶ This article is part of an effort to examine such issues.

Section II briefly reflects upon the crucial role that ocean use has played in U.S. history and in doing so suggests that de facto ocean planning and use has existed from the very beginning of the country's existence. Section III highlights two recently developed regional ocean plans that span ocean waters of the northeastern United States. It focuses on the role of local government and the inclusion of local voice in the development of those plans. It suggests that while rhetorical flourishes lauding local perspectives may have raised the hopes and expectations of local voice proponents, regional ocean planning efforts ultimately subordinated the role of local governments, though some mechanisms for integrating local voice remain.

Section IV identifies prospects and pitfalls as federal, state, and local entities strive to develop integrated coastal and marine spatial plans given the tensions that exist in intergovernmental ocean issues. It suggests relevant approaches and inquiries that might facilitate efforts to better integrate multi-level CMSP efforts. Section V concludes that while much rhetoric is evident suggesting local voice

³ Robert Arganoff, *Managing the Matrix: Do Collaborative Intergovernmental Relations Exist?*, 31(2) PUBLIUS: THE JOURNAL OF FEDERALISM 31, 31-56 (2001); DANIEL J. ELAZAR, AMERICAN FEDERALISM: A VIEW FROM THE STATES (New York: Harper and Row 3d ed. 1984).

⁴ JORDAN DIAMOND ET AL., ENVTL. LAW INST., MARINE SPATIAL PLANNING IN U.S. WATERS: AN ASSESSMENT AND ANALYSIS OF EXISTING LEGAL MECHANISMS, ANTICIPATED BARRIERS, AND FUTURE OPPORTUNITIES 1-94 (2009).

⁵ Steven Bloye Olsen, Erik Olsen, & Nicole Schaefer, *Governance as a basis for adaptive marine spatial planning*, 15(2) JOURNAL OF COASTAL CONSERVATION 313, 313-322 (2011); Erik Olsen et al., *Place-based management at different spatial scales*, 15(2) JOURNAL OF COASTAL CONSERVATION 257, 257-269 (2011).

⁶ Mark J. Spalding, *A New Approach to Oceans: Is Marine Spatial Planning Too Good to be True?*, E: THE ENVTL. MAGAZINE, Mar. 1, 2011, <https://emagazine.com/a-new-approach-to-oceans/>.

integrated CMSP, the near-term prospect of genuine collaborative management where local, state, and national interests are each given substantial weight may seem limited. Nonetheless, the United States' foray into comprehensive regional ocean planning has begun. Its success will depend on how a new generation of ocean planners can learn from the past to purposefully fashion the future ocean.

II. THE EMERGENCE OF OCEAN MANAGEMENT IN THE UNITED STATES

From the birth of the United States in the late eighteenth century through the middle of the twentieth century, individual U.S. states dominated the use and management of public space along, and into, the ocean. State laws governed most fishing, a nascent offshore oil industry paid states royalties for drilling, and individual states considered the three-mile territorial sea "theirs" even as the federal government exercised authority over a limited range of interests including interstate commerce, international shipping, customs and duties, and national security issues. But a tug of war ensued when the federal government began claiming more authority over nearshore waters and submerged lands in the 1940s. Ultimately, the U.S. federal government brought its claims against the states to the Supreme Court in 1947.⁷ The justices agreed with the federal government and long-claimed authority was wrested from the states and recognized as held by the federal government.⁸ But the states tugged back and lobbied Congress to enact the Submerged Lands Act of 1953 which gave primary jurisdiction over most matters in the three nautical mile expanse of coastal waters and underlying lands back to the states.⁹

The resulting patchwork authority shared between the state and federal governments over coastal and ocean waters has been relatively stable for more than half a century. In fact, in the 1970s as Congress contemplated a federal coastal zone management law it did so recognizing substantial state authority and, avoiding conflict, fashioned a bargain with the states to give effect to, and achieve, a set of national standards.¹⁰ When states have attempted to regulate activities such as shipping in their nearshore waters and harbors, the federal government has been quick to denounce such exercises as preempted by federal law.¹¹

⁷ *United States v. California*, 332 U.S. 19, 22 (1947).

⁸ *Id.*

⁹ Submerged Land Act of 1953, 42 U.S.C. §§ 1301-1315 (2002).

¹⁰ J. Duff, *The Coastal Management Act: Reverse Preemption or Contractual Federalism?*, 6:1 OCEAN AND COASTAL LAW JOURNAL 109, 109-118 (2000).

¹¹ *See, e.g., Ray v. Atlantic Ritchfield Co.*, 435 U.S. 151, 173-74 (1978); *United States v. Locke*, 529 U.S. 89, 116 (2000).

Up and down the U.S. northeast coastline, states from Maine to New Jersey acknowledge that coastal cities and towns have some authority in the management of their adjacent waters, resources, and submerged lands. Examples include the state depictions of municipal boundaries that extend offshore and regulatory authority over shellfishing. But just as the larger federal government often tamps down attempts by states to exercise offshore authority, so too do states squelch ocean jurisdictional claims of smaller units of government. Do local units of government have any say in what takes place off their coastlines? A bit perhaps, yet ordinarily the federal or state governments only engage in this inquiry when they contend the answer is “no.” Many states, along with the U.S. federal government have been employing more and more rhetoric to support the notion that local perspectives matter and local authorities ought to be given more “voice” as the upper echelons of government develop plans for comprehensive ocean management.

Is ocean planning new?

To suggest that the United States has only recently engaged in long-term planning (defined broadly) offshore would be to ignore history. The very first Congress addressed important issues regarding ports, harbors, and lighthouses as part of the new nation’s effort to create a federal revenue stream made up of customs and duties.¹² In the late nineteenth century, the United States enacted the Rivers and Harbors Act to manage the navigability of ports and waterways.¹³ More than a century ago, President Theodore Roosevelt used the ocean as a mechanism to plan the growth and extend the influence of the United States when he dispatched the U.S. navy to sail around the world and demonstrate the country’s military strength and capacity. When the United States entered World War II, it planned, built, and set to sea a complement of ships and mariners to circle the globe. At the end of that war, without firing a shot, President Truman claimed an expanse of offshore continental shelf areas that surpassed most of the land fought upon, occupied, and then liberated during World War II.¹⁴ Beginning in the 1950s the United States began mapping and planning wide expanses of the country’s newly claimed offshore area with an eye toward oil and gas extraction that today provides the United States with vast amounts of energy and revenue.¹⁵ Yet, whether those plans, charts, and maps were devoted to one form of power or another, each of those earlier enterprises was sector-oriented. In the late twentieth century ideas of integrated comprehensive coastal and ocean management emerged and buzzed through public discourse but nary such a plan emerged.

¹² FERGUS M. BORDEWICH, *THE FIRST CONGRESS* (Simon & Schuster 2016).

¹³ 33 U.S.C. § 407 (1899).

¹⁴ Proclamation No. 2668, 3 C.F.R. 68 (1945).

¹⁵ Outer Continental Shelf Lands Act, 43 U.S.C. §§ 1331-1356 (1978).

III. U.S. OCEAN PLANNING ENTERS THE 21ST CENTURY

Two substantial ocean reports suggested that as the twenty-first century dawned, the time for comprehensive ocean management had arrived. Both the Pew Commission and the U.S. Ocean Commission lamented United States reliance on sector-by-sector planning. Each recommended a more thoughtful sector-spanning approach. And when one of the world's most heavily "planned areas" exploded in the form of the Deepwater Horizon Spill in the Gulf of Mexico, the deadly disaster served, at least in part, as the impetus for comprehensive planning. Citing that spill as a "stark reminder of how vulnerable our marine environments are, and how much communities and the nation rely on healthy and resilient ocean and coastal ecosystems," President Obama issued an executive order establishing a National Ocean Council and calling for the development of regional ocean plans.¹⁶ In his directive, the president explicitly highlighted the importance of *local* perspectives and participation in ocean planning four times:

- This order also provides for the development of coastal and marine spatial plans that build upon and improve existing Federal, State, tribal, **local**, and regional decisionmaking and planning processes.¹⁷
- The United States shall promote this policy by: ...ensuring a comprehensive and collaborative framework for the stewardship of the ocean, our coasts, and the Great Lakes that facilitates cohesive actions across the Federal Government, as well as participation of State, tribal, and **local** authorities, regional governance structures, nongovernmental organizations, the public, and the private sector.¹⁸
- The Council shall establish a Governance Coordinating Committee that shall consist of 18 officials from State, tribal, and **local** governments in accordance with the Final Recommendations. The Committee may establish subcommittees chaired by representatives of the Governance Coordinating Committee. These subcommittees may include additional representatives from State, tribal, and **local** governments, as appropriate to provide for greater collaboration and diversity of views.¹⁹

¹⁶ Exec. Order No. 13547, 3 C.F.R. 187, 227 (2011) (National Policy for the Stewardship of the Ocean, Our Coasts, and the Great Lakes).

¹⁷ *Id.* at §1 para. 4 (emphasis added).

¹⁸ *Id.* at §2(b)(i) (emphasis added).

¹⁹ *Id.* at §7 (emphasis added).

And the National Ocean Council echoed the import of local interests as it developed its Marine Planning Handbook, employing “local” terminology thirty-two times.²⁰ The strongest of those references include the Council’s direction that local governments ought to have a seat at the table in regional ocean planning efforts. The Marine Planning Handbook states that “[r]egional planning bodies are groups composed of representatives from different levels of government in a region: State, tribal, Federal, regional fishery management council, and **local government**.”²¹ The handbook further notes that “[s]trong partnerships among Federal, state, tribal, **local authorities**, and regional ocean partnerships, is [sic] essential to a truly forward looking comprehensive marine planning effort.”²²

Toward the end of the Obama administration, two federally coordinated regional ocean plans emerged. On October 14, 2016, the Northeast Regional Planning body submitted the Northeast Ocean Plan to the National Ocean Council for certification.²³ The Mid-Atlantic Regional Planning Body followed suit a month later, submitting its Regional Ocean Action Plan.²⁴ On December 7, 2016, the National Ocean Council announced its acceptance of both plans.²⁵

The Northeast Ocean Plan encompasses federal waters and interests that stretch from the U.S. maritime border with Canada in the Gulf of Maine down along New Hampshire’s offshore waters, around Massachusetts Bay, across the ocean waters off Rhode Island and into Connecticut’s expanse of Long Island Sound. An advocate of “local voice” might be heartened by the document’s rhetoric. The northeast plan employs variations of the term “local” 45 times (54 if you

²⁰ NAT’L OCEAN COUNCIL, MARINE PLANNING HANDBOOK (July, 2013), https://obamawhitehouse.archives.gov/sites/default/files/final_marine_planning_handbook.pdf.

²¹ *Id.* at 2 (emphasis added).

²² *Id.* at 18 (emphasis added) (referencing Appendix: Model Charter for Regional Planning Bodies).

²³ Northeast Ocean Plan for National Ocean Council Certification, 81 Fed. Reg. 72,622, 72,622-24 (Oct. 19, 2016), *available at* <https://www.federalregister.gov/documents/2016/10/20/2016-25372/northeast-ocean-plan-for-national-ocean-council-certification>.

²⁴ Submittal of Mid-Atlantic Regional Ocean Action Plan for National Ocean Council Certification, 81 Fed. Reg. 76,635, 76,635-37 (Nov. 3, 2016), *available at* <https://www.federalregister.gov/documents/2016/11/03/2016-26623/submittal-of-mid-atlantic-regional-ocean-action-plan-for-national-ocean-council-certification>.

²⁵ Christy Goldfuss & John P. Holdren, *The Nation’s First Ocean Plans*, THE WHITE HOUSE BLOG: PRESIDENT BARACK OBAMA (Dec. 7, 2016, 9:02 AM), <https://obamawhitehouse.archives.gov/blog/2016/12/07/nations-first-ocean-plans>.

scrutinize the notes and appendices).²⁶ Yet, the weight of “local voice” might be more readily discernible upon perusing the membership of the plan. While the Marine Planning Handbook suggests that local governments ought to be among the members of the regional bodies tasked with developing the plans, they are conspicuous by their absence in the northeast plan. The Northeast Regional Planning Body (NERPB) lists as its members: the six New England states; six federally recognized tribes; nine federal agencies; the New England Fishery Management Council; and two ex-officio members (New York and Canada).²⁷ Local authorities or governments are not listed as distinct members.²⁸

The sibling Mid-Atlantic plan also spends a fair bit of ink on “local” phraseology. Fifteen instances of localized terms appear in the body of that plan.²⁹ But a review of the membership list runs counter to that emphasis. The Mid-Atlantic planning body includes the six coastal states stretching from New York to Virginia; two federally recognized tribes; eight federal agencies; and, the Mid-Atlantic Fishery Management Council.³⁰ Like the Northeast Ocean Plan, local authorities or governments are not listed as distinct members.³¹

The National Ocean Council’s acceptance of the two plans seems to submit to the jettisoning of local governments as deserving distinct membership on regional planning bodies when it acknowledges the composition of the two bodies, referring to the all-but-local “collaboration among states, tribes, federal agencies, and Fishery Management Councils.”³²

²⁶ NORTHEAST REGIONAL PLANNING BODY, NORTHEAST OCEAN PLAN 1-203 (2016) *available at* https://obamawhitehouse.archives.gov/sites/default/files/microsites/ostp/NortheastOceanPlan_October2016.pdf.

²⁷ *Id.* at 3.

²⁸ *Id.* See also *id.* at 1 (referencing letter dated Oct. 14, 2016); NORTHEAST REGIONAL PLANNING BODY, NORTHEAST OCEAN PLAN ADOPTION MEMO AND STATE ADDENDUM 1-8 (2017), *available at* <http://neoplaning.org/wp-content/uploads/2017/01/NE-Plan-Adoption-Memo-and-State-Addendum.pdf>.

²⁹ MID-ATLANTIC REGIONAL PLANNING BODY, MID-ATLANTIC REGIONAL OCEAN ACTION PLAN 1-138 (2016) *available at* https://obamawhitehouse.archives.gov/sites/default/files/microsites/ostp/MidARegionalOceanActionPlan_November2016.pdf.

³⁰ *Id.* at 7.

³¹ BUREAU OF OCEAN ENERGY MANAGEMENT, ADOPTION OF THE MID-ATLANTIC REGIONAL OCEAN ACTION PLAN MEMO 1-21 (2016), *available at* <https://www.boem.gov/Mid-Atlantic-Regional-Plan-Adoption-Memo/>.

³² Goldfuss, *supra* note 25.

Does lack of membership for local authorities mean lack of voice?

Advocates of local voice might naturally be disappointed by the seeming dissolution of the role of local government in regional ocean planning efforts. The initial promise so clearly laid out in the president's ocean planning executive order seems to have faded as regional plans were fashioned and finally came to fruition. A pessimistic interpretation might suggest that local authorities were robbed of the local voice they were promised. And what they may be deprived of seems emphasized each time the rights, interests and opportunities of "members" is suggested in the Marine Planning Handbook's recommendations for collaborative decision-making, i.e.:

- *de facto* veto authority by blocking necessary consensus;³³
- opportunity to develop additional rules and procedures;³⁴
- bring (and seek to resolve) a dispute on an issue;³⁵ and propose alternative recommendations.³⁶

As outlined above, there is plenty of fodder to support the contention that local authorities have lost some of the influence they would have reasonably expected upon reading the statement of the president and the document drafted by the National Ocean Council. The explicit references and emphases in the executive order and the Marine Planning Handbook, augmented by the "local" rhetoric sprinkled throughout the two regional ocean plans, supports the notion that local authorities should have garnered their own distinct memberships on the regional planning bodies that developed their respective ocean plans. But does lack of membership mean lack of voice?

Further scrutiny of the regional ocean planning efforts suggests that, while local governments (and the voices they employed) merited a place in ocean planning, that place never came with an entitlement, nor would it be washed away if not given membership status. The National Ocean Council seems to have realized that local governments (often characterized in U.S. law as "creatures of the states"³⁷ in which they reside) could have their interests sufficiently represented by their respective states. The council counts local government

³³ NAT'L OCEAN COUNCIL, *supra* note 20, at 29 § F(1).

³⁴ NAT'L OCEAN COUNCIL, *supra* note 20, at 29 § F(2).

³⁵ NAT'L OCEAN COUNCIL, *supra* note 20, at 29 § F(3).

³⁶ NAT'L OCEAN COUNCIL, *supra* note 20, at 29 § F(2).

³⁷ *Coleman v. Miller*, 307 U.S. 433, 441 (1939) (referencing municipalities as "creatures of the state").

participation as an imperative as it conceptualizes the role of local government members and calls on the planning bodies to elicit “substantive participation” from them.³⁸ Indeed it follows up on that directive by suggesting how local governments might be provided a membership voice via a Federal Advisory Committee. But then the council provides an alternative approach noting that a planning body has another option. Rather than providing local governments with their own distinct membership places, a planning body might “provide mechanisms for local government input to the marine planning process through its State representatives on the regional planning body.”³⁹

The two approved plans indicate that both the Northeast and Mid-Atlantic regional planning bodies employed the latter option. If local voice advocates think this a lesser option, a few important realities might salve the sting. Numerous opportunities were afforded local governments and other local interests (public, private, and nongovernmental) to voice their interests and concerns during the dozens of hearings that each planning body instituted as they developed, revised, and refined their respective plans. And while local governments have not garnered distinct member status on either of the first two certified regional ocean plans, President Obama’s executive order did call on the National Ocean Council to create a Governance Coordinating Committee (GCC), which has, since its creation, included members from local government.⁴⁰

Finally, local ocean issues are often removed spatially and jurisdictionally from many of the substantive planning processes contemplated in the regional ocean plans. The regional plans, solicited by executive order, directed at federal agencies and authorities, implementable only through existing federal authority, and evaluated and certified by a National Ocean Council housed in the executive branch of the federal government, spend inordinate time, space, and ink focusing on federal waters and acknowledging the limits on their authority to reach into state and local ocean waters. A thorough review of the plans leaves a reader with the impression that they are statements of self-restriction as often as they are aspirational plans for sound ocean stewardship.

And to the degree that existing federal authority does apply to certain activities and issues in state waters and submerged lands, it is the states that hold the substantial sovereignty and proprietary interests in closer ocean areas even

³⁸ NAT’L OCEAN COUNCIL, *supra* note 20, at 3.

³⁹ NAT’L OCEAN COUNCIL, *supra* note 20, at 3.

⁴⁰ See Exec. Order No. 13547, *supra* note 16, at 231.

when such ocean space is regarded as within municipal boundaries. While the Submerged Lands Act gives primacy to state authority over much of the space and activity in nearshore ocean waters, and many states in turn consider municipal boundaries to collectively occupy that state space, the federal government retains primacy over certain uses, activities, and impacts (e.g., shipping, immigration, customs, environmental protection). As a result, much of the northeastern U.S. ocean space serves as a seascape of three levels of government.

Submerged lands stretching out three nautical miles and much of the activity in the water column above “belong” to the state. Many municipal boundaries stretch out to the state-federal offshore delineation (albeit encompassing state lands). And the federal government maintains a few important jurisdictional authorities. If regional ocean plans employ sufficient deftness in fulfilling federal obligations while accommodating state objectives, federal authorities might effectively “model” enhanced intergovernmental collaboration to states, who might in turn demonstrate similar accommodation to local governments.

IV. INTEGRATED COASTAL AND MARINE SPATIAL PLANNING: PROSPECTS AND PROBLEMS

If comprehensive, integrated, intergovernmental, multi-sector coastal and marine spatial planning was the objective set forth by President Obama in July 2010 and developed in the succeeding six years by a host of local, state, federal, public, private, and nongovernmental participants, a simple question might be: did it work? The answer, as is often the case, depends upon whether you are in the glass is “half full” or “half empty” category of observers. An examination of the first two federally certified regional ocean plans supports observer dependent reality. Both can be true simultaneously.

For those who highlight the achievements and prospects of these first two regional planning efforts, it is quite evident that the planning process was a years-long convening, informing, inquiry-prompting, thought-provoking enterprise resulting in formative documents that should serve as salient foundations for ocean use and stewardship scenario-analyses. Certainly the prospects for ocean planning are improved today due to these planning efforts.

For those who lament a diminution of local voice, the perceived problem may frame consideration for future solutions. What avenues do local interests have in regional ocean planning? While lacking distinct member status, the planning directives, documents, and representation that do endure provide some, but

perhaps not ideal, participatory voice. Are there other means for local interests to exert their influence? Three come to mind, each of which resides in local-state intergovernmental relationships.

Local governments can continue to lobby states to integrate local concerns into state prerogatives and positions, including the manner in which states employ their interests via the consistency provisions provided in the federal Coastal Zone Management Act (CZMA). Local governments can also educate and advocate to prompt states to embark on efforts to win by losing, for example in the form of local and state attempts to regulate federal matters in local and state waters. States attempting to regulate shipping, ship construction, equipment, and personnel standards to protect state and local waters face certain defeat under principles of preemption.⁴¹ But state attempts to prescribe law or proscribe activity, while challenged by the federal government as an inviolate invasion of maritime jurisdiction, may prompt federal authorities to promulgate federal rules that give effect to the state's original objectives.

Finally, local (and state) authorities may be able to "signal" their interests in federally governed ocean and coastal matters to prompt otherwise reluctant federal agencies to take action in nearshore waters. The designation of No Discharge Zones (NDZs) by the Environmental Protection Agency (EPA) serves as a model. While EPA has broad authority under the Clean Water Act to "restore and maintain the chemical, physical and biological integrity of the nations' waters," Congress was sensitive to the concerns of local and state governments, and the communities they represent, when it comes to prohibiting vessel discharges.⁴² As a result, the Act's approach to designating NDZs is purposeful when it calls for the integration of state concerns.⁴³

While the regional ocean planning processes are assuredly non-prescriptive, they might nevertheless elicit lessons from these intergovernmental facilitating approaches to managing ocean space and use. As alluded to above, regional ocean plans might emphasize the consistency provision of the CZMA and in so doing elicit state and local perspectives and priorities. Regional ocean planning processes might welcome state and local ecological stewardship objectives related to shipping and navigation affirmatively, rather than responsively, and in so doing beneficially pre-empt juridical pre-emption. And, *a la* the NDZ designation process, federal ocean planning might institutionalize efforts to ask state, regional,

⁴¹ See *United States v. Locke*, 529 U.S. 89, 112-13 (2000); *United States v. Massachusetts*, 724 F.Supp.2d 170, 188 (2010).

⁴² Clean Water Act, 33 U.S.C. §§ 1251- 1387 (1987).

⁴³ Exec. Order No. 13547, *supra* note 16, at 227.

and local groups whether and how certain ocean expanses might be afforded greater environmental protection.

V. CONCLUSION

As set out above, coastal and marine spatial planning efforts in the northeastern region of the United States are emerging and evolving at a steady pace. As those efforts progress, a variety of nods are given to the importance of local interests. Indeed, explicit language in federal and state ocean plans suggest such local voice is imperative. The first two plans merit kudos and perhaps a few concerns. How, if at all, will the remaining regions of the U.S. ocean be planned to achieve the objectives set forth in the July 2010 executive order to, among other things, “protect, maintain and restor[e] ... the health of ocean, coastal, and Great Lakes ecosystems.”⁴⁴ President Eisenhower’s adage cited at the outset is apt. And President Obama’s twenty-first century executive order seems to employ that mid-twentieth century wisdom. Read carefully and in tandem with the plans that were wrought from the 2010 *National Policy for the Stewardship of the Ocean, Our Coasts, and the Great Lakes*, the value to be derived by the recent efforts in the northeast and mid-Atlantic is more likely to result **from the planning** than the plans.

⁴⁴ Exec. Order No. 13547, *supra* note 16, at 227.

NAVIGATING TOWARDS TOMORROW IN THE URBAN SEA: THE CHALLENGES AND OPPORTUNITIES OF MARINE SPATIAL PLANNING IN LONG ISLAND SOUND

Nathaniel Trumbull & Syma A. Ebbin¹

I. INTRODUCTION

Long Island Sound (referred to throughout as Long Island Sound or the Sound), a large estuary situated along the Atlantic coast of southern New England, is governed by Connecticut and New York. The Sound serves as the jurisdictional boundary between the two states and its governance is concomitantly distributed among the states, federal government, and a multitude of coastal municipalities. The uses and users of the Sound are managed by different agencies and regulations, which are not necessarily coordinated or consistently applied. Several years ago, ad hoc efforts began in the Sound to develop marine spatial planning (MSP), defined by UNESCO as “a process of analysing and allocating parts of three-dimensional marine spaces to specific uses, to achieve ecological, economic, and social objectives that are usually specified through the political process.”

In 2015, Connecticut passed legislation to implement MSP in the state. Although New York has developed a marine spatial plan for its Atlantic Ocean waters, it has not followed suit in Long Island Sound. This article investigates the challenges and opportunities that exist to develop and implement bi-state MSP in the waters of Long Island Sound. Based on the premise that a goal of MSP is to make management more comprehensive, cohesive, coordinated, and less institutionally fragmented, the authors entered into this effort to examine how the emerging MSP efforts would address the bi-state governance of the Sound.

The authors hypothesize that obstacles to multi-party cooperation involve perceived competition for the use and control of shared natural resources and the

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benefits generated by the Sound's ecosystem services, and also political and institutional concerns regarding jurisdictional authorities and state sovereignty. Interviews were conducted with official stakeholders involved in on-going MSP efforts in both states to understand barriers and prospects associated with this effort. An index was constructed to assess the management compatibility of state approaches towards the regulation of a suite of activities and impacts. Of the sixteen activities, respondents perceived only two to be incompatible: dredge disposal and sand and gravel mining.

Part II provides a background on the particular challenges and opportunities associated with the governance of marine systems, including the emergence of MSP. Part III includes an overview of Long Island Sound as a coupled natural-human system and explores its natural and economic inheritance, along with the legal and policy framework governing this maritime space. Parts IV, V, and VI outline the research methods, present the results, discuss the interviews, and conclude with an analysis of the responses by MSP practitioners regarding the development of MSP in the Sound and their understanding of the obstacles and opportunities they believe impede or facilitate progress towards that goal. Finally, Part VII provides recommendations with an eye towards contributing to the emergence of successful bi-state governance of the Sound. The good news is that the two states' management approaches are overwhelmingly perceived to be compatible, with the exceptions of dredge disposal and sand and gravel mining. With an enhanced effort to foster substantive ways for managers and stakeholders hailing from both sides of the Sound to communicate, participate, and interact, efforts to implement MSP have a good chance of moving forward.

II. INSTITUTIONAL DIMENSIONS OF MARINE GOVERNANCE

Marine systems pose several unique challenges to actors wishing to control or govern human uses. These challenges are embedded in the marine environment's innate physical nature, size, fluidity, three-dimensionality, dynamism, lack of human settlements, difficulty in delineating boundaries, and in monitoring and enforcing such human constructs, among others. At the same time, these systems can also provide opportunities to craft innovative institutional solutions. Recent advances in this realm include ecosystem-based management, coastal zone management, and MSP.

A. Governance Challenges

Since Garrett Hardin published his famous essay in 1968,² the ocean has been a poster child for the Tragedy of the Commons.³ Even before Hugo Grotius declared the freedom of the seas in his 1608 treatise *Mare Liberum*, the ocean had a long history as an open access region, and in the years following, it became one of the first widely accepted principles of international marine law.

In the wake of Grotius, the absence of ocean governance, coupled with a widely-held view of the ocean as unchanging and unchangeable, invulnerable to human impacts, has led to a degradation of the ocean environment and resources. The biotic and abiotic make-up of the oceans have become increasingly altered by a range of human activities, such as pollution, fisheries depletions, and increased carbon emissions. Scientists mapped seventeen anthropogenic drivers of ecosystem change across the marine environment and found just 4% to be relatively unaffected by humans, while over 40% were experiencing moderate to heavy impacts.⁴ The marine

² Garrett Hardin, *The Tragedy of the Commons*, 162.3859 SCIENCE 1243-48 (1968).

³ Of the four general ownership regimes under which environments and resources can be controlled, the open ocean has long been considered *res nullius*, literally “nobody’s property,” unable to be owned, appropriated, or transferred and lacking rights to exclude. Hardin confused this absence of property rights with *res communes*, or common ownership, in which a community or group of independent users exert a collective right to control. Hardin also neglected to identify the historically and culturally rich variety of solutions to the tragedy, which go beyond government control or privatization approaches. There is a large and growing literature describing the variety of ways that access to the commons has been managed through time and around the world. See generally David Feeny et al., *The Tragedy of the Commons: Twenty-Two Years Later*, 18.1 HUMAN ECOLOGY 1-19 (1990), available at https://www.kth.se/polopoly_fs/1.197993!/Menu/general/column-content/attachment/Feeny_etal_1990.pdf; ARTHUR MCEVOY, *THE FISHERMAN’S PROBLEM: ECOLOGY AND LAW IN THE CALIFORNIA FISHERIES 1850-1980* (Cambridge Univ. Press, England 1986); BONNIE MCCAY & JAMES ACHESON, *THE QUESTION OF THE COMMONS: THE CULTURE AND ECOLOGY OF COMMUNAL RESOURCES* (McCay & Acheson eds., Ariz. Press, Tucson 1987); COMMON PROPERTY RESOURCES, *ECOLOGY AND COMMUNITY-BASED SUSTAINABLE DEVELOPMENT* 302 (Fikret Berkes ed., Belhaven Press, London 1989); Kenneth Ruddle & Tomoya Akimichi, *Sea Tenure in Japan and the Southwestern Ryukyus*, in *A SEA OF SMALL BOATS* 337-370 (J. Cordell ed., Cultural Survival Inc. 1989). See INTERNATIONAL ASSOCIATION FOR THE STUDY OF THE COMMONS, <http://www.iasc-commons.org/> (last visited 2016) as a clearinghouse for information and research on approaches to sustaining commons around the world.

⁴ See Benjamin S. Halpern, *A Global Map of Human Impact on Marine Ecosystems*, 319.5865 SCIENCE 948-52 (2008).

environment is changing and there is a growing recognition that these changes are at least in part rooted in failures of governance.⁵

The boundaries of any ecosystem can be difficult to define. Created by humans, boundaries are subjective products related to human objectives and management goals. However, system boundaries are even more difficult to delineate in the marine environment. Even on land, system boundaries are porous, allowing biotic and abiotic movements across boundaries. Aquatic systems have several attributes that create additional challenges for governing them. They are three-dimensional, often poorly understood due to difficulties in accessing, investigating, and perceiving them, and while some features or resources are stationary, others are mobile and dynamic.

Marine systems often intersect or act as boundaries among adjacent governance units. Internationally, transboundary rivers such as the Mekong, Rhine, Nile, and Danube demarcate the boundaries of nation-states, flowing through multiple countries on their way to the sea. This is also true of marine systems such as seas, gulfs, bays, and sounds. They are rarely encapsulated within one governance jurisdiction. Within the United States, rivers such as the Columbia, Connecticut, and Mississippi create borders between adjacent states. Coastal estuaries like Chesapeake Bay and Long Island Sound are bisected offshore by the invisible lines of state boundaries. At smaller spatial scales, rivers, brooks, creeks, and estuarine embayments often form the boundaries between local municipalities. As a result, the jurisdictional shapes of the relevant governance institutions rarely fit the shapes of the natural ecosystems they seek to govern. Problems of “fit” refer to the ways in which institutions fail to match the ecosystems they govern.⁶ Problems of fit are crucial drivers in determining the effectiveness of resource management regimes since their ability to prevent environmental degradation or achieve desired outcomes is premised in large part

⁵ THE WHITE HOUSE COUNCIL ON ENVTL. QUALITY, FINAL RECOMMENDATIONS OF THE INTERAGENCY OCEAN POLICY TASK FORCE 2 (July 19, 2010), *available at* https://obamawhitehouse.archives.gov/files/documents/OPTF_FinalRecs.pdf (stating that “[t]he challenges we face in the stewardship of the ocean, our coasts, and the Great Lakes lie not only within the ecosystems themselves, but also in the laws, authorities, and governance structures intended to manage our use and conservation of them.”).

⁶ *See* ORAN R. YOUNG ET AL., IHDP REPORT NO. 16: SCIENCE PLAN: INSTITUTIONAL DIMENSIONS OF GLOBAL ENVIRONMENTAL CHANGE (H. Shroeder ed., Rev. Ed. 2005) (1999); *See also* ORAN R. YOUNG, THE INSTITUTIONAL DIMENSIONS OF ENVIRONMENTAL CHANGE: FIT, INTERPLAY, AND SCALE (MIT Press, 2002) (expanding on these themes); *See also* L.B. Crowder et al., *Resolving Mismatches in U.S. Ocean Governance*, 313.5787 SCIENCE 617-18 (2006) (amplifying problems of scale, fit, and institutional fragmentation).

on their fit with the surrounding biogeophysical system.⁷ In addition, some geopolitical contexts (especially where flows are directional) create upstream-downstream problems, which can create a particularly pernicious variation of Hardin's tragedy.⁸

Even within a single political jurisdiction, the multitude and diversity of regulated activities, laws, and agencies creates a dense and fragmented field of institutions which often overlap and conflict, focused on fulfilling divergent mandates or incompatible ends.⁹ This situation is responsible for the existence of problems of "interplay," which involve the interactions among different institutions operating in the institutional space.¹⁰ The lack of comprehensive planning does not mean that the activities which occur in marine areas are unregulated or that these spaces are unallocated. Rather regulation occurs primarily within "individual economic sectors."¹¹

Scaling down below the layer of federal authority, complexities may increase as multiple states compete to impose their individual management regimes on what in actuality are single, unified natural systems. This creates situations where different approaches to managing water quality and quantity, living resources, mineral extraction, transport and shipping lanes, dredging and dredge disposal sites, maritime heritage, recreational and cultural sites and resources, and other realms are deployed within a single aquatic ecosystem. Inappropriate or misaligned incentives, often embedded within human-environment relationships, can also pose significant challenges to governance.¹² Incentive mismatches may be caused by spatial, temporal, and valuational asymmetries, among other factors.

⁷ YOUNG, THE INSTITUTIONAL DIMENSIONS OF ENVIRONMENTAL CHANGE: FIT, INTERPLAY, AND SCALE, *supra* note 6.

⁸ See Syma A. Ebbin, *Swimming Upstream: Institutional Dimensions of Asymmetrical Problems in Two Salmon Management Regimes*, 27.5 MARINE POLICY 441-48 (2003); Syma Ebbin, *What's Up? The Transformation of Upstream-Downstream Relationships on Alaska's Kuskokwim River*, 26.2 POLAR GEOGRAPHY 147-66 (2002) (thoroughly explicating the problems associated with asymmetrical problem structures).

⁹ THE WHITE HOUSE COUNCIL ON ENVTL QUALITY, *supra* note 4, at 13. ("United States governance and management of these areas span hundreds of domestic policies, laws, and regulations covering international, Federal, State, tribal, and local interests.")

¹⁰ See YOUNG ET AL, *supra* note 6.

¹¹ Fanny Douvere, *The Importance of Marine Spatial Planning in Advancing Ecosystem-Based Sea Use Management*, 32 MARINE POLICY 762-71 (2008).

¹² YOUNG, *supra* note 7.

Misaligned incentives can produce outcomes where negative impacts are externalized to the detriment of other individuals, but more importantly, to the ecosystem (and resource base) as an integrated whole. Work on the prisoner's dilemma and game theory has laid out the mechanics and dynamics of these misaligned incentives through the analysis of player decisions to defect or cooperate.¹³ Successful joint use can develop when players act (or refrain from acting) in ways that contribute to each other's well-being. Free-riding behavior is the antithesis of reciprocity, which depends on players demonstrating behaviors that meet mutual expectations over time. Individuals learn what to expect from each other over time and alter their behavior accordingly. Thus, cooperation based upon reciprocity can be achieved when interactions are future-oriented, continuous (non-finite), and there is a good possibility that participants will meet again.¹⁴ Cooperation is of course enhanced with a foundation of trust based on interpersonal history, as well as good communication – both missing from the original prisoner's dilemma. Parties engaged in the joint use and control of shared resources may operate under a similar incentive structure and have competing interests in accumulating benefits, externalizing costs, and retaining jurisdictional authorities.

B. Governance Opportunities

Ecosystem management may be one possible way to avoid the ensuing conflicts caused by institutional interplay and problems of fit. Ostensibly geared to encompass entire ecosystems, with the goal of encompassing all sources of mortality which impact all species within a given system, ecosystem management takes into account impacts on the surrounding system's structures and functions. However, this approach, especially when focused on resources within marine environments, has not been elaborated sufficiently to enable it to be implemented in a cohesive manner.¹⁵ Another way to meet these challenges in marine

¹³ Game theory is a modeling approach used by a number of disciplines including mathematics, economics, political science, among others, to explore the role that incentives play in decision-making as well as the evolution of conflict and cooperation. The "games" that game theory refers to are interactive situations involving independent, rational decision-makers. The prisoner's dilemma is one such game that is designed to show how incentives can be structured to promote outcomes that are less than optimal from the perspective of both the players and society. Oran Young notes that in addition to the prisoner's dilemma, many other "circumstances generate incentives to act in ways that seem rational from an individualistic perspective but yield collective outcomes that are unattractive to all." See YOUNG, *supra* note 7, at 31.

¹⁴ ROBERT AXELROD, *THE EVOLUTION OF COOPERATION* (Basic Books, New York rev. ed. 1984).

¹⁵ JULIA M. WONDOLLECK & STEVEN L. YAFFEE, *MARINE ECOSYSTEM-BASED MANAGEMENT PRACTICE: DIFFERENT PATHWAYS COMMON LESSONS* (Island Press 2017) (describing development of five types of ecosystem-based approaches to marine management, showing the breadth and

governance might be through a place-based spatial planning approach.¹⁶ In fact, place-based approaches have been put forth as a vehicle to implement ecosystem management and create a more comprehensive and integrated management process.

The concept of land use planning has been in use since ancient times, but the concept of zoning – that is designating certain land uses as spatially explicit zones on maps – began in the latter half of the 19th century. These efforts arose in response to conflicts that emerged among users and uses of the land.¹⁷ As cities expanded, the utility of developing spatially explicit plans for managing drinking water sources and wastewater effluents along with other industrial land uses became clear. In the United States, zoning was first applied in 1916 in New York City, upheld ten years later by the Supreme Court of the United States in the case *Euclid v. Ambler*, and adopted by all states and most municipalities in the following years.¹⁸ Individual review and permitting of land use proposals has been supplemented by overarching planning processes that guide future conservation and the development of communities.

C. Marine Spatial Planning

Spatial planning efforts have been implemented in marine systems in the last few decades, often, but not always, evolving from efforts to manage and protect significant marine habitats, such as the Florida Keys National Marine Sanctuary and Great Barrier Reef Marine Park in Australia.¹⁹ These MSP efforts

variation among the ways this approach has been implemented); See Heather Leslie & Karen McLeod, *Confronting the Challenges of Implementing Ecosystem-Based Management*, 5.10 ECOLOGY AND THE ENVIRONMENT 540-48 (2007) for an outline of some of the work needed to implement marine-based management, answer questions that remain over how to implement ecosystem assessments and multi-species approaches, and adjudicate tradeoffs among resources.

¹⁶ Oran Yong et al., *Solving the Crisis in Ocean Governance: Place-Based Management of Marine Ecosystems*, 49.4 ENVIRONMENT 21-32 (2007).

¹⁷ Douvere, *supra* note 11.

¹⁸ See *Zoning Background*, NYC PLANNING - DEPARTMENT OF CITY PLANNING (2016), <https://www1.nyc.gov/site/planning/zoning/background.page> (citing *Village of Euclid, Ohio v. Ambler Realty Co.*, 272 U.S. 365 (1926) describing the U.S Supreme Court decision that the zoning regulations Euclid enacted were constitutional and ruling that these efforts were an appropriate extension of the police powers derived under the 10th Amendment to ensure public health, safety, and welfare).

¹⁹ See Briana W. Collier, *Orchestrating Our Oceans: Effectively Implementing Coastal and Marine Spatial Planning in the U.S.*, 6.1 SEA GRANT LAW AND POLICY JOURNAL 86-87 (2013), available at <https://www1.nyc.gov/site/planning/zoning/background.page>, for a review of international initiatives in marine spatial planning. This article is also available on the National Sea Grant Law Center's website at <http://nsglc.olemiss.edu/sglpj/vol6no1/5-Collier.pdf>.

have sought to integrate the suite of human activities in spatially delimited areas through processes which are explicitly embedded within specific biophysical, socioeconomic, and jurisdictional contexts. UNESCO has come to define MSP as a “process of analyzing and allocating parts of three-dimensional marine spaces to specific uses, to achieve ecological, economic, and social objectives that are usually specified through the political process.”²⁰

In the United States, beginning with the passage of the Oceans Act of 2000, which established the U.S. Commission on Ocean Policy (Commission), and the publication of the Commission’s Blueprint Report in 2004, the idea of creating a more integrated and coordinated approach to ocean management began to receive greater attention.²¹ Indeed, this approach was recommended by the Interagency Ocean Policy Task Force (Task Force) established by President Obama in 2009.²² The Task Force recommended establishing a new framework for a national ocean policy along with a set of national priority objectives that included “implement[ing] comprehensive, integrated, ecosystem-based coastal and marine spatial planning and management in the United States.”²³ The report goes on to define MSP as a “comprehensive, adaptive, integrated, ecosystem-based, and transparent spatial planning process, based on sound science, for analyzing current and anticipated uses of ocean, coastal and Great Lakes areas.”²⁴ It further notes that this process aims to identify the areas “most suitable for various types of classes of activities in order to reduce conflicts among uses, reduce environmental impacts, facilitate compatible uses, and preserve critical ecosystem services to meet economic, environmental, security, and social objectives.”²⁵

²⁰ CHARLES EHLE & FANNY DOUVERE, VISIONS FOR SEA CHANGE: REPORT OF THE FIRST INTERNATIONAL WORKSHOP ON MARINE SPATIAL PLANNING – INTERGOVERNMENTAL OCEANOGRAPHIC COMMISSION AND MAN AND THE BIOSPHERE PROGRAMME 4 (UNESCO iOC 2006), available at <http://unesdoc.unesco.org/images/0015/001534/153465e.pdf>.

²¹ U.S. COMMISSION ON OCEAN POLICY, AN OCEAN BLUEPRINT FOR THE 21ST CENTURY, FINAL REPORT 10 (2004), available at http://govinfo.library.unt.edu/oceancommission/documents/full_color_rpt/000_ocean_full_report.pdf (“Ultimately, a streamlined program for each activity should be combined with a comprehensive offshore management regime that considers all uses, addresses the cumulative impacts of multiple activities, and coordinates the many authorities with interests in offshore waters.”).

²² THE WHITE HOUSE COUNCIL ON ENVTL. QUALITY, *supra* note 5, at 2.

²³ THE WHITE HOUSE COUNCIL ON ENVTL. QUALITY, *supra* note 5, at 32.

²⁴ THE WHITE HOUSE COUNCIL ON ENVTL. QUALITY, *supra* note 5, at 41.

²⁵ THE WHITE HOUSE COUNCIL ON ENVTL. QUALITY, *supra* note 5, at 41.

President Obama implemented the recommendations of the Task Force with Executive Order 13,547, signed on July 19, 2010.²⁶ This step led to the formation of nine regional planning bodies tasked with initiating regional efforts aimed at MSP. In the northeast, the Northeast Regional Ocean Council (NROC) was formed in 2005 by governors of the six New England states.²⁷ NROC's ocean planning, one of three NROC focus areas, has moved under the guidance of the Ocean Planning Committee to create a Northeast Ocean Data Portal which showcases the spatial dimensions of marine resources and resource uses.

In 2012, the Northeast Regional Planning Body (RPB) was formed to develop an ocean plan for New England.²⁸ The Northeast RPB has representatives from each New England state, federally recognized tribes, relevant federal agencies, and the New England Fishery Management Council. The Northeast RPB's work has been supported by the NROC Ocean Planning Committee. Over the past four years, the Northeast RPB has solicited input from the public, and in May 2016, it released a draft plan for the region and sought public feedback. This plan was certified by the National Ocean Council in December 2016. With no management authority of its own, the Northeast RPB's central objective in drafting the ocean plan has been to coordinate the efforts of the various state, tribal, and federal agencies involved in ocean management activities.²⁹ Connecticut is a member of the Northeast RPB and NROC. A parallel effort in the mid-Atlantic region spawned the Mid-Atlantic Regional Ocean Council (MARCO), as well as a Mid-Atlantic RPB and Mid-Atlantic Ocean Data Portal.³⁰ New York State is a member of MARCO and the Mid-Atlantic RPB.

²⁶ See Exec. Order No. 13,547, 75 Fed. Reg. 43,023, [pin cite?] § 6 (July 19, 2010) for a description of the order that formally adopted the recommendations of the Interagency Ocean Policy Task Force and directed agencies to "participate in the process for coastal and marine spatial planning and comply with Council certified coastal and marine spatial plans, as described in the Final Recommendations and subsequent guidance from the Council."

²⁷ See generally, NORTHEAST REGIONAL OCEAN COUNCIL, <http://northeastoceancouncil.org/>, for more information.

²⁸ See generally, OCEAN PLANNING IN THE NORTHEAST, <http://neoplan.org/>, for more information.

²⁹ See OCEAN PLANNING IN THE NORTHEAST, THE PLAN, 12 (2016), available at <http://neoplan.org/plan/> (specifying that the Northeast Ocean Plan "is a forward-looking document intended to strengthen intergovernmental coordination, planning, and policy implementation, while at the same time enhancing the public's ability to participate in the process of managing ocean resources.").

³⁰ See generally MID-ATLANTIC REGIONAL COUNCIL ON THE OCEAN, <http://midatlanticocean.org/>; Mid-Atlantic Regional Planning Body, BUREAU OF OCEAN ENERGY MANAGEMENT, <https://www.boem.gov/Environmental-Stewardship/Mid-Atlantic-Regional-Planning->

Several other states have also moved forward with MSP efforts within state waters, as well as adjacent federal waters. California was early to adopt coast-wide marine planning with the passage of its Marine Life Protection Act in 1999. Although not strictly focused on MSP, the law phased in the creation of a series of marine reserves, which protect roughly 350 square miles of the state's offshore waters. As of January 2012, when the third phase created fifty reserves in southern California, the law prohibited extractive activities, such as commercial and recreational fishing and shell collecting, on over 10% of the coast.³¹

In the northeast, three states have developed marine spatial plans: Massachusetts, Rhode Island, and New York. Massachusetts was the first of these states to complete an ocean management plan for its state waters in December 2009.³² An amended version of the Massachusetts Ocean Management Plan was released in 2015.³³ The Plan was initiated to provide a means to balance traditional marine uses with emerging uses of the ocean space and to develop guidelines for renewable energy development including offshore wind and tidal energy. It created guidelines for the protection and sustainable use of the state's marine waters, sensitive marine habitats and resources, and historically important recreational and commercial uses of Massachusetts' marine waters.³⁴

In 2010, Rhode Island finalized an Ocean Special Area Management Plan (Ocean SAMP) for its offshore waters as part of its coastal zone management program, encompassing approximately 1,500 square miles of Rhode Island state waters and adjacent federal waters. The plan was initiated in response to offshore wind energy and other potential development projects.³⁵ The plan protected traditional commercial and recreational uses of its marine waters and created a Renewable Energy Zone where wind development is currently occurring. The

Body/index.aspx; *Data Portal*, MID-ATLANTIC REGIONAL COUNCIL ON THE OCEAN, <http://midatlanticocean.org/data-portal/>.

³¹ Erik Olsen, *No-Fishing Rule Roils Southern California*, N.Y. TIMES, Jan. 12, 2012.

³² COMMONWEALTH OF MASSACHUSETTS, 2009 MASSACHUSETTS OCEAN MANAGEMENT PLAN VOLUMES 1-2 (Dec. 31, 2009), available at <http://www.mass.gov/eea/waste-mgnt-recycling/coasts-and-oceans/mass-ocean-plan/2009-final-ocean-plan.html> [hereinafter 2009 Plan].

³³ COMMONWEALTH OF MASSACHUSETTS, 2015 MASSACHUSETTS OCEAN MANAGEMENT PLAN VOLUME 1 (Jan. 6, 2015), available at <http://www.mass.gov/eea/docs/eea/oceans/ocean-plan/2015-ocean-plan-v1-complete-low-res.pdf>.

³⁴ See generally, COMMONWEALTH OF MASS. ENERGY & ENVTL. AFFAIRS, <http://www.mass.gov/eea/waste-mgnt-recycling/coasts-and-oceans/mass-ocean-plan/>, for more information.

³⁵ RHODE ISLAND OCEAN MANAGEMENT PLAN, OCEAN SAMP VOLUME 1, 2 (Oct. 19, 2010), available at http://seagrant.gso.uri.edu/oceansamp/pdf/samp_crnc_revised/RI_Ocean_SAMP.pdf.

plan also identified several areas of special concern, as well as areas requiring protection.³⁶ In 2015, a review of the Ocean SAMP was initiated as part of a regular schedule of updating the plan.

In January 2017, New York completed a marine spatial plan for its marine and estuarine waters, encompassing the 2017 to 2027 time period.³⁷ Although Long Island Sound is formally included in the geographic scope of this draft, the New York Ocean Action Plan (OAP) focuses on New York's offshore territorial waters extending up to three nautical miles offshore and a desire to impact the federal management of offshore waters contiguous to these, extending 200 nautical miles from New York's coastline. The OAP focuses on enhancing intergovernmental coordination and providing avenues for stakeholder input and participation in the planning process. The plan is also focused on developing "a better understanding of how current human activities and emerging opportunities for offshore development (e.g., renewable energy, aquaculture) may impact the ecological integrity of the ocean ecosystem" and aims to provide support for "offshore planning in order to minimize conflicts that often arise between diverse ocean user groups for limited space and resources."³⁸

Efforts to implement coastal and MSP in the United States are beginning to proliferate at both the state and regional level. These initiatives have experienced both successes and challenges. In the United States, state-based MSP has until now involved single states developing unitary planning processes for their state waters, measured from the coast to three nautical miles, and in some cases, adjoining federal waters, which include waters three nautical miles to 200 nautical miles from their coasts. But at this time, there are no MSP efforts that involve multiple states in joint planning and governance in the United States, outside of the regional efforts discussed above.

Examples of joint or interstate governance of aquatic resources do exist, however. A variety of mechanisms have been used to develop various interstate agreements, commissions, and compacts. As per Article 1, Section 10 of the U.S. Constitution, states developing these types of interstate agreements must obtain congressional consent in addition to state authorization prior to implementation, assuring the federal government a role in multistate resource management.

³⁶ See generally, OCEAN SAMP, <http://seagrant.gso.uri.edu/oceansamp/>, for more information.

³⁷ N.Y. DEP'T OF ENVTL. CONSERVATION, DEP'T OF STATE, NEW YORK OCEAN ACTION PLAN 2017-2027 (Oct. 2017), available at http://www.dec.ny.gov/docs/fish_marine_pdf/nyoceanactionplan.pdf.

³⁸ *Id.* at 1.

Notable interstate compacts include the Atlantic States Marine Fisheries Commission (ASMFC), formed in 1942, which coordinates the management and conservation of the shared coastal fishery resources on the Atlantic coast. The Atlantic Coastal Fisheries Cooperative Management Act of 1993 has further mandated state compliance with fishery management plans to which they are party. Prior to this, compliance had been voluntary. The Columbia River Compact is another notable interstate agreement which involves the states of Oregon and Washington in the joint management of the fisheries of the Columbia River.

III. LONG ISLAND SOUND

Described as the “most domesticated body of salt water in the Western hemisphere” by F. Scott Fitzgerald in *The Great Gatsby*,³⁹ the estuary named Long Island Sound is surrounded by one of the most densely settled areas of the United States with over nine million people living near its shores (See Figure 1).⁴⁰ Long Island Sound continues to support a rich diversity of animal and plant species with over 1,300 invertebrates and fish species and 400 coastal bird species dwelling within it.⁴¹ The Sound generates a tremendous value to residents of both New York and Connecticut, as well as others, through its economic provision of resources and services.

³⁹ F. SCOTT FITZGERALD, *THE GREAT GATSBY* 5 (Scribner, N.Y. 2004).

⁴⁰ Compare NEIWPCC LONG ISLAND SOUND STUDY, SOUND HEALTH 2012: STATUS AND TRENDS IN THE HEALTH OF LONG ISLAND SOUND 14 (2012), available at http://longislandsoundstudy.net/wp-content/uploads/2012/11/Sound_Health_2012_Report.pdf; with MARK ANDERSON ET AL., THE NATURE CONSERVANCY, THE LONG ISLAND SOUND ECOLOGICAL ASSESSMENT EXECUTIVE SUMMARY (2015), available at https://www.conservationgateway.org/ConservationByGeography/NorthAmerica/UnitedStates/edc/Documents/CT_LISEA_ExecSum_final.pdf (depending upon proximity, population density changes; according to this study, 23 million people live within 50 miles of Long Island Sound).

⁴¹ NEIWPCC LONG ISLAND SOUND STUDY, SOUND HEALTH 2012: STATUS AND TRENDS IN THE HEALTH OF LONG ISLAND SOUND 14 (2012), available at http://longislandsoundstudy.net/wp-content/uploads/2012/11/Sound_Health_2012_Report.pdf.

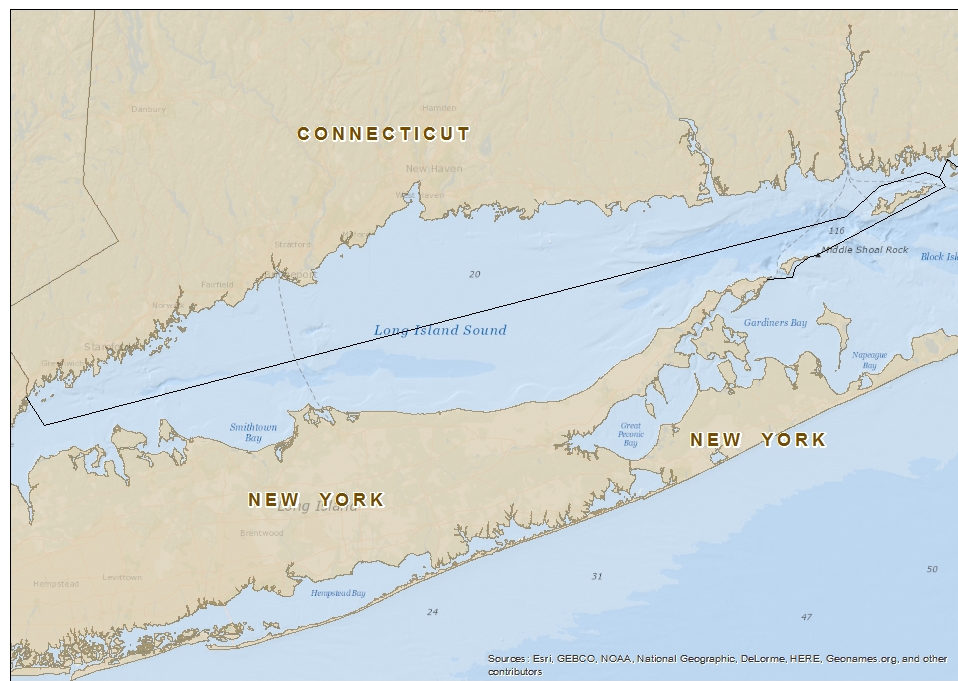


Figure 1. Boundary of Connecticut and New York State on Long Island Sound. Map by Nathaniel Trumbull.

In 1992, Altobello made initial estimates of the economic value of Long Island Sound. She calculated the total annual economic value of the Sound to be in excess of \$5 billion.⁴² A more recent economic valuation of the Long Island Sound basin, including its watersheds, concluded that the Sound generates between \$17 and \$37 billion in ecosystem goods and services every year and supports more than 190,000 jobs, bringing in over \$12 billion in wages.⁴³ Over a

⁴² MARILYN ALTABELLO, UNIV. OF CONN., THE ECONOMIC IMPORTANCE OF LONG ISLAND SOUND'S WATER QUALITY DEPENDENT ACTIVITIES (1992) (on file with the author). In 1997, Mark Parker updated Altobello's estimated value, calculating the value to be \$3.25 billion greater than the original estimate. See *Maritime Commerce Contributes to the Value of Long Island Sound*, SOUND OUTLOOK (CTDEP Newsletter) (June 2007).

⁴³ MAYA KOCIAN ET AL., EARTH ECONOMICS, THE TRILLION DOLLAR ASSET: THE ECONOMIC VALUE OF THE LONG ISLAND SOUND BASIN (2015), available at

100 year period, the authors estimated the asset value of this natural capital to be between \$690 billion and \$1.3 trillion, at a discount rate of 4%. Another recent study focused solely on Connecticut's maritime economy, excluding aquaculture production, and estimated its worth to be almost \$7 billion, contributing nearly 40,000 jobs to the state.⁴⁴

Despite decreases in the overall weight of fish and shellfish harvested in Long Island Sound since peaking in 1992, the overall value to harvesters of commercial finfish and shellfish has generally increased since 2005, exceeding \$30 million a year in ex-vessel values, generating a far greater economic impact to coastal communities.⁴⁵ It has been estimated that over 200,000 recreational anglers from both Connecticut and New York make approximately 1,000,000 fishing trips each year, catching over 10,000,000 fish.⁴⁶ The Connecticut Department of Agriculture, Bureau of Aquaculture maintains information on the economic value of Connecticut's shellfish industry, noting on their website that shellfishing in the state generates over \$30 million a year in farm-gate sales, supports over 300 jobs, and generates over \$900,000 in revenue from the leasing of shellfish beds.⁴⁷

The importance of Long Island Sound to Connecticut and New York, however, extends far beyond its ability to foster economic prosperity. The region's residents all rely on the Sound for a multitude of environmental services, including its role in nutrient cycling, regulating atmospheric gases, moderating regional climate, as well as supporting the hydrological cycle. In addition, the Sound has the ability to mitigate coastal hazards such as storms, floods, and droughts. Recent research indicates that every 2.5 acres of Connecticut's coastal wetlands prevents about \$28,500 in storm-related damage each year.⁴⁸ These

<https://static1.squarespace.com/static/546d61b5e4b049f0b10b95c5/t/5500b552e4b0a43f0c73ddd7/1426109778859/Earth+Economics+Long+Island+Sound+Basin+2015+Final+Report.pdf>.

⁴⁴ ROBERT S. POMEROY ET AL., CONNECTICUT SEA GRANT, VALUING THE COAST: ECONOMIC IMPACTS OF CONNECTICUT'S MARITIME INDUSTRY (Mar. 2013), *available at* <http://media.ctseagrant.uconn.edu/publications/coastalres/value.pdf>.

⁴⁵ JAMES S. LATIMER ET AL., LONG ISLAND SOUND: PROSPECTS FOR THE URBAN SEA 558 (Latimer, Tedesco, Swanson, Yarish, Stacey & Garza eds., Springer, N.Y. 2014).

⁴⁶ *Id.*

⁴⁷ *See generally*, CONN. DEP'T. OF AGRIC., BUREAU OF AQUACULTURE, <http://www.ct.gov/doag/cwp/view.asp?a=3768&q=451508&doagNav>, for more information on this and other economic information.

⁴⁸ Robert Costanza et al., *The Value of Coastal Wetlands for Hurricane Protection*, 37.4 AMBIO 241, 241-248 (June 2008), *available at*

crucial ecosystem services are likely to grow in importance in a world of changing climate and rising seas.

A. Governance in Long Island Sound

Long Island Sound serves as the jurisdictional boundary between Connecticut and New York State. The Sound's governance is concomitantly distributed among the states, federal government, and a multitude of coastal municipalities. Similar to other marine areas, the governance of marine-based activities, both extractive and passive, is delegated among a variety of governance levels and management agencies, creating a crowded and fragmented institutional space. Management goals and efforts are neither coordinated or integrated, nor necessarily consistent among the various authorities. Below are the most important spheres of activity on Long Island Sound, which also reflect the fragmented nature of management in the Sound.

1. Recreational and commercial fisheries

Long Island Sound's recreational and commercial fisheries exist entirely within state waters. The fisheries are under the jurisdiction of either the Connecticut Department of Energy and Environmental Protection (CT DEEP) or New York Department of Environmental Conservation (NY DEC). License requirements, catch limits, the timing of openings, and other fisheries regulations are not necessarily coordinated nor consistent between the two states, creating potential problems for fishermen. Fish stocks which are migratory or have a coast-wide distribution, including invertebrates like the American lobster, enter the waters of multiple states.

Cross-state boundaries come under the management purview of an interstate compact.⁴⁹ Those stocks are governed by the ASMFC, as well as the Mid-Atlantic Fishery Management Council and New England Fishery Management Council, established by the 1976 Magnuson-Stevens Fisheries Conservation and

http://seagrant.noaa.gov/Portals/0/Documents/what_we_do/social_science/ss_tools_reports/value_hurricane_protection.pdf.

⁴⁹ See ENVTL. LAW INST. & THE CENTER FOR OCEAN SOLUTIONS, COASTAL & MARINE SPATIAL PLANNING: LEGAL CONSIDERATIONS (2010), available at <http://www.centerforoceansolutions.org/sites/default/files/publications/Armsby-CMSP%20Legal%20Workshop%20Background%20Paper%20%282010%29.pdf>.

Management Act.⁵⁰ Relevant laws also include the Endangered Species Act, under which several Long Island Sound fish species are listed, including the Atlantic Salmon (*Salmo salar*) and Atlantic Sturgeon (*Acipenser oxyrinchus oxyrinchus*). Marine managers from the state agencies develop stock assessments supplemented by fisheries scientists of the National Marine Fisheries Service (NMFS).

2. Energy

For energy siting issues in Long Island Sound, including tidal, current, wave, and wind, the Federal Energy Regulatory Commission has regulatory permitting authority with up to 15 other agencies and layers of oversight and review involved in the permitting process. Section 10 of the Rivers and Harbors Act of 1899 assigns the U.S. Army Corps of Engineers (USACE) a role in placing structures in navigable waters.⁵¹ The USACE also oversees dredging or filling activities under Section 404 of the Clean Water Act (CWA).⁵²

Under the Coastal Zone Management Act (CZMA), the states of New York and Connecticut, depending upon the specific location of the proposed activity, are charged with evaluating the consistency or lack thereof of actions with their individual state coastal management plans and other relevant state laws and policies.⁵³ In Connecticut, the CT DEEP has this authority while in New York, the NY DEC is charged with this responsibility. Similarly, under the CZMA neighboring states that are adjacent to the area of impact have the opportunity to submit feedback related to issues of mutual concern. At the federal level, the NMFS and U.S. Fish and Wildlife Service (USFWS) review the proposed siting of energy projects and are required to decide whether approval is allowable under the Fish and Wildlife Coordination Act, Endangered Species Act, Marine Mammal Protection Act, and Submerged Lands Act. Federal and state agencies also consider the impact on existing cultural and historic resources in these siting decisions.

⁵⁰ Magnuson-Stevens Fishery Conservation and Management Act of 1976, 16 U.S.C. §§ 1801-1882 (2007).

⁵¹ 33 U.S.C. § 401 (2016).

⁵² 33 U.S.C. § 1344 (1987).

⁵³ Coastal Zone Management Act, 16 U.S.C. §§ 1451-1466 (1990).

3. Water pollution

The oldest federal environmental law in the United States, the Rivers and Harbors Act of 1899, prohibits the dumping of refuse into navigable waters (a provision of the law known as the Refuse Act).⁵⁴ The other critical law governing water quality is the Federal Water Pollution Control Act of 1972, amended in 1977 and 1987, and now commonly referred to as the CWA.⁵⁵ The CWA established the National Pollution Discharge Elimination System (NPDES) program, which requires any entity to obtain a permit to discharge pollutants into navigable waters from a point source.⁵⁶ The 1987 amendments of the CWA, focused on non-point source pollution, require states to develop Total Maximum Daily Loads (TMDL) to help combat non-point source pollution that does not require a NPDES permit.⁵⁷ In 1990, the CZMA required coastal states to develop coastal management programs and address non-point source pollution.⁵⁸ Under the CWA, the U.S. Environmental Protection Agency (EPA) can delegate to states the authority to issue NPDES permits, specify conditions, and enforce regulations.

In Long Island Sound, the CT DEEP and NY DEC are responsible for implementing these mandates. In 1985, the Long Island Sound Study, a federal-state partnership involving the EPA, New York, and Connecticut was formed to focus on restoring and protecting the Sound.⁵⁹ Since 2002, New York and Connecticut have used a nitrogen credit trading system to reduce the nitrogen discharged by seventy-nine public-owned sewage treatment plants into the Sound.⁶⁰

4. Dredging and at-sea dredge disposal

The Marine Protection, Research and Sanctuaries Act (MPRSA, also known as the Ocean Dumping Act) regulates the dumping of waste, including

⁵⁴ 33 U.S.C. § 407 (1899).

⁵⁵ Federal Water Pollution Control Act, 33 U.S.C. §§ 1251-1376 (1987).

⁵⁶ 33 U.S.C. § 1342 (1972).

⁵⁷ 33 U.S.C. § 1313(d) (1987) (commonly referred to as Federal Clean Water Act § 303(d)).

⁵⁸ 16 U.S.C. §§ 1455(b)-1466 (1990).

⁵⁹ *See About the Long Island Sound Study*, LONG ISLAND SOUND STUDY, <http://longislandsoundstudy.net/about/about-the-study/>.

⁶⁰ CT DEEP, BUREAU OF WATER PROTECTION AND LAND REUSE, CONNECTICUT'S NITROGEN CREDIT EXCHANGE – AN INCENTIVE-BASED WATER QUALITY TRADING PROGRAM 1-10 (2010), available at http://www.ct.gov/deep/lib/deep/water/lis_water_quality/nitrogen_control_program/water_quality_trading_summary_2010.pdf.

dredged materials, at sea.⁶¹ The EPA and USACE have oversight over evaluating, permitting, managing, and monitoring the disposal of dredged material at sea.⁶² Dredge and dredge disposal activities in Long Island Sound are also under the jurisdiction of the NY DEC and CT DEEP. The location, designation, and use of these sites in Long Island Sound is a contentious issue, reflecting divergent positions held by stakeholders and government agencies in New York and Connecticut.⁶³ For instance, recent efforts by the EPA and USACE to reauthorize the New London dredged material disposal site in the eastern portion of the Sound has led New York to bring litigation to stop the designation.

5. Environmental review

All federal activities in Long Island Sound that have significant environmental impacts, including fisheries, dredging, and energy development, among others, are subject to review under the National Environmental Policy Act (NEPA). NEPA provides for the development and review of environmental assessments and, if warranted, environmental impact statements to determine if an activity will have a significant impact.

B. Marine Spatial Planning Efforts

MSP efforts got off the ground in the spring of 2012 with the ad hoc formation of a Connecticut-New York Bi-State Marine Spatial Planning Working Group (WG).⁶⁴ The group, spearheaded by representatives of The Nature Conservancy (TNC) and Connecticut Sea Grant, includes representatives from state and federal agencies including the CT DEEP, NY DEC, New York

⁶¹ 16 U.S.C. §§ 1431-1445 (2000); 33 U.S.C. §§ 1401-1445 (1988).

⁶² The 1972 CWA provided jurisdiction over different aspects of dredging and the disposal of the spoils within three miles of shore to the EPA and USACE. While the USACE issues permits for dredging and the disposal of dredged material if it will have minimal impact, the EPA develops criteria that the USACE uses to assess these impacts. Both agencies oversee the selection of the sites receiving dredged material.

⁶³ See generally, Gregory B. Hladky, *New York to Sue Over L.I. Sound Dredging*, HARTFORD COURANT, Dec. 6, 2016, <http://www.courant.com/politics/hc-ny-files-sound-dredging-lawsuit-20161206-story.html>; Gregory B. Hladky, *New Federal Long Island Sound Dredging Plan Divides Connecticut and New York*, HARTFORD COURANT, Feb. 8, 2016, <http://www.courant.com/news/connecticut/hc-sound-dredge-dispute-20160208-story.html>; Stephen Singer, *Dredged Materials Dumped into Long Island Sound Spur Debate*, WASH. TIMES, July 31, 2015, <http://www.washingtontimes.com/news/2015/jul/31/dredged-materials-dumped-into-long-island-sound-sp/>.

⁶⁴ One of this article's authors, Syma Ebbin, has served on this group since its inception.

Department of State (NY DOS), New York Sea Grant, the EPA Long Island Sound Study office, U.S. Coast Guard, U.S. Navy, National Oceanic and Atmospheric Administration, NROC, Stony Brook University, and Rhode Island Sea Grant. The WG has also had representation from several marine stakeholder groups in Long Island Sound, including the Long Island Marine Trades Association, Connecticut Marine Trades Association, and Save the Sound.

The WG holds regular meetings via conference calls and occasionally meets in person. The group has established several sub-committees to tackle issues of datasets, frameworks, and stakeholder involvement. Funded by private foundation grants, the WG has hired consultants to facilitate data gathering and reporting functions. Although the Blue Plan legislation identifies a specific role and duties for the WG, as of the fall of 2016, its future is unclear since many individuals involved and activities addressed are now formally incorporated within the Blue Plan framework.

As part of the efforts of the WG and lobbying from TNC, bills to establish a MSP process in Connecticut were introduced to the Connecticut General Assembly in 2014 and 2015. The 2015 bill was successfully passed into law. The law, entitled *An Act Concerning a Long Island Sound Blue Plan and Resource and Use Inventory*, PA 15-66, became effective July 1, 2015. The law initiated the creation of a Blue Plan Advisory Committee and outlined its goals and responsibilities. The law sought to create a resource and use inventory for Long Island Sound and develop a spatially-based marine plan; which will enhance stewardship of Long Island Sound; promote science-based management, take into account the natural, social, cultural, historic, and economic characteristics of the Sound; and protect traditional water-dependent uses and activities. The Advisory Committee, chaired by the Commissioner of CT DEEP, includes representatives from Connecticut Sea Grant, TNC, and the Connecticut Department of Agriculture Bureau of Aquaculture, Connecticut Department of Transportation, Connecticut Siting Council, Connecticut Office of Policy and Management, as well as several members representing municipalities and other stakeholders.⁶⁵

⁶⁵ In addition to those identified, the current Blue Plan Advisory Committee membership includes a gas and electric distribution industry representative to be appointed by the Governor, the Town of Old Saybrook Town Planner, Connecticut Fund for the Environment/Save the Sound, the General Manager and Dockmaster of the Rex Marine Center in Norwalk, a commercial boating representative to be appointed by State Senate Majority, a representative of Beebe Dock and Mooring Systems in Madison, a marine trades representative appointed by State Senate Minority Leader, a commercial finfish industry representative appointed by Speaker of the House, the Town of Westport Conservation Director, a coastal municipality representative appointed by House

New York representatives of the NY DEC and NY DOS are invited to participate in an official capacity in the work of the Advisory Committee.

C. Overview of Past Connecticut and New York Conflicts

Broader uses of Long Island Sound over which the two states have a long history of debate and discussion, include differences in the states' fishing regulations, issues with handling and mitigating runoff into the Sound, the future of the U.S. Department of Agriculture facility on Plum Island, New York, and the dredging and disposal of dredged materials into the Sound. Specific conflicts and disputes between Connecticut and New York have emerged in recent years over the placement of power cables on the bottom of the Sound in order to supply Long Island with electricity, the construction of the Indian Point pipeline, and perhaps most intensely, consideration (and eventual rejection) of the Broadwater liquid natural gas platform proposal in New York waters.⁶⁶

IV. METHODS

Given the emerging MSP efforts by the state of Connecticut in Long Island Sound described in the preceding section, the authors initiated research efforts in 2016 to better understand the impediments and prospects that exist to develop and implement bi-state MSP in Long Island Sound. Based on the premise that MSP seeks to create a more cohesive and less institutionally fragmented management system, we sought to assess the prospects that the emerging MSP process would be successful in achieving its aims and grow to include meaningful participation by New York state agencies and stakeholders. To reiterate, the working hypothesis was that obstacles to multi-party cooperation involve perceived competition for the use and control of shared natural resources and benefits generated by the Sound's ecosystem services, and also political and institutional concerns regarding jurisdictional authorities and state sovereignty.

Majority Leader, and a recreational fishing/hunting community representative appointed by House Minority Leader. See STATE OF CONN., DEP'T OF ENERGY & ENVTL. PROT., LONG ISLAND SOUND BLUE PLAN ADVISORY COMMITTEE,

http://www.ct.gov/deep/cwp/view.asp?a=2705&pm=1&Q=574830&deepNav_GID=1635.

⁶⁶ John Rather, *For Broadwater Gas Plant, Opposition on Many Fronts*, N.Y. TIMES, May 1, 2009, at CT5, available at

http://www.nytimes.com/2009/05/03/nyregion/connecticut/03broadCT.html?ref=collection%2Fbyline%2Fjohn-rather&action=click&contentCollection=undefined®ion=stream&module=stream_unit&version=latest&contentPlacement=1&pgtype=collection.

A set of interview questions were developed by the authors to assess the understandings of formal stakeholders with respect to the compatibility of management efforts in Long Island Sound, the obstacles and benefits associated with developing MSP, and the types of system threats that might be addressed under an MSP initiative. Interviews were solicited and scheduled via an emailed invitation to participate with members of the WG and the Blue Plan Advisory Committee. Interviews were conducted with experts directly involved in developing MSP efforts in Long Island Sound by phone, in person, or self-administered via an online interface.

Forty experts were invited to participate in the survey from both New York and Connecticut. Twenty-two individual experts responded to our interview request, among whom nineteen agreed to participate in the survey. They were interviewed on the condition of anonymity. Three individuals affiliated with the NY DOS who were invited to participate refused to participate in the survey. In total, there were five respondents from New York and fourteen from Connecticut. Interview were scheduled to take fifteen minutes; however, several interviews extended up to forty-five minutes. Five of the nineteen respondents chose to respond by email rather than during a telephone or in-person interview.

The survey consisted of eight closed and open-ended questions. Respondents were asked to provide their understanding of the relative compatibility of management and planning approaches taken by Connecticut and New York with respect to various extractive and non-extractive uses in Long Island Sound. The interviewees were asked a short series of open-ended questions related to their knowledge of the future of MSP, its potential effectiveness for Long Island Sound, and their views of existing obstacles to MSP implementation.

Respondents were asked to evaluate different realms of economic activity/use as most incompatible (value of 1) to most compatible (value of 5) in terms of management approaches between Connecticut and New York. Responses to this question were collected on a 5-point Likert scale. A management compatibility index (MCI), indicating the degree of compatibility or incompatibility of the management approaches of New York and Connecticut, was created for each of the sixteen activities based on the responses of the interviewees. The MCI was created by weighting the most incompatible category as a 1, and most compatible as a 5, and then averaging the responses for each realm of economic activity/use on Long Island Sound. An MCI greater than 3 indicates that respondents believe the two states' management approaches are compatible; an MCI less than 3 indicates a perceived incompatibility. An MCI

value of 3 indicates perceived neutrality among management approaches. The MCI thereby gives an indication of congruence or dissonance between the two sides of Long Island Sound, based on the views of the study's respondents.

In order to explore the topic, the authors attended quarterly meetings of the Blue Plan Advisory Committee, EPA-convened public hearings regarding the designation of dredge dump sites in Long Island Sound in summer 2016, and public information meetings of NROC.

V. RESULTS

The goal of the survey was to identify the relative compatibility, or incompatibility, of each state's management approaches with respect to sixteen different extractive and non-extractive uses of Long Island Sound. The results indicate that, to a great extent, the two states' approaches to managing Long Island Sound are perceived to be compatible. Only two spheres of economic activity, out of sixteen, were perceived to be incompatible. Dredge disposal (MCI value of 1.4) was the economic activity/use judged to be the least compatible. Sand/gravel mining followed as the second most incompatible activity (MCI 2.7). The siting of cables/pipelines had an average MCI of 3.0. (See Tables 1 and 2), with seven respondents responding that the two states' approaches had some degree of incompatibility, and five noting that the approaches were compatible to some degree.

Table 1. Frequency of Responses (n=19) and the Associated Management Compatibility Index (MCI) Values for Sixteen Spheres of Economic Activity in Long Island Sound as Derived from Interview

	Incompatible	Some-what Incompatible	Neutral	Somewhat Compatible	Compatible	MCI (1 = Incompatible; 5 = Compatible)
Cultural Sites	0	0	8	8	2	3.7
Protected Reserves/Parks	0	1	6	4	7	3.9
Military/Security Sites	1	3	8	2	4	3.3
Cables/Pipelines	2	5	6	1	4	3.0
Energy (Tidal or Current)	1	0	11	2	3	3.4
Sand/Gravel Mining	1	4	12	1	0	2.7
Nonpoint Source Runoff/Pollution	0	0	4	6	8	4.2
Wastewater Treatment/ Effluent Treatment/ Effluent	1	1	6	4	6	3.7
Shipping/ Navigational lanes	1	1	6	4	6	3.7
Significant or Critical Biological Area/Benthic Habitat	1	2	4	3	8	3.8
Energy/Infrastructure/Platforms	3	1	4	6	3	3.3
Shellfish Harvest Areas	0	1	6	6	5	3.8
Recreational Fishing	0	3	5	3	7	3.8
Commercial Fishing	0	1	8	6	3	3.6
Dredge Disposal	14	1	2	1	0	1.4
Aquaculture	0	4	8	2	4	3.3

Table 2. Responses Tallied by Percentage (%) (n=19) by Category

	Combined Incompatible and Somewhat Incompatible	Neutral	Combined Compatible and Somewhat Compatible
Cultural Sites	0	44	56
Protected Reserves/Parks	0	33	41
Military/Security Sites	23	44	33
Cables/Pipelines	39	33	27
Energy (Tidal or Current)	6	65	30
Sand/Gravel Mining	28	67	5
Nonpoint Source Runoff/Pollution	0	22	77
Wastewater Treatment/Effluent Treatment/Effluent	12	33	55
Shipping/Navigational Lanes	12	39	50
Significant or Critical Biological Area/Benthic Habitat	17	22	61
Energy/Infrastructure/Platforms	24	24	53
Shellfish Harvest Areas	6	33	61
Recreational Fishing	17	28	56
Commercial Fishing	6	44	50
Dredge Disposal	84	11	6
Aquaculture	22	44	33

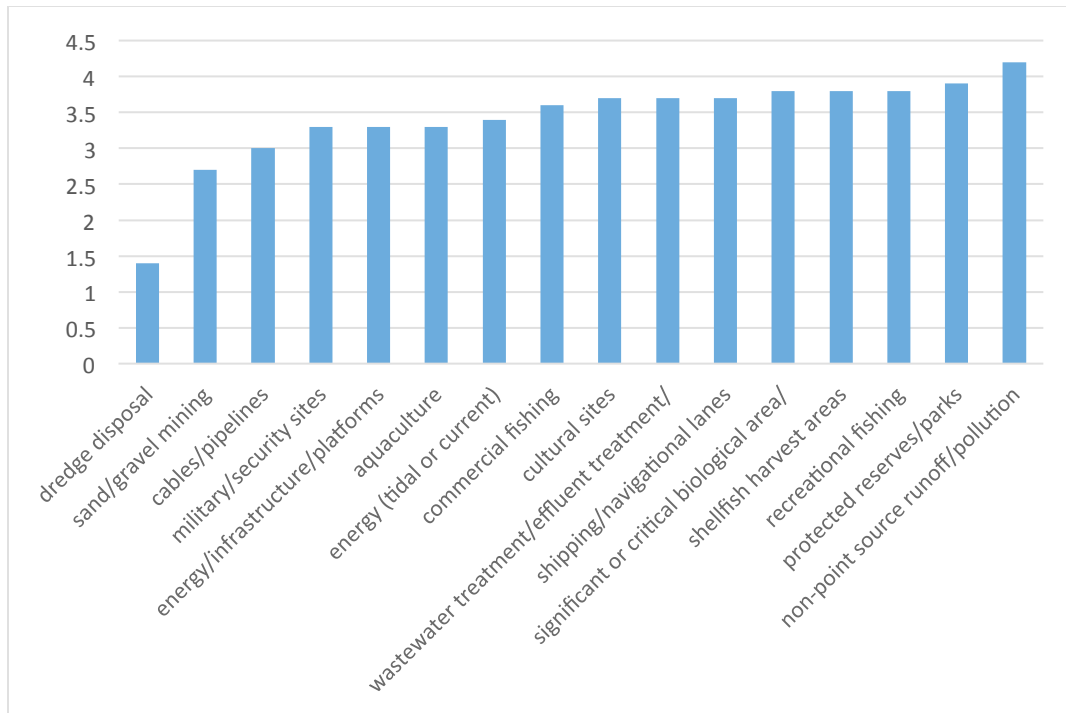


Figure 2. Comparison of Management Compatibility Index Values by Realm of Economic Activity/Use on Long Island Sound

Among those uses identified by respondents as having highly compatible management approaches are: non-point source runoff/pollution (MCI 4.0), protected reserves/parks (3.9), significant or critical biological area/benthic habitat cultural sites (3.8), recreational fishing (3.8), and shellfish harvest areas (3.8). Similarly, wastewater treatment/effluent (3.7), shipping/navigational lanes (3.7), and cultural sites (3.7) were identified as largely compatible (See Figure 2). One explanation for this perceived compatibility is related to the spatial segregation of the activity and its management to one or both state's coastal margins. It was believed in these cases that the activity and its management did not impact the other state's users, resources, or management. Another explanation put forth for the perceived compatibility reflects the role of federal governance and regulation in those realms, reducing perceptions of conflict between differing or opposing management approaches. For example, with respect to the management of nonpoint source pollution, the realm with the highest MCI, management approaches are mandated by the EPA under the CWA and other relevant laws.

A comparison of New York and Connecticut respondents' views on the most incompatible activity, the disposal of dredged materials in Long Island Sound, demonstrates that the topic is perceived differently by respondents from each state (See Figure 3). Connecticut respondents' views on this issue are based on the economic interests at stake in Connecticut and the state's long-standing use of dredging and access to the relatively lower cost disposal of dredged material in the Sound (as opposed to disposal in more distant aquatic or terrestrial sites). Connecticut's three largest rivers (Connecticut, Housatonic, and Thames), along with most of its smaller rivers, carry large sediment loads (compared with the tributaries found on Long Island in New York) which gradually fill many of the state's harbors, ports, and moorage facilities on the Connecticut side with silt and sand. Regular dredging at low-cost is therefore perceived as essential in Connecticut to retain the economic viability of many coastal maritime activities, such as general navigation, shipping, military uses, commercial and recreational fishing, and recreational boating and its related services like marinas, yacht clubs, and mooring areas.

On the other hand, New York respondents focus on potential environmental externalities related to the disposal of dredged materials in the Sound. With relatively small watersheds, Long Island's harbors generally do not need regular dredging to remain open and have a lower contaminant load than Connecticut's more industrialized rivers and harbors. Dredged material originating in the region of New York City is not allowed to be disposed of at sea, requiring land-based disposal techniques. Thus, New York's Long Island Sound-based maritime economy is not dependent on dredging and the disposal of dredged material within Long Island Sound. This creates an asymmetrical problem where benefits of dredging and disposal are perceived to accrue to Connecticut alone with no perceived benefits, only deleterious impacts, generated for the New York economy.

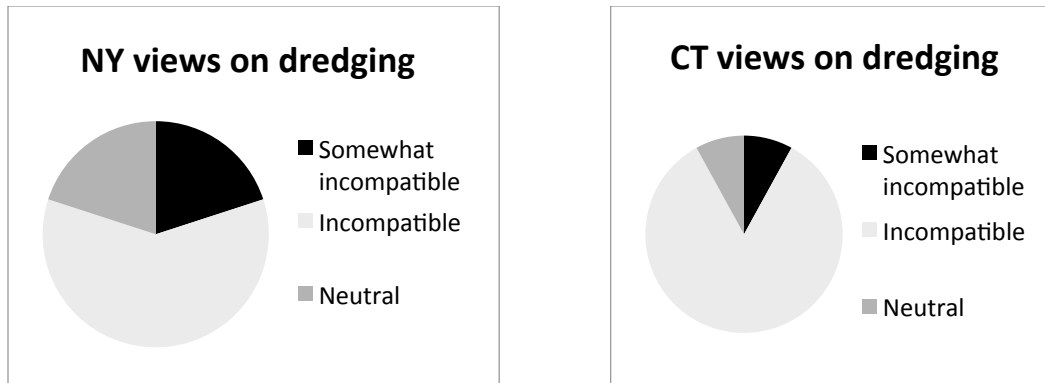


Figure 3. Comparison of New York and Connecticut Sides on Dredging and Dredge Disposal.

VI. ANALYSIS

A. Asymmetric Interests and Spatial Dimensions

Interview respondents placed a large emphasis on the different geographies of each state's coastlines when explaining their selected compatibility for the states' management approaches. Most of Connecticut's larger harbors have become well developed industrial and transportation hubs over the last three centuries. Connecticut's coast is directly impacted by the accumulation of sand and silt from its large rivers, which all drain into Long Island Sound. The Connecticut economy's relatively strong reliance on its coastlines for marine transportation plays directly into Connecticut leaders' thinking about dredging on the Connecticut side. Further, the viability of shipping, transportation, recreational boating, and military sites on the Connecticut side is highly dependent on dredging.

New York's Long Island Sound communities are less economically dependent on dredging. The fundamental differences in geography and the related historical landscape of industrialization (related to the existence of Connecticut's large rivers generating hydropower and economic opportunities) explains much of the disparity in the perceived threat to disposal of dredging into the Sound (Figures 2 and 3) that was identified in the survey. As one respondent of the survey noted, "[w]e don't always agree about what's significant and what are significant impacts on benthic habitat."

Connecticut and New York have traditionally had divergent viewpoints on the use of Long Island Sound for dredged material disposal. Connecticut sees disposal in the Sound as a viable and economically necessary activity while New York does not see this as an acceptable management approach under any circumstances. The four ocean dredged material disposal sites that currently exist in Long Island Sound are located in Connecticut territorial waters: Western Long Island Sound, Central Long Island Sound, Cornfield Shoals, and New London (See Figure 4). The EPA and USACE share management and monitoring responsibilities for the disposal sites. The EPA designated the Western and Central Long Island Sound ocean disposal sites under MPRSA for long-term use in 2005.⁶⁷ The USACE has selected the Cornfield Shoals and New London ocean disposal sites under Section 103 of the MPRSA for short-term use.

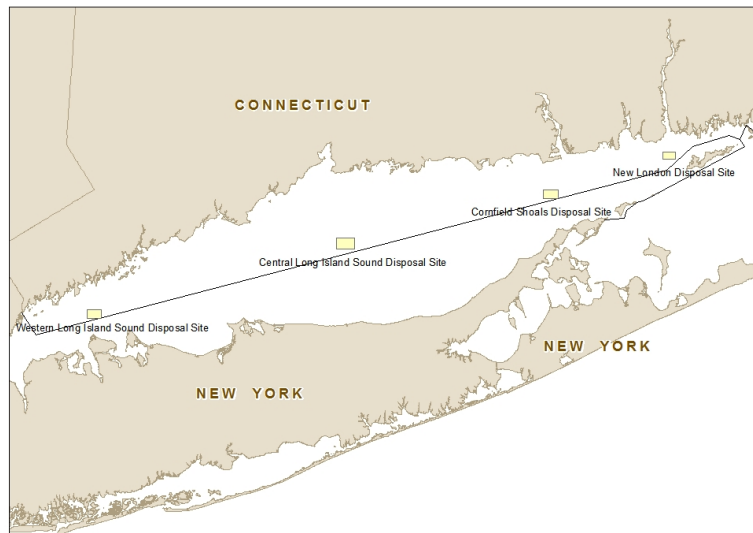


Figure 4. Long Island Sound Dredge Disposal Sites. Map by Nathaniel Trumbull.

⁶⁷ THE LOUIS BERGER GROUP, INC. ET AL, SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT FOR THE DESIGNATION OF DREDGED MATERIAL DISPOSAL SITE(S) IN EASTERN LONG ISLAND SOUND, CONNECTICUT AND NEW YORK DRAFT (Louis Berger & Univ. of Conn., Apr. 2016), available at https://www.epa.gov/sites/production/files/2016-04/documents/supplemental_environmental_impact_statement_for_the_designation_of_dredged_material_disposal_sites_in_eastern_long_island_sound.pdf.

Such differences in viewpoints on dredging became particularly manifest during the public hearings for the Eastern Long Island Sound Supplemental Environmental Impact Statement held in the spring and early summer of 2016. The EPA released a proposed rule for the designation of the Eastern Long Island Sound Dredged Material Disposal Site on April 27, 2016 and published a final rule designating the site on December 6, 2016.⁶⁸ Based on the EPA's analysis of how dredge material from Eastern Long Island Sound should be handled for the next 30 years, the EPA concluded that part of the current New London Disposal Site, slated to close in December, should remain open.⁶⁹ Connecticut leaders at the highest level supported the extension of the license for the New London Disposal Site (See Figure 5).⁷⁰ This asymmetry in economic interests on each state's side continues to contribute to and shape approaches to current management of Long Island Sound.⁷¹



Figure 5. Connecticut Governor Dannel P. Malloy, at podium, answers questions during a press conference at City Pier in New London on Aug. 17, 2016 in support of the EPA's proposed Eastern Long Island Sound Dredged Material Disposal Site. (Photo by N. Trumbull)

⁶⁸ See 40 C.F.R. § 228.15 (2017).

⁶⁹ Judy Benson, *Plan for New London Dredge Disposal Site Debated at Public Hearing*, THE DAY, May 26, 2016, <http://www.theday.com/article/20160526/NWS01/160529362>.

⁷⁰ Judy Benson, *Malloy Leads Support for Eastern Long Island Sound Dredge Disposal Site*, THE DAY, Aug. 17, 2016, <http://www.theday.com/article/20160817/NWS01/160819379>.

⁷¹ *Long Island Sound: Three Critical Problems*, THE NATURE CONSERVANCY, <https://www.nature.org/ourinitiatives/regions/northamerica/unitedstates/connecticut/explore/long-island-sound-challenges.xml>.

A common observation among interview respondents was that many of the Long Island Sound activities and uses of concern are located near-shore, and therefore, not the source of any perceived competition between the two states. That is, some activities, such as shellfishing, take place in the near-shore area of each side of the Sound, so one state's management of shellfishing activities does not impact the other side directly (though one might argue that the condition of water quality in the Sound impacts shellfishing overall on both sides). Similarly, such activities as navigation and marine transportation are under the jurisdiction of the U.S. Coast Guard and governed under a common set of federal navigational rules and regulations on both sides of the Sound. Therefore, interstate conflicts related to marine transportation seems unlikely. On the other hand, activities such as recreational fishing are regulated individually by each state. Complications arise when recreational fishermen pass into the other state and encounter new rules and regulations.

B. Opportunities for Marine Spatial Planning in Long Island Sound

Interview respondents were, in general, very positive about the development of MSP for Long Island Sound. As one respondent summarized, "I think it [MSP] can be an effective way to investigate and assess alternatives approaches to management decisions by visually showing impacts or by using best available data to help remove biases or assumptions of future states or conditions." Respondents emphasized the value of the MSP process, the inclusion of diverse stakeholders, and improved communication and trust, as a benefit of MSP. One respondent argued that the process of MSP could play a direct role in helping to overcome such a wide range of complexities of management of Long Island Sound. Long Island Sound hosts diverse uses including recreation, aquaculture, commercial and recreational fishing and boating, marine trades and transportation, and habitats for fish, shellfish, birds, marine mammals, and plants. Comprehensive, coordinated, and proactive planning through MSP will address complexities of managing these existing offshore and coastal resources while also considering new activities in Long Island Sound. "Marine Spatial Planning is a process that will improve information for stakeholder engagement and agency decision making," stated another respondent.

In terms of the challenges of implementing MSP in Long Island Sound, a number of possible obstacles were cited by the respondents. A common shortcoming mentioned was financial resources, that is, neither Connecticut nor New York have dedicated financial resources towards MSP efforts for Long

Island Sound.⁷² The Connecticut Blue Plan does not include a state budget allocation for its activities. Another challenge to implementing MSP, cited by several respondents, is the absence of a burning issue or cause around which both sides might oppose or support together. Several respondents mentioned the eventually unsuccessful Broadwater LNG loading platform proposed for Long Island Sound on the New York side as a previous issue that had drawn public attention to MSP on the Sound, as Connecticut and New York did not initially have consistent views on this proposed project.

In addition, a number of respondents commented that it has been difficult to meet together with colleagues on the opposite of the Sound.⁷³ Another respondent expressed a high degree of skepticism that MSP, even under the best of circumstances, would change any economic activities or the siting of new projects on the Sound.

C. Challenges to Developing Marine Spatial Planning in Long Island Sound

A number of respondents focused on the institutional differences between the approaches to Long Island Sound governance taken by Connecticut and New York. New York adopted the Long Island South Shore Estuary Reserve Comprehensive Management Plan in 2001, which focused on coastal communities, water-dependent businesses, and residents.⁷⁴ The Plan sought to provide a blueprint for the long-term health of the Reserve's bays and tributaries, tidal wetlands and wildlife, and tourism and economy. Respondents described the roles of the two overseeing agencies in New York, the NY DOS and NY DEC, as representing a much different institutional setting than that of the CT DEEP. "Their overall coastal policies are very similar to ours. But their institutional arrangements are very different," commented one respondent in regard to New York.

⁷² CONSENSUS BUILDING INSTITUTE, FINDINGS FROM EARLY INTERVIEWS WITH STAKEHOLDERS RELATED TO MARINE SPATIAL PLANNING IN LONG ISLAND SOUND (2016), *available at* http://www.ct.gov/deep/lib/deep/long_island_sound/lis_blue_plan/Early_Stakeholder_Interview_Findings_Feb_2016.pdf.

⁷³ The current long-advance-window for travel out of state for New York State public officials has been a regular impediment, according to several respondents in our interviews, to improved cooperation between the two states' agency representatives.

⁷⁴ SOUTH SHORE ESTUARY RESERVE COUNCIL ET AL., LONG ISLAND SOUTH SHORE ESTUARY RESERVE: COMPREHENSIVE MANAGEMENT PLAN (2017), *available at* <https://www.dos.ny.gov/opd/programs/pdfs/SSERCMP.pdf>

Respondents also expressed concern that the status of the Blue Plan in Connecticut could potentially upset institutional compatibility in the management of Long Island Sound. As one respondent explained, “[t]he greatest threat is that the Connecticut Legislature has decided to move forward, while New York State has not. There’s an attempt through this to entrain New York in the Connecticut plan and to involve New York in the Connecticut plan.” The Connecticut Blue Plan has made all the starker the absence of such a plan on the New York side. “It’s now an official government activity in Connecticut. And the bi-state working group is not in control of it. And New York is not doing anything,” commented another respondent. While Connecticut and New York are still far from such an agreement over developing bi-state governance of Long Island Sound, the fact that the Blue Plan Advisory Committee meetings now include two New York official representatives (one from NY DOS and one from NY DEC) is promising for future institutional cooperation between the two states.⁷⁵

From the technical perspective of sharing Long Island Sound data, the New York State Geographic Information Systems (GIS) website is recognized as more robust and extensive than any such database in Connecticut. As a result, the Blue Plan will be relying on the framework of the New York State GIS database for the development of the Blue Plan. Looking toward a potential future agreement between Connecticut and New York, the Interim Framework Report Team, a sub-committee of the WG, argue that:

Once an approach in each state is established, an appropriate bi-state agreement could potentially structure how the states will cooperate and communicate to effectively implement the respective plans. The goal is to ensure as much uniformity and consistency in implementation as is reasonably possible with the result that Long Island Sound can be collectively managed as a whole.⁷⁶

⁷⁵ At the September 2016 meeting, the two New York representatives played an active and positive role. On several topics, the New York representatives were able to make constructive suggestions based on their own experience in New York State.

⁷⁶ INTERIM FRAMEWORK REPORT TEAM, *OPTIONS FOR DEVELOPING MARINE SPATIAL PLANNING IN LONG ISLAND SOUND: SOUND MARINE PLANNING INTERIM FRAMEWORK REPORT (2016)*, *available at* http://www.ct.gov/deep/lib/deep/long_island_sound/lis_blue_plan/options_for_developing_marine_spatial_planning_in_long_island_sound-sound_marine_planning_interim_framework_report.pdf.

The number and variety of economic activities on Long Island Sound where cooperation between Connecticut and New York appears likely to occur in the future could be large.

VII. CONCLUSIONS

Overwhelmingly, our results demonstrate that the management approaches of the two states are compatible with respect to most realms of economic activities on Long Island Sound. Only two out of sixteen management approaches were perceived to be incompatible. This finding indicates that the possibility for developing collaborative or joint bi-state management is high with respect to the vast majority of uses of Long Island Sound. While the survey questions placed an emphasis on a comparison of perspectives, results support the hypothesis that an asymmetry in economic interests, and specifically as they concern dredging and sand and gravel mining, must be taken into account when cooperation over shared management of Long Island Sound is sought. Respondents repeatedly identified those differences in economic interests in New York and Connecticut as the greatest obstacle for implementing MSP in Long Island Sound.

As we noted above, those asymmetric interests stem from different perceptions of the distribution of economic benefits and costs. Dredge disposal appears to be the most contentious and asymmetrical problem in Long Island Sound, as the two states perceive the problem differently. New York respondents were concerned about not having enough input into the dredge disposal siting process, while Connecticut respondents tended to perceive that New York has too much influence in the siting process.

Existing institutional differences between Connecticut and New York may be an additional potential impediment to greater cooperation concerning Long Island Sound. The Interim Framework Report Team of the WG have also emphasized this institutional setting, noting that “[g]iven that Connecticut and New York may have different levels and types of legal authority to develop and/or adopt a MSP at any given time, . . . legislative or administrative changes that provide sufficient authority may need to be considered.”⁷⁷ Such institutional changes are likely to be slow in coming. Other possible threats to cooperation between the states concern issues of sovereignty. A more likely scenario for developing cooperation between the two states would focus on specific topics and tasks of mutual interest and cooperation. Our results indicate that there is indeed

⁷⁷ *Id.*

much room for cooperation to develop based on the broad range of spheres of activity identified as compatible by respondents.

The work of preparing the Blue Plan has brought people together on a regular basis to build a collaborative process in which both Connecticut and New York participate. In this way, the process of preparing the Blue Plan represents a first step in addressing prisoner's dilemma mis-incentives. The regularly scheduled meetings of the Blue Plan Advisory Committee, including the previous efforts of the WG, may have created lasting relationships, trust, and improved communications that will facilitate future cooperation and collaboration. Another sign of potentially promising future cooperation comes from New York's commitment to assist with the development of the Long Island Sound data portal and Connecticut's commitment to use the New York's data portal in developing its Blue Plan.

MSP in Long Island Sound is an attempt to draw together independent sectoral governance regimes into a cohesive form, avoiding institutional fragmentation and overlapping and competing jurisdictional claims. MSP is a way of mitigating problems of fit and interplay. MSP is an on-going process that provides an alternative way of avoiding Hardin's tragedy and sets a course towards a more sustainable future.

The findings of this study suggest three broad recommendations concerning communicating, information sharing, and including a wide breadth of stakeholders.

First, the challenge of fostering communication between Connecticut and New York stakeholders is real and tangible, despite the relatively close distance across Long Island Sound. Any efforts to develop MSP in the Sound must focus consciously on creating avenues for two-way communication and engagement among all stakeholders.

Second, the bi-state sharing of spatially referenced ecological, biophysical, social, economic, and other information is essential and is already in the process of taking place. The fact that the Connecticut Blue Plan will use New York's data portal as the framework for Connecticut's spatial planning is a promising step. This approach will help ensure a common source of information to be used in planning and decision-making. Shared use of such data can serve as a powerful analytical tool that can help develop potential scenarios of joint management and shared uses of Long Island Sound and avoid future conflicts.

Third, and more challenging, stakeholders must learn more not only about the other side's spatially relevant biophysical and social information, but also about the other side's priorities and perspectives from an institutional and political perspective. The effort to include New York representatives within the Connecticut Blue Plan is an excellent first step. Further interactions, whether they include scientists, journalists, or other stakeholders and the public, are essential. Again, the short physical distance across Long Island Sound can be deceptive. Each state's perspectives will likely remain wide apart on issues such as dredging, sand and gravel mining, and the disposal of dredged materials. Wide and broad inclusion of different stakeholders and the public will help inject a diversity of views. This study has shown that the two states' management approaches to the majority of human uses of Long Island Sound are perceived to be compatible.

An overall consensus exists that Long Island Sound will not be sustainably and collaboratively managed if a single state or side pursues its goals unilaterally. Nurturing cooperation to overcome institutional differences and achieve bi-state governance of Long Island Sound is critical. As one respondent of our survey explained:

We need maybe not a sea change, but a sound change in the views of the respective states, of their planning and natural resource agencies, and in terms of what lies outside their prerogatives.... There has to be a recognition that you can't get it done by yourself, and the walls have to come tumbling down to get that done.

**FINANCING RESILIENCE IN CONNECTICUT:
CURRENT PROGRAMS, NATIONAL MODELS, AND NEW OPPORTUNITIES**

Rebecca A. French, Wayne W. Cobleigh, Jessica H. LeClair & Yi Shi¹

I. INTRODUCTION

Over the last few years, the State of Connecticut has made significant commitments to becoming more resilient to the impacts of climate change and extreme weather, particularly in communities on coastal and inland waterways. In the wake of storms Alfred, Irene, and Sandy, Governor Dannel Malloy formed the Two Storm Panel² and the Long-term Recovery Committee.³ The state legislature,

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² TWO STORM PANEL, THE OFFICE OF GOVERNOR DANIEL MALLOY, *REPORT OF THE TWO STORM PANEL* (January 9, 2012), available at http://portal.ct.gov/-/media/Office-of-the-Governor/Two-Storm-Panel/two_storm_panel_final_report.pdf?la=en.

³ STATE OF CONNECTICUT LONG TERM RECOVERY COMMITTEE, <http://www.ct.gov/ctrecover/cwp/view.asp?a=4498&q=528634> (last visited Feb 1, 2016).

led by Representative James Albis, formed the *Shoreline Preservation Task Force*.⁴ With the passage of Public Act 13-179, An Act Concerning the Permitting of Certain Coastal Structures by the Department of Energy and Environmental Protection,⁵ Connecticut codified the requirement that the state plan of conservation and development, municipal plans of conservation and development, the civil preparedness plan and program, and municipal evacuation or hazard mitigation plans must “consider” the risk of increasing erosion due to the sea level change scenarios from the NOAA OAR CPO-1 report.⁶ In October 2015, Executive Order 50⁷ created the State Agencies Fostering Resilience Council (“SAFR Council”) charged with the creation of a statewide resilience roadmap. In January 2016, the Connecticut Department of Housing released \$7 million in funding from Sandy recovery dollars for mitigation and resiliency plans to ten municipalities, the Lower Connecticut River Valley Councils of Government, four state agencies, a nonprofit, and the University of Connecticut.⁸ As these planning efforts raise awareness of the challenges facing communities and start the design of solutions – ranging from home and road elevation to hardening critical infrastructure to living shorelines for mitigating coastal erosion (Figure 1) – the next question on many leaders minds might be: how do we pay for it?

⁴ KEVIN E. MCCARTHY, REPORT OF THE SHORELINE PRESERVATION TASK FORCE, Conn. Gen. Assemb. 2012-R-0513 (Jan. 11, 2013), *available at* <https://www.cga.ct.gov/2012/rpt/2012-R-0513.htm>.

⁵ An Act Concerning the Permitting of Certain Coastal Structures by the Department of Energy and Environmental Protection, PA 13-179—sSB 1012 §§ 3-6 (2013).

⁶ The NOAA OAR CPO-1 Report concluded that “we have very high confidence (>9 in 10 chance) that global mean sea level will rise at least 0.2 meters (8 inches) and no more than 2.0 meters (6.6 feet) by 2100.” *See* NOAA CLIMATE PROGRAM OFFICE, GLOBAL SEA LEVEL RISE SCENARIOS FOR THE UNITED STATES NATIONAL CLIMATE ASSESSMENT, NOAA TECHNICAL REPORT OAR CPO-1 (Dec. 6, 2012), *available at* http://scenarios.globalchange.gov/sites/default/files/NOAA_SLR_r3_0.pdf.

⁷ Press Release, Exec. Order No. 50, State of Conn., The Office of Governor Dannel Malloy (Oct. 26, 2015) *available at* <http://portal.ct.gov/-/media/94273BD61AD24C63B5B07A86638CB68E.pdf> (establishing the State Agencies Fostering Resilience Council “SAFR Council” which is responsible for strengthening the state’s resiliency from extreme weather events).

⁸ Connecticut Department of Housing, *Commissioner Klein Announces Federal Funding to Assist Disaster Recovery Efforts for Residents* (January 15, 2016), *available at* www.ct.gov/doh/lib/doh/sandy_planning_grants2.pdf.

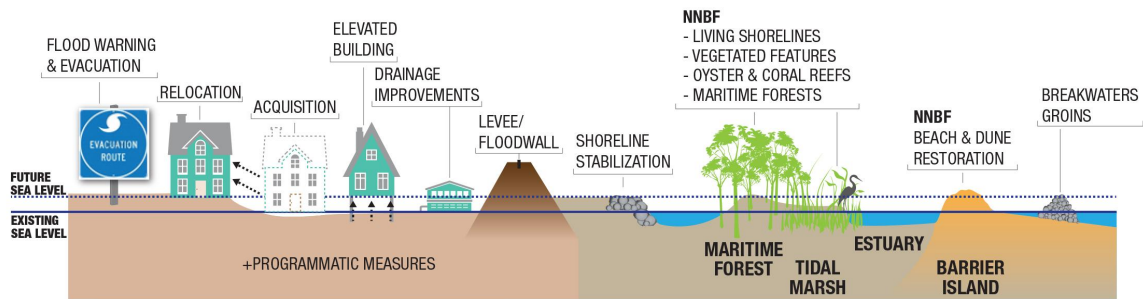


Figure 1. Coastal communities sea level rise and flooding adaptation measures needing federal, state or local funding or long-term financing. NNBF stands for Natural and Nature-based features.⁹

Today in Connecticut, virtually all disaster recovery and climate change adaptation projects are funded through grants from the federal government in response to natural disaster declarations under the Stafford Act.¹⁰ The largest amount of funding comes from disaster recovery programs like the U.S. Department of Housing and Urban Development (HUD) Community Development Block Grant Disaster Recovery (CDBG-DR)¹¹ or Federal Emergency Management Agency (FEMA) Emergency Assistance.¹² For example, after Sandy, the State of Connecticut received a little over \$159 million in CDBG-DR funding, but that payout left at least \$158 million in documented unmet repair needs for housing and infrastructure damage alone.¹³

Projects that incorporate resiliency improvements rather than simply repair damage make that cost even higher. In the Rebuild by Design competition, the City of Bridgeport asked for over \$290 million to develop citywide resiliency projects.¹⁴ In the National Disaster Resilience Competition, the State of Connecticut requested nearly \$115 million for two neighborhood-scale pilot

⁹ U.S. Army Corps of Eng'rs, *North Atlantic Coast Comprehensive Study: Natural and Nature-based Features Brochure* (2015), available at http://www.nad.usace.army.mil/Portals/40/docs/NACCS/1_15_16_NNBF_Brochure-viewing-format.pdf.

¹⁰ Robert T. Stafford Disaster Relief and Emergency Assistance Act, 42 U.S.C. §§ 5121-5207 [hereinafter *Stafford Act*].

¹¹ Housing and Community Development Act of 1974, 42 U.S.C. §§ 5301-5321.

¹² 42 U.S.C. §§ 5121-5207.

¹³ Conn. Inst. For Resilience and Climate Adaptation, et al., *SAFR Connecticut Connections: NDRC Phase 1 Application* (June 22, 2015), available at <http://web9.uits.uconn.edu/circa/ndrc/pubs/FinalSAFRConnecticutConnectionsJune22.pdf>.

¹⁴ *Id.*

projects and a regional resilience plan for New Haven and Fairfield counties¹⁵ and was awarded \$54.3 million to implement one of the pilots and the resilience plan.¹⁶ Even with this recent grant, lingering recovery needs from Sandy remain, and the question increasingly becomes where do communities turn to fund the long-term resilience projects that ongoing resilience planning efforts encompass? If a community was fortunate not to be hit by the storm and therefore has not received disaster recovery funds, but remains vulnerable to future storms, what are their options for funding the planning, designing, or construction of adaptation measures that improve resiliency to extreme weather, flooding, or future climate change? Financing programs are critical to answering that question.

In August 2013, the Connecticut Department of Energy and Environmental Protection (DEEP) invited a diverse group of stakeholders from Connecticut and the northeast region to discuss flood insurance affordability and the need to develop innovative financing methods to improve community resiliency in areas vulnerable to the impacts of climate change, sea level rise, and flooding.¹⁷ The stakeholders included the authors of this article, academic, government, and private sector leaders from around the region. The stakeholders were involved in risk management research, coastal and riverine floodplain regulation, insurance, engineering, renewable energy and energy efficiency finance, and disaster recovery. That same year, new FEMA flood insurance rate maps that included additional homeowners and small businesses in the floodplains and notices of significant increases in their flood insurance premiums for those currently covered, garnered the attention of policy makers and the media.¹⁸ The debate that ensued soon made it clear that Congress' attempts to address the financial instability of the National Flood Insurance Program (NFIP) in the

¹⁵ Conn. Inst. For Resilience and Climate Adaptation, et al., *National Disaster Resilience Phase 2 Application* (2015), available at http://www.ct.gov/doh/ndrc_application/pdf.

¹⁶ Connecticut was one of 13 winners – out of 40 finalists that included states, municipalities, and county governments – in the nationwide National Disaster Resilience Competition run by the Dept. of Housing and Urban Development to distribute the last \$1 billion in recovery funds from P.L. 113-2. See Dep't. of Hous. & Urban Dev., *National Disaster Resilience Competition Grantee Profiles* (Jan., 2016), available at <https://portal.hud.gov/hudportal/documents/huddoc?id=NDRCGrantProf.pdf>.

¹⁷ Personal communication with Macky McCleary, Deputy Comm'r, Env'tl. Quality, Conn. Dep't. of Energy & Env'tl. Prot. (Aug., 2013).

¹⁸ Jenny Anderson, *Outrage as Homeowners Prepare for Substantially Higher Flood Insurance Rates*, N.Y. TIMES, July 29, 2013 at A12, available at <http://www.nytimes.com/2013/07/29/nyregion/overhaul-and-a-hurricane-have-flood-insurance-rates-set-for-huge-increases.html?mcubz=0>.

Biggert-Waters Flood Insurance Reform Act of 2012¹⁹ (2012 NFIP Reforms) had become too politically controversial to implement.²⁰

The 2012 NFIP Reforms²¹ sought to have insurance premiums reflect actuarial risk with a 25% increase in premium rates per year until that assessed rate is achieved.²² But in 2014 Congress passed the Homeowners Flood Insurance Affordability Act²³ (HFIAA) that repealed or modified some of the more bitter pills, including repealing the implementation of actuarial rates at sale, restoring grandfathering of previous lower insurance rates if a home was assessed as being at a higher risk, and lowering rate increases to 5-15% per year for individual primary homeowners, rather than the 25% increase.²⁴ However, the 25% annual increase was maintained for commercial buildings and secondary homes.²⁵ The HFIAA also called for an affordability study led by FEMA with support from the National Academy of Science (NAS).²⁶ The release of two NAS reports in 2015²⁷ and 2016²⁸ fulfilled that mandate. The second report concluded that “policy analysis capacity and necessary data, however, currently are not available to complete a comprehensive analysis of affordability options,”²⁹ which represents challenges for the upcoming reauthorization of the NFIP in 2017.

¹⁹ Biggert-Waters Flood Insurance Reform Act of 2012, 126 Stat. 916 (codified as amended at 42 U.S.C. §§ 4001-4131 (2012)) [hereinafter *Biggert-Waters*].

²⁰ Annie Linskey, *Good News: The Government Will No Longer Make You Put Your House on Stilts*, BLOOMBERG BUSINESSWEEK, Mar. 14, 2014.

²¹ *Biggert-Waters*, *supra* note 19.

²² Diane Ifkovic, *National Flood Insurance Program Changes – BW12 & HFIAA* (Oct. 10, 2014) available at http://clear.uconn.edu/climate/docs/Ifkovic_DEEP.pdf (presenting to Conn. Climate Adaptation Academy for Conn. Dep’t. of Energy & Envtl. Prot.) [hereinafter *Ifkovic NFIP Changes*].

²³ Homeowner Flood Insurance Affordability Act of 2014, Pub. L. No. 113-89, 128 Stat. 1020 (2014) [hereinafter *HFIAA 2014*].

²⁴ *Ifkovic NFIP Changes*, *supra* note 22.

²⁵ *Ifkovic NFIP Changes*, *supra* note 22.

²⁶ *HFIAA 2014*, *supra* note 23, at § 23(a).

²⁷ NAT’L RESEARCH COUNCIL OF THE NAT’L ACADEMIES, AFFORDABILITY OF NATIONAL FLOOD INSURANCE PROGRAM PREMIUMS: REPORT 1 (National Academies Press 2015), available at <https://www.nap.edu/catalog/21709/affordability-of-national-flood-insurance-program-premiums-report-1>.

²⁸ NAT’L ACAD. OF SCIENCES, ENG’G & MED., AFFORDABILITY OF NATIONAL FLOOD INSURANCE PROGRAM PREMIUMS: REPORT 2 (National Academies Press 2016), available at <https://www.nap.edu/catalog/21848/affordability-of-national-flood-insurance-program-premiums-report-2>.

²⁹ *Id.*

With increasing flood insurance rates, albeit at a slower pace, and the big price tags of recovery, Connecticut has been looking at financing for resilience. Connecticut is already a leader in using finance to address climate change. Connecticut Green Bank's³⁰ innovative financing program for climate mitigation measures in the commercial real estate market has exceeded expectations. In 2014, Connecticut became the first state to create a low-interest loan program for home elevation, Shore Up Connecticut.³¹ Financing was also listed as one of the priority research areas when the Connecticut Institute for Resilience and Climate Adaptation (CIRCA)³² was created in 2014 as a partnership between the University of Connecticut and the Department of Energy and Environmental Protection.

This article aims to educate Connecticut municipalities, regulators, policymakers, and legislators on the need to collaborate on developing financing methods for resiliency, including innovative public-private partnership (P3) models and adapting existing public and private finance models for resiliency. These actions will proactively address flood insurance affordability and promote voluntary climate adaptation measures (Figure 1) to reduce and avoid future losses to life, property and casualty, property taxes, critical infrastructure, and business continuity. Most importantly, Connecticut needs these financing methods in place prior to the next natural disaster when motivation to rebuild resiliently is high. Developing effective financing methods for resiliency now will benefit vulnerable residents, natural ecosystems, businesses, and governments on the local, state, and federal levels. Investments in the short-term will create taxpayer savings for disaster recovery costs and lead to more affordable flood insurance over the long-term.

The authors are not providing an endorsement of any one approach to financing resilience and there may be other opportunities that could be considered that are not reviewed here. Resilience financing is an emerging area of policy research and new ideas are put forward every day. The authors hope that this article will serve as a starting point for a growing list of finance options for

³⁰CONNECTICUT GREEN BANK, <http://www.ctgreenbank.com/> (last visited August 4, 2017).

³¹ Press Release, The Office of Governor Dannel P. Malloy, Gov. Malloy Announces Launch of Program to Help Shoreline Homeowners and Businesses Prepare for Future Severe Weather and Flooding (July 28, 2014), *available at* <http://portal.ct.gov/Office-of-the-Governor/Press-Room/Press-Releases/2014/07-2014/Gov-Malloy-Announces-Launch-of-Program-to-Help-Shoreline-Homeowners-and-Businesses-Prepare-for-Future-Severe-Weather-and-Flooding> [hereinafter *Shore Up Connecticut Launch*].

³² UNIV. OF CONN., CONNECTICUT INSTITUTE FOR RESILIENCE AND CLIMATE ADAPTATION, <http://www.circa.uconn.edu> (last visited Mar. 3, 2017).

Connecticut and that the local talent in insurance, finance, science, and engineering can be leveraged to create a national and global model for innovative and sustainable resilience financing.

II. RESILIENCE FINANCING PROGRAMS IN CONNECTICUT

Connecticut has several existing low interest, affordable, state-run resilience financing programs, including Shore Up Connecticut, the microgrid grants and loan program, and the Connecticut Clean Water Fund. Also reviewed is tax increment financing districts, a new opportunity for local government to capture the value of resilience projects and use that value to pay back an investment.

A. *Shore Up Connecticut Low-Interest Loans*

Shore Up Connecticut was announced³³ in July 2014 as a low-interest loan program for small businesses and homeowners located in the FEMA Flood Zones VE and AE in Connecticut's coastal municipalities.³⁴ The legislature authorized \$25 million in bonding for the program, which was the first program in the nation that used non-federal resources to finance home elevations.³⁵ The program was created in part to fill a funding gap for residents who were not eligible or prioritized for disaster recovery services from federal resources. The terms of the loan are a 2.75% fixed interest rate with a 1% origination fee. The loan can provide between \$10,000 and \$300,000 in funds with a 15-year term.³⁶ There are no principal or interest payments for the first 12 months and the borrower must maintain property, hazard, and flood insurance for the life of the loan.³⁷ The program stopped accepting new applications in December 2016.

The Shore Up Connecticut program requires elevations of residential structures and utilities to meet the estimated 500-year recurrence interval storm event elevation plus one additional foot of freeboard in order to reduce the likelihood of future losses while the loan is being paid back.³⁸ Commercial

³³ *Shore Up Connecticut Launch*, *supra* note 31.

³⁴ FEMA Flood Zone Definitions, *available at* https://www.fema.gov/sites/default/files/images/flood_zones_limwa.jpg (last visited Jan. 16, 2017) [hereinafter *FEMA Flood Zones*].

³⁵ *Shore Up Connecticut Launch*, *supra* note 31.

³⁶ *Shore Up Connecticut Launch*, *supra* note 31.

³⁷ *Shore Up Connecticut Launch*, *supra* note 31.

³⁸ Hous. Dev. Fund: Shore Up Conn., *Project Information Form, Shore Up Connecticut: Connecticut's Shoreline Resiliency Loan Fund*, CONN. DEP'T OF HOUSING, 1-24 (2014),

property must be elevated to the 100-year floodplain reoccurrence interval storm event Base Flood Elevation (BFE) level elevation plus one foot of freeboard.³⁹ Additional and partial flood and wind protection measures, such as utility elevation alone and installing storm shutters, can also be financed, provided that they are part of an elevation project or evidence is provided that structural elevation is not feasible.⁴⁰

B. *Microgrids Grants and Green Bank Financing Program*

In its inaugural round in July 2013, the microgrids grants program provided \$18 million in grants to nine projects across Connecticut.⁴¹ This was the first statewide microgrids program in the United States⁴² and was a direct response to widespread power outages in the state after storms Alfred and Irene,⁴³ and Sandy.⁴⁴ Microgrids have a local power source that can operate as part of the larger grid, but during power outages they can be disconnected from the grid and operate in “island” mode, providing power to critical infrastructure and emergency facilities.⁴⁵ Microgrids can be powered by renewable energy resources like solar panels, wind, and hydropower, as well as fuel cells, batteries, or fossil fuels.⁴⁶ For example, one of the nine inaugural projects in the Town of Fairfield received funding for a 50 kW natural gas reciprocating engine, a 250 kW natural gas reciprocating engine, and 47 kW of PV solar to power the police station, emergency operations center, cell tower, fire headquarters, and a public shelter.⁴⁷ A project like the one in Fairfield offers the potential to increase resiliency during storms by providing emergency backup, but also while reducing emissions on a daily basis. In October 2014, Governor Malloy announced \$5.1 million in funding

<http://shoreupct.org/wp-content/uploads/2014/08/HDF-Form-with-attachments.pdf>.

³⁹ *Id.*

⁴⁰ *Id.*

⁴¹ Connecticut Department of Energy and Environmental Protection, *Microgrid Program*, (last updated August 2016), *available at* <http://www.ct.gov/deep/cwp/view.asp?a=4120&Q=508780> [hereinafter *Microgrid Program*].

⁴² Press Release, The Office of Governor Dannel P. Malloy, Governor Malloy Announces Nation’s First Statewide Microgrid Pilot (July 24, 2013) *available at* <http://www.ct.gov/deep/cwp/view.asp?Q=528784&A=4380> [hereinafter *Microgrid Announcement*].

⁴³ JOE MCGEE ET AL., REPORT OF THE TWO STORM PANEL PRESENTED TO: GOVERNOR DANNELL P. MALLOY (Jan. 9, 2012), *available at* http://portal.ct.gov/-/media/Office-of-the-Governor/Two-Storm-Panel/two_storm_panel_final_report.pdf?la=en.

⁴⁴ *Microgrid Announcement*, *supra* note 43.

⁴⁵ *Microgrid Program*, *supra* note 42.

⁴⁶ *Microgrid Program*, *supra* note 42.

⁴⁷ *See Microgrid Announcement*, *supra* note 43.

for two additional projects,⁴⁸ bringing Connecticut's total microgrids projects to eleven. In November 2016, the state bond commission approved \$30 million in state bonds for additional new projects to be awarded.⁴⁹

A partnership with the Connecticut Green Bank allows for financing components of the microgrid projects, including onsite power generation, thermal energy distribution infrastructure, and end use facility improvements.⁵⁰ Microgrid applicants and grantees can use the Green Bank's financial programs, which use private capital, to further finance their microgrid projects. These programs include the Commercial Property-Assessed Clean Energy (C-PACE) program and potential future applications of the DEEP's Lead by Example program for performance contracting in state buildings.⁵¹ Energy Savings Performance Contracts can also play a role.⁵² Further grants, loans, and loan enhancements or power purchase incentives are available for onsite power generation from anaerobic digestion of wastes from wastewater treatment facilities and combined heat and power projects.⁵³

C. Clean Water Revolving Loan Funds

The Clean Water State Revolving Funds were set up in 1987 in Connecticut.⁵⁴ The DEEP administers the Connecticut Clean Water Fund, but the U.S. Environmental Protection Agency has oversight and regulatory authority

⁴⁸ Press Release, The Office of Governor Dannel P. Malloy, Gov. Malloy: Microgrid Projects in Bridgeport and Milford Awarded \$5 Million in State Funding to Harden Energy System (Oct. 8, 2014) *available at* <http://portal.ct.gov/office-of-the-governor/press-room/press-releases/2014/10-2014/gov-malloy-microgrid-projects-in-bridgeport-and-milford-awarded-5-million-in-state-funding-to-harden>.

⁴⁹ Press Release, The Office of Governor Dannel P. Malloy, Gov. Malloy Advances Commitment to Storm Resiliency with Funding for New Microgrids (Nov. 14, 2016) *available at* <http://portal.ct.gov/en/Office-of-the-Governor/Press-Room/Press-Releases/2016/11-2016/Gov-Malloy-Advances-Commitment-to-Storm-Resiliency-With-Funding-for-New-Microgrids>.

⁵⁰ Conn. Dep't of Energy and Env'tl. Prot., *Microgrid Grant Program Round 2-FAQ Third Installment-Financing*, ENERGIZECT.COM (Feb. 19, 2014), <https://www.energizect.com/sites/default/files/uploads/FAQs%20-%20Round%202%20-%20Third%20Installment%20-%20Project%20Financing%20FINAL.PDF> [hereinafter *Microgrid Grant Program Round 2 FAQs*].

⁵¹ *Id.*

⁵² Chris Lotspeich, *Stamford, Connecticut: a City on the Cutting-Edge of Sustainable Development*, NESEA BLOG (Jan. 4, 2016), <http://nesea.org/conversation/masters-blog/stamford-connecticut-city-cutting-edge-sustainable-development>.

⁵³ *Microgrid Grant Program Round 2 FAQs*, *supra* note 51.

⁵⁴ 33 U.S.C. § 1383 (2016).

over the programs.⁵⁵ A Congressional appropriation and a required match from the state provide the capital funding for the programs.⁵⁶ Connecticut allocates the funding as a mix of grants and loans, and the mix is project dependent. All loans must be repaid back at a 2% interest rate over no more than 20 years.⁵⁷ The FY14-FY15 Priority List called on municipal wastewater treatment plant planning applications to consider “assessment of the risk to existing wastewater infrastructure from climate change (rising sea levels, increased storm frequency and intensity and coastal flooding) and an evaluation of alternatives for remedial actions.”⁵⁸ According to the FY14-FY15 Priority List, planning funds are allocated on a 55% grant/45% loan basis. There were also two reserve programs for Construction of Resiliency Projects of \$4 million per year allocated as 20% grant/80% loan to “mitigate the impacts of sea level rise.”⁵⁹ Additionally, \$20 million per year was allocated for a reserve for construction of green infrastructure for combined sewer overflow communities (CSO) with the opportunity to receive funding for demonstration projects as a 50% grant/50% loan.⁶⁰

In the FY 2016-2017 Clean Water Fund Priority List,⁶¹ funding for these specific programs is no longer present. However, the report mentions that the bond authorizations for “\$20 million in FY16 for a Long Island Sound stewardship and resiliency program; and \$20 million in FY16 for a grant-in-aid program to encourage low-impact design of green municipal infrastructure to reduce non-point source pollution” are now available, but they will be administered separately from the Clean Water Fund. Furthermore, the DEEP now requires all Clean Water Fund projects to have an energy audit if they have not already signed an agreement for a complete upgrade.⁶² The climate change assessment and evaluation of remedial actions also became a requirement for plants.⁶³

⁵⁵ *Connecticut's Clean Water Fund*, CT.GOV, http://www.ct.gov/deep/cwp/view.asp?a=2719&q=325578&depNav_GID=1655 (last visited Mar. 10, 2014).

⁵⁶ Conn. Dep't of Energy and Env'tl. Prot., *Clean Water Fund: Financial Assistance Programs, Municipal Water Pollution Control, State Fiscal Years 2014 and 2015*, CT.GOV (July 7, 2014), http://www.ct.gov/deep/lib/deep/water/municipal_wastewater/final_fy2014_2015cwf_pl.pdf.

⁵⁷ *Id.*

⁵⁸ *Id.*

⁵⁹ *Id.*

⁶⁰ *Id.*

⁶¹ Conn. Dep't of Energy and Env'tl. Prot., *Clean Water Fund: Financial Assistance Programs, Municipal Water Pollution Control, State Fiscal Years 2016 and 2017*, CT.GOV (Mar. 10, 2016), http://www.ct.gov/deep/lib/deep/water/municipal_wastewater/cwf_final_priority_list_2016_2017.pdf.

⁶² *Id.*

⁶³ *Id.*

D. Tax Increment Financing Districts

Tax increment financing (TIF) uses the future value to private owners or developers from local government improvements to a specific geographic area to finance the government's investment in that area.⁶⁴ The local government captures that value through leveeing district-level taxes or fees on the private owners or developers in the TIF district. Although not yet widely used for this purpose, the principle of TIF districts could also be applied to public investments to reduce disaster risk to private landowners.⁶⁵ If an adaptation or resilience measure can increase the property value, then TIF could be used to finance the resilience project.

In 2015, the Connecticut General Assembly passed Public Act 15-57, An Act Establishing Tax Increment Financing Districts.⁶⁶ The relatively new statute⁶⁷ allows municipalities to establish tax increment districts to finance economic development projects through using real property tax revenue to repay the costs of the project, assessing the benefits to the property from the public improvements or issuing bonds backed by these revenue sources.⁶⁸ The Act requires that the district include property that is blighted, needing rehabilitation or conservation, or is suitable for downtown or transit-oriented development.⁶⁹

Although the tax increments district statute makes no specific mention of resiliency to climate change or the impacts of extreme weather, transit-oriented development⁷⁰ can be an element of a municipality's community resilience strategy.

⁶⁴ RICHARD BRUGMAN, ICLEI GLOBAL REPORTS, FINANCING THE RESILIENT CITY: A DEMAND DRIVEN APPROACH TO DEVELOPMENT, DISASTER RISK REDUCTION, AND CLIMATE ADAPTATION - AN ICLEI WHITE PAPER (2011), *available at* http://resilient-cities.iclei.org/fileadmin/sites/resilient-cities/files/Frontend_user/Report-Financing_Resilient_City-Final.pdf.

⁶⁵ *Id.*

⁶⁶ An Act Establishing Tax Increment Financing Districts, PA 15-57—sSB 677 (2015), *available at* <https://www.cga.ct.gov/2015/sum/2015SUM00057-R01SB-00677-SUM.htm> (citing summary provided by Planning and Development Committee and Finance, Revenue and Bonding Committee).

⁶⁷ CONN. GEN. STAT. §§ 7-339cc to kk.

⁶⁸ An Act Establishing Tax Increment Financing Districts, *supra* note 67.

⁶⁹ An Act Establishing Tax Increment Financing Districts, *supra* note 67.

⁷⁰ CONN. GEN. STAT. § 7-339cc (2015) (defining transit-oriented development as “the development of residential, commercial and employment centers within one-half mile of walking distance of a transit facility, including rail and bus rapid transit and services that meet transit supportive standards for land uses, built environment densities and walkable environments, in order to facilitate and encourage the use of those services. Transit-oriented development includes, but is not limited to, transit vehicles such as buses, ferries, vans, rail conveyances and related equipment; bus shelters and other transit-related structures; benches, signs and other transit-related

For example, the State of Connecticut put forward the concept of resilient transit-oriented development for its Phase 2 grant application for the National Disaster Resilience Competition,⁷¹ which was recently awarded \$54.3 million to implement a pilot project in Bridgeport built on this concept.⁷² Additionally, the December 2015 call for proposals from the Connecticut Office of Policy and Management, entitled the Responsible Growth and Transit-Oriented Development Grant Program, included “projects that promote community resiliency in response to extreme weather events, and that are supportive of responsible growth and/or TOD” as eligible activities.⁷³

III. MODEL PROGRAMS FOR FINANCE

Although Connecticut has made great strides in developing resilience financing programs, there are other programs within the state and from neighboring New Jersey that could serve as models for additional future programs. These models include financing renewable energy and energy efficiency using a property assessment, leveraging recovery grant dollars to create a resilience bank, and tweaking catastrophe insurance bonds to create resilience bonds.

A. *Connecticut Green Bank C-PACE Program*

Connecticut’s Commercial-Property Assessed Clean Energy (C-PACE) program was the first such statewide program of its kind and is now one of the most successful in the country. The program has been widely adopted by Connecticut municipalities. 125 out of 169 cities and towns have signed up to participate, and \$97 million worth of projects have been financed through the C-PACE program as of September 2016.⁷⁴

infrastructure; bicycle lane construction and other bicycle-related improvements; pedestrian improvements such as crosswalks, crosswalk signals and warning systems and crosswalk curb treatments and the industrial, commercial, residential, retail and mixed-use portions of transit-oriented development projects.”)

⁷¹ Press Release, U.S. Dep’t of Housing and Urban Dev., HUD Awards \$1 Billion Through National Disaster Resilience Competition, HUD No. 16-006 (Jan. 21, 2016) *available at* https://portal.hud.gov/hudportal/HUD?src=/press/press_releases_media_advisories/2016/HUDNo_16-006.

⁷² See Presentation, Rebecca French et al., 2015 American Geophysical Union Fall Meeting, Safe Shores and Resilient Transit Corridors: Using Science, Design, and Stakeholder Partnerships to Address Connecticut’s Coastal Vulnerabilities (Dec. 14-18, 2015), <https://agu.confex.com/agu/fm15/webprogram/Paper85050.html>.

⁷³ *Request for Application: Responsible Growth and Transit-Oriented Development Grant Program*, STATE OF CONNECTICUT OFFICE OF POLICY AND MANAGEMENT, <http://www.ct.gov/opm/lib/opm/secretary/rfp/opm-igp-20151209-rg-tod.pdf> (Dec. 9, 2015).

⁷⁴ Data Request to Connecticut Green Bank (Oct. 14, 2016) (on file with author).

According to the Connecticut Green Bank, C-PACE uses a voluntary assessment on a property tax bill to finance energy efficiency and clean energy projects.⁷⁵ The assessment is used to spread the cost of the project over “the expected life of the measure” and the “repayment obligation transfers automatically to the next owner if the property is sold.”⁷⁶ The capital invested by a C-PACE loan is secured by a lien on the property, which in the event of default, provides the security for “low-interest, long-term capital to be raised from the private sector with no government financing required.”⁷⁷ C-PACE is considered useable for multiple commercial business types: retail, manufacturing, office, agricultural, non-profit, and faith institutions, as well as many multi-family residential properties.⁷⁸ Applying the PACE model to 1-4 family residential properties remains a challenge, but there are proposals in the policy pipeline as described below.

B. *Connecticut’s Proposed R-PACE Program*

The Green Bank revisited its PACE enabling statute during Connecticut’s 2016 Regular Legislative Session. Originally passed in 2011,⁷⁹ 1-4 family residential PACE (R-PACE) financing was held up for years by federal policy uncertainty over lien seniority and survivability through property transfers. The 2016 proposed House Bill 5563⁸⁰ updates the existing statute to make the Green Bank a central program administrator for operating an R-PACE program, removing the administrative burden from municipalities that were enabled to create their own programs, but none of which had launched them. The proposal subordinated the lien position to other debt on the property, specifically first mortgages and property tax obligations.⁸¹ The change made transferability of the payment obligation – the R-PACE lien – the key long-term financing concept, rather than lien seniority.⁸² House Bill 5563 was not passed and was reintroduced in 2017 as Substitute Senate Bill 973⁸³ with revisions to the lien position no longer being subordinate to first mortgages and with transferability of the payment

⁷⁵ *C-PACE Financing High Performance Building Upgrades*, CONN. GREEN BANK, <http://www.ctcleanenergy.com/YourBusinessInstitution/CommercialPropertyAssessedCleanEnergyCPACE/tabid/642/Default.aspx> (last visited Apr. 12, 2016) [hereinafter *C-PACE Financing*].

⁷⁶ *Id.*

⁷⁷ *Id.*

⁷⁸ *Id.*

⁷⁹ An Act Concerning the Establishment of the Department of Energy and Environmental Protection and Planning for Connecticut’s Energy Future, PA 11-80—SB 1234 § 100 (2011).

⁸⁰ An Act Concerning the Residential Sustainable Energy Program, H.B. No. 5563 (2016).

⁸¹ *Id.*

⁸² *Id.*

⁸³ An Act Concerning a Residential Sustainable Energy Program, SB 973 (2017).

obligation as optional at the discretion of the parties involved in purchase of the property. Senate Bill B 973, An Act Concerning a Residential Sustainable Energy Program, did not advance out of the Finance Committee to a vote by the legislature in the 2017 general session.

Lenders on mortgages backed by the government-sponsored enterprises Fannie Mae and Freddie Mac are accountable to the guidance of the Federal Housing Finance Agency (FHFA).⁸⁴ The FHFA has formally indicated - with the advent of a successful R-PACE program in California⁸⁵ - that the super seniority design of PACE-liens challenge the first-lien position of Fannie Mae and Freddie Mac mortgages.⁸⁶ FHFA General Counsel Alfred Pollard has also indicated that the presence of PACE liens altogether is a type of seniority and would therefore throw PACE-encumbered mortgages out of compliance with FHFA standards.⁸⁷ While C-PACE programs have been very successful, R-PACE programs across the country have been stifled by FHFA's prohibition on purchasing any mortgages with first-lien PACE-loans attached.⁸⁸ The Obama Administration had encouraged states to advance R-PACE policy, and the Federal Housing Authority (FHA) issued formal guidance supportive of their mortgage lenders working with PACE-encumbered properties to ensure consumers can access credit in sale or refinance scenarios.⁸⁹ The key barrier to policy implementation is with the banking industry serving loans backed by Fannie Mae or Freddie Mac, as banks tend to transact with

⁸⁴ Clean Energy Finance and Investment Authority, *Residential Property Assessed Clean Energy: A Connecticut Program Viability Assessment*, CLEAN ENERGY STATES ALLIANCE at 3 (Jan. 30, 2015), <http://cesa.org/assets/Uploads/R-PACE-CT-Viability-Assessment.pdf>.

⁸⁵ *Id.* at 25.

⁸⁶ Press Release, Federal Housing Finance Agency, Statement of the Findings of the Federal Housing Finance Agency on Certain Super-Priority Liens, (Dec. 22, 2014), *available at* <https://www.fhfa.gov/Media/PublicAffairs/Pages/Statement-of-the-Federal-Housing-Finance-Agency-on-Certain-Super-Priority-Liens.aspx> [hereinafter *FHFA Statement*].

⁸⁷ Statement from Alfred M. Pollard, General Counsel, Federal Housing Finance Agency, to California Legislature, Assembly Banking and Finance Committee and Assembly Local Government Committee, *Keeping Up with PACE: A Joint Oversight Hearing on Residential PACE Programs* (June 9, 2016), *available at* https://www.fhfa.gov/Media/PublicAffairs/PublicAffairsDocuments/PACStatementCalifAssembly_testimony_FINAL692016.pdf.

⁸⁸ Stroock & Stroock & Lavan LLP, *A Tale of Two PACEs: Commercial Success vs. Residential Repose*, STROOCK SPECIAL BULLETIN, Mar. 15, 2013, <http://www.stroock.com/siteFiles/Pub1306.pdf>.

⁸⁹ Press Release, The White House, Office of the Press Secretary, Fact Sheet: Obama Administration Announces Clean Energy Savings for All Americans Initiative (July 19, 2016), *available at* <https://obamawhitehouse.archives.gov/the-press-office/2016/07/19/fact-sheet-obama-administration-announces-clean-energy-savings-all>.

portfolios of residential mortgages and have concerns about PACE-encumbered mortgages being returned to them after a sale due to FHFA non-compliance.⁹⁰

C. A Model for Finance Based on PACE: Property Assessed Resilience Financing

In 2011, Kunreuther and Michel-Kerjan⁹¹ proposed that PACE could be used as a model for financing resilience projects through multiyear flood insurance contracts. In PACE, the retrofit project's lower energy use is tied to a tax assessment that reflects the increased value of the property. Much of that value is the resulting savings in energy costs.⁹² If a resilience project were being financed, then the tax assessment could be combined with reduced flood insurance premiums to create the value to finance resiliency projects and repay that additional special assessment charge on the property tax bill.⁹³ The Kunreuther proposal, which was advanced by the Connecticut DEEP stakeholder group in 2013, is referred to here as Property Assessed Resilience (PAR). PAR is like PACE in that the financing contracts for resilience retrofit projects would be attached to a property, not the individual person(s) owning that property.⁹⁴ Insurance rates for the property with improved resilience could be lowered in recognition of the mitigation and resilience actions, therefore any PAR loans taken out to cover the cost of the flood loss control actions would be offset by the corresponding reduction in premiums for flood insurance.⁹⁵

PAR financing attaches home improvement resiliency costs to the property tax bill through a special public benefits assessment like PACE.⁹⁶ Such obligations, when secured to the property and assigned a lien position on the assessed property subordinate to the first mortgage and property tax, create a stable security interest for the investor or lender that conforms to guidance on the use of certain super priority liens from the FHFA.⁹⁷ This PAR obligation, like a PACE obligation, is transferrable to subsequent property owners and would not need to be paid in full when a property

⁹⁰ Personal communication with Matthew Macunas, Legislative Liaison and Marketing Manager, Connecticut Green Bank (Mar. 12, 2017).

⁹¹ Howard Kunreuther & Erwann Michel-Kurjan, *People Get Ready: Disaster Preparedness*, ISSUES IN SCIENCE AND TECHNOLOGY- VOLUME 28 at 1-7 (Fall 2011), available at http://opim.wharton.upenn.edu/risk/library/J2011IST_PeopleGetReady.pdf.

⁹² *Id.* at 6.

⁹³ *Id.* at 5.

⁹⁴ *Id.* at 6.

⁹⁵ *Id.* at 5.

⁹⁶ *C-PACE Financing*, *supra* note 76.

⁹⁷ *FHFA Statement*, *supra* note 87.

is sold.⁹⁸ We propose that the public benefit is derived from: (1) reduced future disaster recovery expenses to taxpayers; (2) market value preservation or increase of a resilience home improvement project to a homeowner; (3) improved property tax stability of the more resilient residential property that benefits the municipality; (4) lower flood insurance premiums for the property owner; (5) increased likelihood of the homeowner's ability to pay their primary mortgage in the event of a natural disaster; and (6) increased Community Rating System (CRS)⁹⁹ score for any municipality's participating CRS program, potentially lowering flood insurance premiums for all others in that community.

At the time that the authors first outlined this article, PAR only existed as an idea, but that changed in the 2016 Connecticut legislative session. The 2016 House Bill 5563¹⁰⁰ included resiliency improvements as eligible measures for R-PACE financing, including: flood and hurricane resistant construction retrofits; water conservation; health and public safety measures like asbestos, mold and lead-based paint remediation; and renewable energy and energy efficiency improvements.¹⁰¹

D. *Energy Savings Performance Contracts*

Owners of properties with large energy usage can hire an Energy Services Company (ESCO) and an Owner's Representative to help assist the owner in procuring financing, and the installation, operation, and maintenance of building retrofits involving onsite energy generation, energy efficiency, and water conservation related capital improvements.¹⁰² The ESCO can access long-term financing methods such as Tax-Exempt Lease Purchase (TELP) commercial loans or bonds for these projects with limited or no upfront costs to the owner.¹⁰³ Cash flow to the ESCO from the energy savings can pay down the financing over the term of the TELP.¹⁰⁴ These programs are referred to as Energy Savings Performance Contracts (ESPCs).¹⁰⁵ ESPCs can help municipalities and institutions like hospitals and first

⁹⁸ *C-PACE Financing*, *supra* note 76.

⁹⁹ FEDERAL EMERGENCY MANAGEMENT AGENCY COMMUNITY RATING SYSTEM, <https://www.fema.gov/community-rating-system> (last visited Mar. 7, 2017).

¹⁰⁰ H.B. No. 5563, *supra* note 81.

¹⁰¹ H.B. No. 5563, *supra* note 81, at § 1a-1.

¹⁰² Lotspeich, *supra* note 53.

¹⁰³ Lotspeich, *supra* note 53.

¹⁰⁴ Lotspeich, *supra* note 53. For a chart looking at the conceptual framework for ESPCs, see Satish Kumar, *IPMVP—from a DOE-Funded Initiative to a Not-for-Profit Organization*, 3 Environmental Energy Technology Division News, Lawrence Berkeley National Lab, n.3 (2002), available at <https://eta.lbl.gov/sites/all/files/related-files/eetd-nl10.pdf>.

¹⁰⁵ Lotspeich, *supra* note 53.

responders make their public building, storm shelters, and emergency management command centers more resilient. The City of Stamford, CT is using an ESPC to construct a microgrid at the Government Center building.¹⁰⁶

E. *New Jersey Energy Resilience Bank*

The New Jersey Energy Resilience Bank¹⁰⁷ intends to fund “distributed energy resource” (DER) technologies that can operate in island mode with black start capabilities, both of which allow for operation of critical facilities during power outages to the grid. According to the Bank’s program guide, technologies include combined heat and power systems, fuel cells, natural gas micro turbines, and renewable fuels such as methane digesters, solar panels with off-grid inverters, and storage systems.¹⁰⁸ All resilient energy systems in the program require elevation above FEMA base flood elevation for resilience to flooding.¹⁰⁹ The program guide encourages the use of additional tools for assessing flood risk due to sea level rise, including the NOAA Sea Level Rise tool for Sandy Recovery and Rutgers University’s NJ Flood Mapper.¹¹⁰ Emergency generators and fossil fuel storage for those generators are not considered eligible projects.¹¹¹

New Jersey received \$200 million in funds from the Department of Housing and Urban Development (HUD) Community Development Block Grant-Disaster Recovery (CDBG-DR) program for Sandy.¹¹² The funds provide the capital for the Energy Resilience Bank. CDBG-DR funding rules stipulate, however, that funding may only go to public entities, non-profits, and small businesses.¹¹³ Priority for funds must be for low-moderate incomes (LMI) areas¹¹⁴ and for those most-impacted by the disaster.¹¹⁵ The small business definition resulted in the limited use of these funds for

¹⁰⁶ Lotspeich, *supra* note 53.

¹⁰⁷ Press Release, New Jersey Board of Public Utilities, NJ Energy Resilience Bank Now Accepting Applications: Critical Facilities Can Begin Process to Secure Resilience Grant Funds (Oct. 20, 2014), *available at* http://www.state.nj.us/bpu/newsroom/announcements/pdf/20141020_erb_press.pdf [hereinafter *NJ Energy Resilience Bank Announcement*].

¹⁰⁸ State of New Jersey Board of Public Utilities, *New Jersey Energy Resilience Bank Grant and Loan Financing Program Guide*, ERB FINANCING PROGRAM GUIDE (Oct. 14, 2014), <http://www.state.nj.us/bpu/pdf/erb/Final%20ERB%20Program%20Guide.pdf>.

¹⁰⁹ *Id.*

¹¹⁰ *Id.*

¹¹¹ *Id.*

¹¹² *NJ Energy Resilience Bank Announcement*, *supra* note 108.

¹¹³ 42 U.S.C. § 5305(a) (2014).

¹¹⁴ HUD Community Development Block Grants Eligible Activities, 24 C.F.R. § 570.200 (2016).

¹¹⁵ Robert T. Stafford Disaster Relief and Emergency Assistance Act of 1974, 42 U.S.C. §§ 5121-

energy resilience because for-profit entities or a mix of for-profit and non-profit entities provide many utilities and critical services.¹¹⁶ As a result, New Jersey decided to apply for a waiver from HUD from the small business rule. On August 25, 2015, New Jersey was granted the waiver allowing for-profit applicants to apply for funds, if they provide critical public services and meet the following conditions of HUD.¹¹⁷ The Bank must provide preferential treatment to LMI areas and populations in its scoring methodology, require an equity contribution for for-profit critical facilities, and establish a mix of financing terms (loan, forgivable loan, and/or grant) for each assisted for-profit facility to safeguard against the potential over-subsidization of for-profit facilities.¹¹⁸ The Energy Resilience Bank currently has funding available for water and wastewater treatment facilities¹¹⁹ and hospitals or other related healthcare facilities.¹²⁰

F. *Resilience Bonds*

Modeled after catastrophe bonds (“cat bonds”), resilience bonds may provide funding for large-scale resiliency projects. Re:Focus Partners, LLC described the concept of resilience bonds in a 2015 report¹²¹ in cooperation with RMS and Swiss Re, with funding provided by the Rockefeller Foundation, one of the foundations championing resilience policy and planning.

Cat bonds are financial instruments designed to help reduce the economic disruption of financial losses experienced by businesses and governments when a disaster reaches a predetermined financial threshold or a physical threshold such as a storm surge height of ten feet or greater above a elevation datum during the bond term, which may be three to five years.¹²² In effect cat bonds are used as

5207 (1988).

¹¹⁶ Additional Clarifying Guidance, Waivers, and Alternative Requirements for Grantees in Receipt of Community Development Block Grant Disaster Recovery Funds Under the Disaster Relief Appropriations Act, 80 Fed. Reg. 51589-01 at § 2-2 (Aug. 25, 2015).

¹¹⁷ *Id.*

¹¹⁸ *Id.*

¹¹⁹ New Jersey Energy Resilience Bank, *ERB Funding Round 1: Water and Wastewater Treatment Facilities*, ERB FINANCING PROGRAM GUIDE (Oct. 15, 2015) (revised Apr. 12, 2016), http://www.njeda.com/pdfs/ERB/ERB_WWWTF_Funding_Program_Guide_4_21_16.aspx.

¹²⁰ New Jersey Energy Resilience Bank, *ERB Funding: Hospitals and Related Healthcare Facilities*, ERB FINANCING PROGRAM GUIDE (Oct. 15, 2015) (revised Apr. 12, 2016), http://www.njeda.com/pdfs/ERB/ERB_Hospitals_Funding_Program_Guide_4_21_16.aspx.

¹²¹ RE:FOCUS PARTNERS, REBOUND INSURING FOR RESILIENCE REPORT: LEVERAGING CATASTROPHE BONDS – AS A MECHANISM FOR RESILIENT INFRASTRUCTURE PROJECT FINANCE (Dec. 9, 2015), available at <http://www.refocuspartners.com/wp-content/uploads/2017/02/RE.bound-Program-Report-December-2015.pdf>.

¹²² *Id.* at 2-3.

insurance after a triggering event such as a hurricane, flood, earthquake, or typhoon strikes.¹²³ A sponsor issues the bond and pays investors a coupon, much like an insurance premium.¹²⁴ Also, similar to traditional insurance, if an agreed upon trigger event occurs, those who hold the bond pay a previously set amount. If the trigger event does not occur over an established time period, no payment from the investor to the sponsor is required. Therefore, there is potential for a significant payout for either the sponsor or the investor. Typically bonds issued for inherently riskier hazards, those more likely to occur, pay higher coupon values. However, when risk can be diminished the bond investment may be more valuable as investors are less likely to have to pay the triggered amount.¹²⁵

A resilience bond differs from a cat bond in that resilience bonds anticipate the risk reduction of resiliency projects.¹²⁶ Cat bond coupon pricing is set by expected outcomes generated by catastrophe models.¹²⁷ These models determine the risk level of the particular hazard(s) covered by the bond. In a resilience bond, the coupon price is determined pre- and post-resilience project implementation.¹²⁸ With a resilience project in place, the risk of the hazard hitting the trigger event is assumed to decrease, and the coupon price is therefore reduced, freeing up the difference in value to be used for the implementation of the resilience project.¹²⁹ The model could also be thought of as a rebate to invest in resilient infrastructure projects.¹³⁰

Resilience bonds are structured like cat bonds when a sponsor(s) partners with a bond issuer.¹³¹ The bond issuer creates the bond parameters, accepts premium payments from the sponsor, and pays coupons to the investors.¹³² They may also pay rebates for resilience project execution. There is no one-size-fits-all resilience bond format, each must be tailored to meet the specific situation.¹³³

¹²³ *Id.* at 3.

¹²⁴ *Id.* at 31-33.

¹²⁵ *Id.*

¹²⁶ *Id.* at 34.

¹²⁷ *Id.* at 33.

¹²⁸ *Id.* at 34.

¹²⁹ *Id.* at 34-38.

¹³⁰ Shalina Vajjhala, *Financing infrastructure through resilience bonds*, THE AVENUE BLOG (Dec. 16, 2015), <https://www.brookings.edu/blog/the-avenue/2015/12/16/financing-infrastructure-through-resilience-bonds/>.

¹³¹ RE:FOCUS PARTNERS, *supra* note 123, at 47.

¹³² RE:FOCUS PARTNERS, *supra* note 123, at 47.

¹³³ RE:FOCUS PARTNERS, *supra* note 123, at 31.

We argue that resilience bonds can provide a variety of benefits to meet recovery and resilience needs, including rapid response funding in the wake of a disaster, a more affordable insurance model (for example, in 2013 the MTA secured \$200 million in catastrophe bond coverage¹³⁴ for an affordable alternative to traditional insurance), a path for meeting regulatory insurance compliance obligations, an incentive for performance based design for risk reduction, and a way to monetize success for future public investment in resilience.¹³⁵

IV. OPPORTUNITIES AND CHALLENGES FOR FINANCING RESILIENCE

This article has reviewed current programs and potential programs, but questions remain as to why Connecticut should make the investment in resilience financing and what barriers and challenges need to be overcome to implement programs. The return on investment for resilience is obvious in theory, but less obvious to quantify and monetize. However, studies have shown how one might attack that problem. Appropriately using flood insurance as a monetization tool, creating financing programs that result in resilience at the neighborhood scale, and making standards for resilient building are also all challenges that must be addressed.

A. *Opportunity: Return on Investment for Resilience*

Resilience investment might viably scale by bundling financing for such resilience measures with financing for faster-payback energy efficiency or renewable energy measures. The evaluation, measurement and verification standards used in the energy industry support the value of these future streams of energy savings as tradable commodities. The Connecticut Green Bank transacts with these markets, and in 2014 pioneered the first securitization of a commercial efficiency portfolio of C-PACE loans.¹³⁶ After five years of activity, the Connecticut Green Bank has attracted over \$1 billion in private capital investment into Connecticut clean energy projects, using just a fraction of public ratepayer dollars in support.¹³⁷ The Green Bank's leverage ratio has been during fiscal year

¹³⁴ *N.Y. MTA buys insurance protection for future 'Sandy' storms*, METRO FOR TRANSIT & MOTORCOACH BUSINESS MAGAZINE, July 13, 2013, <http://www.metro-magazine.com/management-operations/news/290796/n-y-mta-buys-insurance-protection-for-future-sandy-storms>.

¹³⁵ RE:FOCUS PARTNERS, *supra* note 123, at 47.

¹³⁶ *In a 'Watershed' Deal, Securitization Comes to Commercial Efficiency*, Green Tech Media (May 19, 2014), *available at* <http://www.greentechmedia.com/articles/read/the-first-known-commercial-efficiency-securitization>.

¹³⁷ Personal communication with Matthew Macunas, Legislative Liaison and Marketing Manager,

2017 has been \$6 in private capital investment for every \$1 in government public funding.¹³⁸ The Green Bank estimates that the multiplier for private investment to public investment in climate change adaptation and resilience projects may need to be 50:1 or 100:1, given the scope of need.¹³⁹

In Section II.C. of this article, the PAR (property assessed resilience) finance model was evaluated in Connecticut to incorporate a community benefit assessment derived from improving building resilience and reaping the cumulative community benefits from insured and uninsured loss avoidance (or taxpayer savings) in future natural disasters, municipal property tax stability during and after future storm events, and NFIP financial stability.

In January 2013, FEMA Region VI conducted a loss avoidance study of southeast Louisiana on 95 properties that were elevated above base flood elevation (BFE) post Hurricane Katrina in 2005 and then experienced Hurricane Isaac in 2012.¹⁴⁰ The conclusion was that one flood event over that 7-year period already demonstrated an average losses avoided ratio of 0.81,¹⁴¹ where a ratio greater-than-one would have meant that the project mitigation benefits already exceeded the mitigation costs. Given that home elevation projects have an expected useful life exceeding thirty years and the storm prone history of southeast Louisiana, the cost of elevation or mitigation could have a significant positive return on investment over the next twenty-two years.¹⁴²

Understanding the payback that the above example shows can be challenging for decision makers. FEMA recognized this need, and in 2015 they funded a research study by Fatemeh Orooji and Carol Friedland of Louisiana State University¹⁴³ to examine the behavioral economics and budgetary decision-making process of consumers posed with an opportunity to invest in a wind

Connecticut Green Bank (July 15, 2017).

¹³⁸ *Id.*

¹³⁹ Personal communication with Brian Garcia, President and Chief Executive Officer, Connecticut Green Bank (September 9, 2015).

¹⁴⁰ John E. Bourdeau, et al., *Loss Avoidance Study, Southeastern Louisiana, Hurricane Isaac 2012, DR-4080-LA*, FEDERAL EMERGENCY MANAGEMENT AGENCY (Jan. 2013), https://www.fema.gov/media-library-data/20130726-1910-25045-9289/las_study__southeastern_louisiana.txt.

¹⁴¹ *Id.* at 2.

¹⁴² *Id.*

¹⁴³ Fatemah Orooji, *Risk-Based Wind Loss and Mitigation for Residential Wood Framed Construction* (2015) (unpublished Ph.D. dissertation, Louisiana State University) (on file with LSU Digital Commons).

resistant retrofit for their homes. The *Wind Hazard Mitigation Framework*, as they called it, has the potential to serve as a return on investment worksheet to help consumers make informed resilience investment decisions and provide underwriters the ability to calculate the benefit-cost of a resilience loan.¹⁴⁴

B. Challenge: Underinsured Properties

FEMA has been challenged to persuade homeowners of the value of investing in NFIP insurance. On average, in Connecticut only 20-23% of eligible properties have flood insurance policies and that number dropped between 2013 and 2015.¹⁴⁵ A number of factors may contribute to the low levels of insured properties in the State, including increasing premiums and older homes with no mortgages, and therefore, no requirement to have flood insurance.¹⁴⁶ The payments for financing resilience can be based on insurance savings.¹⁴⁷ Without the prospect of savings from lower insurance premiums there may be little motivation to make a resilience investment despite the real risk of flooding to the property. The 1% annual chance flood event is estimated to occur at a probability of 51% over the average 70-year useful lifespan of a single family located in the Special Flood Hazard Areas (Figure 2).¹⁴⁸ With increasing sea levels, today's 1% annual chance flooding event will occur more frequently in the future.¹⁴⁹ Educating homeowners about these issues may increase demand for resilience projects and potentially new ways to fund them through financing. In Old Saybrook, Connecticut, for example, the town formed the Sea Level Rise and Climate Adaptation Committee (SLRCAC).¹⁵⁰ After becoming educated about the impacts of sea level rise and storm surge on their town now and in the future, the SLRCAC made recommendations to the Town Selectman that included budgeting

¹⁴⁴ *Id.*

¹⁴⁵ Jan Ellen Spiegel, *Flood insurance hikes arriving at a waterfront near you*, THE CT MIRROR, May 4, 2015, <https://ctmirror.org/2015/05/04/flood-insurance-hikes-arriving-at-a-waterfront-near-you/>.

¹⁴⁶ *Id.*

¹⁴⁷ Kunreuther & Michel-Kerjan, *supra* note 92, at 5.

¹⁴⁸ James F. O'Connell & Stacey Justus, *Model Coastal Floodplain Development Bylaw: Effectively Managing Coastal Floodplain Development*, CAPE COD COMMISSION (Dec. 14, 2009), http://www.capecodcommission.org/resources/bylaws/Coastal_Floodplain_Bylaw_Dec2009.pdf.

¹⁴⁹ U.S. ARMY CORPS OF ENG'RS, NORTH ATLANTIC COAST COMPREHENSIVE STUDY: RESILIENT ADAPTATION TO INCREASING RISK MAIN REPORT (Jan. 2015), *available at* http://www.nad.usace.army.mil/Portals/40/docs/NACCS/NACCS_main_report.pdf.

¹⁵⁰ TOWN OF OLD SAYBROOK, REPORT OF FINDINGS FROM A STUDY OF THE EFFECTS OF SEA LEVEL RISE AND CLIMATE CHANGE ON OLD SAYBROOK, CONNECTICUT (Dec. 2015), *available at* http://www.oldsaybrookct.org/Pages/OldSaybrookCT_Conservation/SLRCAC2/SLRCAC_Resour ces/SLRCAC%20Report%20of%20Findings.pdf.

for the design and construction of physical solutions to address the challenges that Old Saybrook will face.¹⁵¹

C. Challenge: Providing Resilience at the Neighborhood Scale

Financing models that work on a property-by-property basis face the challenge of not being able to improve resilience for an entire neighborhood or area that faces a shared risk. For example, if \$25 million in approved bond funds was made available to Shore Up, then the loan program could fund approximately 200 home elevations with an average loan of \$125,000.¹⁵² Unfortunately, more than 32,000 homes in the state lie within the FEMA FIRM 100-year floodplain.¹⁵³ This program was a great step forward and the first of its kind in the nation, but at its initial approved funding level, Shore Up loans would be a drop in the bucket. Without additional funding and motivation by all homeowners to use the Shore Up program, Connecticut will have large gaps in home elevation within neighborhoods (Figure 4). Affordability of the program is also an issue that needs to be addressed. Even with a low interest rate, taking on a loan may not be possible for low or moderate-income property owners. Herbert et al. found that low income households may not have the cash on hand for down payments and closing costs, cannot pay down debts, have low credit scores, and could be subject to higher borrowing costs.¹⁵⁴ Moreover, home and commercial property elevation alone does not address the infrastructure needs that make an entire neighborhood resilient. Programs like Shore Up could be paired with a TIF district for elevating the roads or instituting a flood protection strategy. A revolving loan fund project to finance a resilient wastewater utility could be added as well. There are many combinations that could apply, but the point is that in isolation none of these programs will address the entire problem.

¹⁵¹ *Id.*

¹⁵² *Shore Up Connecticut Launch*, *supra* note 31.

¹⁵³ Conn. Dep't of Energy and Env'tl. Prot., *Natural Hazards Mitigation Plan, For 2007-2010*, CT.GOV (Dec. 2007),

http://www.ct.gov/deep/lib/deep/water_inland/hazard_mitigation/plan/hazardmitigationplan.pdf.

¹⁵⁴ Christopher E. Herbert et al., Joint Center for Housing Studies of Harvard University, *Critical Housing Finance Challenges for Policymakers: Defining a Research Agenda*, WHAT WORKS COLLABORATIVE (2012), available at

http://www.jchs.harvard.edu/sites/jchs.harvard.edu/files/w12-2_herbert_belsky_apgar.pdf.



Figure 2. Two houses in the coastal municipality of Old Saybrook, Connecticut. The house on the right is in the process of being elevated.¹⁵⁵

D. *Challenge: Setting Appropriate Building Codes for Resilience*

Financing resilience will require predictable and uniform building construction standards and codes and guidance for efficient loan underwriting. The Department of Homeland Security published the report *Including Building Codes in the National Flood Insurance Program, Fiscal Year 2013 Report to Congress* as an impact study for the proposed Biggert-Waters Flood Insurance Reform Act of 2012.¹⁵⁶ In this report the agency concluded that, “the overall impacts of including building code as part of NFIP would be positive in helping to reduce physical flood losses and other hazard losses.”¹⁵⁷ In addition:

- 22 states, including Connecticut, mandate local enforcement of statewide building codes.¹⁵⁸

¹⁵⁵ Photo courtesy of Rebecca French taken in the fall of 2014 on a tour of the Town of Old Saybrook Connecticut’s shoreline.

¹⁵⁶ DEP’T OF HOMELAND SEC., FED. EMERGENCY MGMT. AGENCY, INCLUDING BUILDING CODES IN THE NATIONAL FLOOD INSURANCE PROGRAM: FISCAL YEAR 2013 REPORT TO CONGRESS IMPACT STUDY FOR BIGGERT-WATERS FLOOD INSURANCE REFORM ACT OF 2012 at 21-30 (Jan. 2013), available at https://www.fema.gov/media-library-data/1385728818014-f08e55ee83590650103995b2c66e2285/Incl_Bldg_Codes_NFIP2.pdf.

¹⁵⁷ *Id.* at 21-24.

¹⁵⁸ *Id.* at 27-30.

- 28 states have a shared responsibility with localities (partial) or no shared responsibility with localities (complete code adoption) and enforcement shared between state and local levels. (Connecticut has a single statewide code.)¹⁵⁹
- The benefits to communities that initially incur the costs associated with establishing building departments to perform permitting and inspection include: generally increased property values, reduced losses during flood and other hazard events, which reduce insurance rates over a 5- to 10-year period, and a more actuarially sound NFIP and insurance industry.¹⁶⁰
- The most significant benefits would likely arise from the required added elevation above base flood elevation levels (freeboard) for dwellings in certain special flood hazard areas, such as coastal A and V zones.¹⁶¹
- The reduction of NFIP insured losses would lower actuarially rated insurance premiums for those code compliant structures, making insurance more affordable, attracting more participation in the NFIP, enhancing the program's financial soundness, and reducing the subsidy needs of the NFIP.¹⁶²
- The statutory enforcement authority of building officials would increase code compliance by builders and designers of new structures and substantially damaged or substantially improved structures as part of the NFIP.¹⁶³

The general concern with enforcing the nationally recognized building codes was the regulatory and financial impacts on communities that do not already have the enforcement programs in place since they have not yet adopted the national building codes.¹⁶⁴ However, the report found that these costs could be offset by the collection of permit fees and reimbursement from the federal government and net economic benefit over time.¹⁶⁵

Nationally recognized building codes applicable to flood resistant design and construction include: the American Society of Civil Engineers (ASCE) 24, *Flood Resistant Design and Construction*, as a reference standard in the International Residential Code and International Building Code® (IRC, IBC or I-Codes).¹⁶⁶ In addition ASCE/SEI 7-10, *Minimum Design Loads for Buildings and Other*

¹⁵⁹ *Id.*

¹⁶⁰ *Id.*

¹⁶¹ *Id.*

¹⁶² *Id.*

¹⁶³ *Id.*

¹⁶⁴ *Id.* at 10.

¹⁶⁵ *Id.*

¹⁶⁶ FLOOD RESISTANT DESIGN AND CONSTR. COMM. OF THE CODES AND STANDARDS ACTIVITIES DIV. OF THE STRUCTURAL ENG'G INST. OF ASCE, FLOOD RESISTANT DESIGN AND CONSTRUCTION ASCE/SEI 24-14 (Am. Soc'y of Civil Eng'rs, 2014).

Structures, “provide requirements for general structural design and includes means for determining dead, live, soil, flood, snow, rain, atmospheric ice, earthquake, and wind loads, as well as their combinations suitable for including in building codes and other documents.”¹⁶⁷ The International Mechanical Code, International Plumbing Code, and International Fuel Gas Code also include codes for design for flooding per ASCE 24.¹⁶⁸



Figure 3. Helical pile foundations installed by GZA GeoEnvironmental, Inc. for elevated residence in Milford, Connecticut to withstand 100 mph wind load and 500-year occurrence interval storm flood elevation plus one foot freeboard.¹⁶⁹

¹⁶⁷ FLOOD RESISTANT DESIGN AND CONSTR. COMM. OF THE CODES AND STANDARDS ACTIVITIES DIV. OF THE STRUCTURAL ENG'G INST. OF ASCE, MINIMUM DESIGN LOADS FOR BUILDINGS AND OTHER STRUCTURES, ASCE/SEI 7-10 (2013).

¹⁶⁸ FED. EMERGENCY MGMT. AGENCY, ENGINEERING PRINCIPLES AND PRACTICES FOR RETROFITTING FLOOD-PRONE RESIDENTIAL STRUCTURES, FEMA P-259 (3d ed. Jan. 2012), available at https://www.fema.gov/media-library-data/20130726-1506-20490-2593/fema259_complete_rev.pdf.

¹⁶⁹ Photo courtesy of James Davis, GZA GeoEnvironmental (provided by co-author Wayne Cobleigh, Vice President- GeoEnvironmental).

The Connecticut State Building Inspector, State Fire Marshal and the Codes and Standards Committee are currently conducting a code review process to adopt the 2018 State Building and Fire Safety Codes based on the 2015 editions of the International Code Council (ICC) and National Fire Protection Association (NFPA) documents.¹⁷⁰ The process was initiated in January 2017 and it was planned to be completed in July 2017.

ASCE 24-14 is a referenced standard in the 2015 International Building Code® (IBC) and the 2015 International Residential Code® (IRC).¹⁷¹ Building and structures within the scope of the IBC proposed to be constructed in flood hazard areas must be designed in accordance with ASCE 24-14.¹⁷² The IRC requires dwellings in floodways to be designed in accordance with ASCE 24-14 and includes an alternative that allows communities to require homes in any flood zone to be designed in accordance with ASCE 24-15.¹⁷³ Sections of the ASCE 24-14 that complement the NFIP minimum requirements include: Building Performance; Flood-Damage Resistant Materials; Utilities and Service Equipment and Siting Considerations.¹⁷⁴

The FEMA has worked since 1998 to include flood provisions into the International Building Codes.¹⁷⁵ The flood provisions of the 2015, 2012, 2009, and 2006 editions of the I-Codes are consistent with the minimum requirements of the NFIP for buildings and structures.¹⁷⁶ The Design Flood Elevation (DFE) term used in ASCE 24 and ASCE 7 is defined as the Base Flood Elevation (BFE), which is the height of the corresponding water level on the 100-yr FIRMs flood event plus any additional elevation above that BFE as established by a regulatory authority, and

¹⁷⁰ *Building and Fire Safety Code Adoption*, DEPT. OF ADMIN. SERVICES (Apr. 3, 2017, 8:26:12 AM), <http://www.ct.gov/dcs/cwp/view.asp?a=4447&q=523368>.

¹⁷¹ FED. EMERGENCY MGMT. AGENCY, HIGHLIGHTS OF ASCE 24-14 FLOOD RESISTANT DESIGN AND CONSTRUCTION (July 2015), *available at* https://www.fema.gov/media-library-data/1436288616344-93e90f72a5e4ba75bac2c5bb0c92d251/ASCE24-14_Highlights_Jan2015_revise2.pdf.

¹⁷² *Id.*

¹⁷³ *Id.*

¹⁷⁴ *Id.*

¹⁷⁵ BUILDING SCIENCE BRANCH, FEMA FED. INS. AND MITIGATION ADMIN., FLOOD PROVISIONS OF THE INTERNATIONAL CODES SERIES: HIGHER STANDARDS AND MORE SPECIFIC REQUIREMENTS THAN THE MINIMUM REQUIREMENTS OF THE NATIONAL FLOOD INSURANCE PROGRAM (June 2013), *available at* https://www.fema.gov/media-library-data/20130726-1921-25045-5477/icodes_asce24_higherstdns_paper_060713.pdf [hereinafter *Flood Provisions of the International Code Series*].

¹⁷⁶ *Id.* at 1.

represents a level of flood protection exceeding the BFE.¹⁷⁷ Most NFIP communities adopt the FIRM as their regulatory DFE, making the DFE and BFE the same, but the DFE will always be the BFE or higher.¹⁷⁸ The DFE has become integrated into land use permitting requirements and a design basis for new buildings and structures, as well as a standard for elevating buildings and structures substantially damaged by floods subject to insurance under the NFIP.¹⁷⁹

FEMA's Building Science Branch reports that using ASCE 24 for design for dwellings in coastal high-hazard areas (Zone V), where wave heights of over three feet are expected during the base flood, has several benefits,¹⁸⁰ which include:

- Foundation designs must account for erosion and scour;
- Pile design specification details are provided; and
- Requirements are provided for elevated structures in relation to the orientation of the lowest horizontal structural member to be one foot above the elevation of a wave crest that could impart a load during the base flood.

Concerns with the use of FEMA's FIRMs as a design basis elevation is that only past flood and hurricane events are evaluated and maps may be updated infrequently.¹⁸¹ In addition, FEMA does not currently evaluate the impact of sea level rise or future climate change impacts when establishing the BFE.¹⁸²

¹⁷⁷ *Id.* at 1-2.

¹⁷⁸ *Id.* at 2.

¹⁷⁹ CHRISTOPHER P. JONES ET AL., AMERICAN INSTITUTES FOR RESEARCH, EVALUATION OF THE NATIONAL FLOOD INSURANCE PROGRAM'S BUILDING STANDARDS (Oct. 2006), *available at* https://www.fema.gov/media-library-data/20130726-1602-20490-5110/nfip_eval_building_standards.pdf.

¹⁸⁰ *Flood Provisions of the International Code Series*, *supra* note 177, at 7-8.

¹⁸¹ According to FEMA's website: "Each year, FEMA initiates studies and restudies of flood hazards in communities across the U.S. for the creation, as well as the revision, of community flood hazard maps. Because of funding constraints, however, FEMA can study or restudy only a limited number of communities each year. As a result, FEMA prioritizes study and restudy needs based on a cost-benefit approach whereby the highest priority is given to studies where development is greatest and where the maps are most outdated." *See Flood Map Revision Processes*, FED. EMERGENCY MGMT. AGENCY (Jan. 11, 2017), <https://www.fema.gov/flood-map-revision-processes#1>.

¹⁸² According to FEMA's website: "FEMA maps coastal flood hazards based on existing shoreline characteristics, and wave and storm climatology at the time of the flood study. In accordance with the current Code of Federal Regulations, FEMA does not map flood hazards based on anticipated future sea levels or climate change. Over the lifespan of a study, changes in flood hazards from sea level rise and climate change are typically not large enough to affect the validity of the study

The 2016 State Building Code adopted on October 1, 2016 is considered rigorous in respect to flood and wind hazards protection by combining several international building codes, including the 2012 International Building Code (IBC).¹⁸³ The current State Building Code meets the minimum requirements of the NFIP. Since the first state building code was adopted in 1970, periodic revisions have generally increased the level of protection required for flooding and wind protection in coastal hazard areas.¹⁸⁴ Structures built before 1970 (pre-existing structures) are considered at the highest risk of damage from coastal hazards such as flooding, wind, and precipitation.¹⁸⁵ Structures built between 1970 and 1990 are also at high risk of flood and wind damage, because 1990 was the first year the state code included provisions from international building codes.¹⁸⁶ Of all the coastal structures in Connecticut, structures built since 2005 are likely to have the best protection from flood and wind damage from hurricanes and winter storms.¹⁸⁷

New building codes, designs, and construction methods for flood resistance and resilience will require consumer outreach, consumer protection, and training programs for inspectors, design professionals, and contractors. There are several professional training and guidance resources available. FEMA's Building Science Branch of the Risk Reduction Division at FEMA's Federal Insurance and Mitigation Administration (FIMA) has a helpline and online resources.¹⁸⁸ The Insurance Institute for Business & Home Safety® (IBHS) also provides online resources.¹⁸⁹

results.” See *Coastal Frequently Asked Questions*, FEMA.GOV (Aug. 17, 2016), available at <https://www.fema.gov/coastal-frequently-asked-questions> (citing questions asked “How is FEMA accounting for sea level rise and climate change on the FIRMs?; Does sea level rise/climate change affect the FIRMs?”).

¹⁸³ Press Release, International Code Council, Updated Building Code Adopted Statewide in Connecticut (Nov. 21, 2016) available at http://das.ct.gov/images/1090/NR_Connecticut_Codes_Final.pdf.

¹⁸⁴ JOEL JOHNSON, STATE OF CONN., DEP'T OF ENVTL. PROT., OFFICE OF LONG ISLAND SOUND PROGRAMS, COASTAL HAZARDS IN CONNECTICUT : THE STATE OF KNOWLEDGE: 2009 -VERSION 2 at 17 (2010) available at

http://www.ct.gov/deep/lib/deep/long_island_sound/coastal_hazards/ct_coastal_hazards.pdf.

¹⁸⁵ *Id.*

¹⁸⁶ *Id.*

¹⁸⁷ *Id.*

¹⁸⁸ See generally *Building Science*, FED. EMERGENCY MGMT. AGENCY (Nov. 12, 2015), <https://www.fema.gov/building-science>.

¹⁸⁹ See generally INS. INST. FOR BUS. & HOME SAFETY (2016), <http://disastersafety.org/about/>.

IBHS studies and reports address FORTIFIED HomeTM¹⁹⁰ programs for hurricane, high-wind, and hail prone areas. FORTIFIED HomeTM Technical Guides and training programs are offered to inspectors, design professionals, and contractors.¹⁹¹ IBHS also has a FORTIFIED Commercial Standards program.¹⁹² Both the residential and commercial standards include Bronze, Silver, and Gold designations for addressing budgetary and inspection constraints to meet three tiers of storm resilience goals. IBHS publishes Technical Requirements for Hurricane and High-Wind/Hail Construction Methods¹⁹³ that have been field tested in IBHS's building testing facility, which simulates hurricane force winds. IBHS also rates building materials as FORTIFIED.¹⁹⁴ IBHS has collaborated with DHS to pilot a Resilience STAR designated homes program using IBHS construction standards.¹⁹⁵

ASCE¹⁹⁶ provides technical training on Floodplain Management and NFIP, and develops standards ASCE 7 and ASCE 24 for continuing education for maintaining Professional Engineer licensure.

¹⁹⁰ See generally FORTIFIED HOME, INS. INST. FOR BUS. & HOME SAFETY, <https://disastersafety.org/fortified/> (last visited 2017) for more information.

¹⁹¹ *Id.*

¹⁹² See generally FORTIFIED COMMERCIAL, INS. INST. FOR BUS. & HOME SAFETY (2016), <http://disastersafety.org/fortified/commercial/>.

¹⁹³ See FORTIFIED HOME, INS. INST. FOR BUS. & HOME SAFETY, HURRICANE STANDARDS (2012), available at <https://disastersafety.org/wp-content/uploads/fortified-home-hurricane-standards.pdf>; FORTIFIED HOME, INS. INST. FOR BUS. & HOME SAFETY, HIGH WIND & HAIL STANDARDS (2015), available at <http://disastersafety.org/wp-content/uploads/2015/10/FORTIFIED-High-Wind-Hail-Standards-2015.pdf>; FORTIFIED HOME, INS. INST. FOR BUS. & HOME SAFETY, HIGH WIND STANDARDS (2015), available at <http://disastersafety.org/wp-content/uploads/2015/07/FORTIFIED-High-Wind-Standards-2015.pdf>; See also FORTIFIED HOME, INS. INST. FOR BUS. & HOME SAFETY, HIGH WIND & HAIL TECHNICAL SUMMARY: NEW CONSTRUCTION (2015), available at http://disastersafety.org/wp-content/uploads/2015/10/FORTIFIED-High-Wind-Hail-New-Technical-Summary_10.9.pdf; FORTIFIED HOME, INS. INST. FOR BUS. & HOME SAFETY, TECHNICAL REQUIREMENTS SUMMARY (2016), available at <https://disastersafety.org/fortified/resources/#standards>.

¹⁹⁴ See generally FORTIFIED HOME, INS. INST. FOR BUS. & HOME SAFETY, available at <https://disastersafety.org/fortified/> (2017).

¹⁹⁵ Press Release, Insurance Institute for Business Home & Safety, New Resilience STAR Home Program Uses IBHS Construction Standards (December 5, 2013) (on file with disastersafety.org), available at <https://disastersafety.org/ibhs-news-releases/new-resilience-star-home-program-uses-ibhs-construction-standards/>.

¹⁹⁶ See generally AM. SOC'Y OF CIVIL ENG'RS, www.asce.org (last visited 2015) for more information.

The U.S. Green Building Council recently introduced resilience credits for LEED that are in the pilot stage right now.¹⁹⁷ There are three credits available: Credit 1 - Assessment & Planning for Resilience; Credit 2 – Design for Enhanced Resilience; and Credit 3 – Design for Passive Survivability.¹⁹⁸ Under Credit 2, a building designed for resilience to flooding must follow ASCE 24-14, the lowest occupied floor must be 5 feet above the FEMA BFE or dry floodproofing for commercial buildings, sewers must contain backflow preventers, and mechanical and electrical equipment must be protected¹⁹⁹ as per FEMA P-55 guidelines for coastal construction.²⁰⁰

Consistent with Connecticut's policy leadership on initiatives to address the challenges posed by climate change, Governor Dannel P. Malloy announced on April 22, 2016 a new Executive Order No. 53²⁰¹ in which he is directing state agencies to develop new building code standards and training programs for builders and inspectors that will better protect residential and commercial structures from damage caused by flooding and high winds. The Governor is instructing the Department of Administrative Services (DAS), the Department of Energy and Environmental Protection (DEEP), and the Connecticut Insurance Department (CID) to work with the State Building Inspector to ensure that the next revision to the State Building Code includes standards that increase the resiliency of new and renovated homes and commercial buildings.²⁰²

Executive Order No. 53 will accelerate updating the State Building Code to address resiliency through evaluating the numerous international, federal, and state standards and guidance summarized herein by the authors and through collaboration with public officials and technical experts in wind and flood resistant design and construction. Establishing a new State Building Code will benefit the public by avoiding costly and repetitive property and casualty and

¹⁹⁷ Alex Wilson, *LEED Pilot Credits on Resilient Design Adopted*, RESILIENT DESIGN INST. (Nov. 13, 2015), <http://www.resilientdesign.org/leed-pilot-credits-on-resilient-design-adopted/>.

¹⁹⁸ *Id.*

¹⁹⁹ *Id.*

²⁰⁰ FED. EMERGENCY MGMT. AGENCY, *Coastal Construction Manual: Principles and Practices of Planning, Siting, Designing, Constructing, and Maintaining Residential Buildings in Coastal Areas*, FEMA P-55, 4th Edition (2011).

²⁰¹ Press Release, The Office of Governor Dannel P. Malloy, Gov. Malloy Signs Order Strengthening State Building Code to Limit Storm Damage as a Result of Climate Change (Apr. 22, 2016), *available at* <http://portal.ct.gov/en/Office-of-the-Governor/Press-Room/Press-Releases/2016/04-2016/Gov-Malloy-Signs-Order-Strengthening-State-Building-Code-to-Limit-Storm-Damage-as-a-Result-of-Climat>.

²⁰² *Id.*

disaster recovery losses, whether those losses are insured or uninsured. Taxpayers will also benefit by reducing the budgets they contribute to fund NFIP insured losses in Connecticut over the life span of these new and renovated buildings. Future economic losses will be mitigated when residential and commercial buildings throughout Connecticut are designed, constructed, and inspected in compliance with a State Building Code that results in more residential and commercial buildings that are less vulnerable to the impacts of flooding, extreme wind conditions, severe weather, sea level rise, and climate change.

V. CONCLUSION: HOW POLICY CAN MOTIVATE RESILIENCE FINANCING

This article began with a description of how the federal government is currently paying out hundreds of millions of dollars to Connecticut – and in neighboring states, billions of dollars – to recover from Sandy. But that model may change. Currently, when a State is declared as a Presidential major disaster, FEMA provides Public Assistance,²⁰³ but the agency is now considering a disaster deductible in a Supplemental Advance Notice of Proposed Rulemaking.²⁰⁴ Under the current Public Assistance program, FEMA provides a 75% federal cost share of the cost of recovery for public facilities damaged by a storm.²⁰⁵ Under a disaster deductible policy, the State of Connecticut would commit funds up front before FEMA would provide any financial assistance for recovery under the Public Assistance program.²⁰⁶ The Notice from FEMA calculated Connecticut's deductible as \$20.85 million, although FEMA would phase this amount in over five years.²⁰⁷ The deductible would start at \$5.04 million in year one.²⁰⁸ FEMA would allow states to satisfy their deductible through a credit system. The goals of the credits are to, “incentivize States to dedicate resources on activities that are demonstrated to promote and support readiness, preparedness, mitigation, and

²⁰³ FEMA administers the Public Assistance program under Section 406 of the Stafford Act to “make contributions—(A) to a State or local government for the repair, restoration, reconstruction, or replacement of a public facility damaged or destroyed by a major disaster and for associated expenses incurred by the government.” See 42 U.S.C. § 5172 (a)(1)(A).

²⁰⁴ Establishing a Deductible for FEMA's Public Assistance Program, 82 Fed. Reg. 4064, 4064-97 (Jan. 12, 2012) (codified at 44 C.F.R. § 206), *available at* <https://www.federalregister.gov/documents/2017/01/12/2017-00467/establishing-a-deductible-for-femas-public-assistance-program>.

²⁰⁵ The Federal share for FEMA public assistance “shall be not less than 75 percent of the eligible cost of repair, restoration, reconstruction, or replacement” of a public facility. 42 U.S.C. § 5172(b)(1).

²⁰⁶ 82 Fed. Reg. 4064, *supra* note 206.

²⁰⁷ 82 Fed. Reg. 4064, *supra* note 206, at 4086 (referencing Table 11).

²⁰⁸ 82 Fed. Reg. 4064, *supra* note 206, at 4086 (referencing Table 11).

resilience. Such activities could include adopting and enforcing building codes that promote disaster resilience, funding mitigation projects, or investing in disaster relief, insurance, and emergency management programs.”²⁰⁹

FEMA gave particular weight to the credits for investment by states in mitigation projects, providing a \$3.00 credit for every \$1.00 spent.²¹⁰ The \$2.00 in savings that the State of Connecticut would gain on their investment in mitigation versus other options to meet the deductible, not only strongly incentivizes this option for credits, but that savings could also be used to pay back the investment in the resilience project. By establishing the 2:1 return on investment ratio, FEMA has also established the market value of a qualifying resilience project for states. For example, under the \$20.85 million deductible, an investment of \$6.95 million dollars leads to a savings of \$13.9 million. That savings pays the state back for its investment in mitigation projects two times over.

FEMA also proposed a higher incentive for creating tax incentives relative to other credits – \$2.00 in credit for every \$1.00 spent on administering a tax incentive program and any lost tax revenue.²¹¹ FEMA notes that these tax incentives could provide an income tax credit for home elevation, for example.²¹² This type of tax savings could again be used for financing. For example, the tax savings could be used by the homeowner to pay off the cost of a private loan for the construction, thereby leveraging public investment to attract private investment.

Even without the incentives for investment that this FEMA proposal outlines, the state of Connecticut’s recovery and resiliency needs cannot be completely covered by federal grant dollars alone now or going forward. Resilience financing can be part of the solution, but in order for financing programs to work effectively and proactively, public policies encouraging resiliency investments need to be in place that monetize the value that comes with implementing a qualifying resilience project, as one that demonstrates measurable and cumulative social welfare, public safety, and financial returns on investment. This monetizing capacity for preventing economic losses to property, increasing real estate market value, and stabilizing property tax is what the FEMA disaster deductible credit, lower insurance premiums, and increased property values all have in common.

²⁰⁹ 82 Fed. Reg. 4064, *supra* note 206, at 4064-66.

²¹⁰ 82 Fed. Reg. 4064, *supra* note 206, at 4076.

²¹¹ 82 Fed. Reg. 4064, *supra* note 206, at 4078.

²¹² 82 Fed. Reg. 4064, *supra* note 206.

The multiple financing mechanisms described in this article all hinge on creating an equitable method to pay back these long-term investments in our future welfare. The federal government can play a role here as can states, but without loss prevention policies, insurance, and funding programs being integrated to incentivize investing in resilience, a state's disaster recovery unmet budgetary needs will increase. As the climate changes and the seas rise, those unmet costs increase even more. With a track record of innovation and success from the Connecticut Green Bank, the launch of Shore Up as the first residential elevation loan program of its kind nationwide, the creation of the Connecticut Institute for Resilience and Climate Adaptation as a resource for program evaluation and impact, state agencies committed to resiliency through SAFR, and R-PACE legislation and building codes to address extreme winds and coastal flooding under review, Connecticut is on the right track and is leading the way in creating methods for financing resilience that can become model programs for the country.

NATIONAL FLOOD INSURANCE REFORM AS A TOOL FOR MUNICIPAL CLIMATE
RESILIENCE ENHANCEMENT

John Ryan-Henry¹

I. INTRODUCTION

The National Flood Insurance Program (NFIP)² plays a significant role in the land use policy and floodplain management of coastal municipalities. In coastal communities, flood insurance from the NFIP covers losses to properties exposed to both riverine and coastal flooding. The NFIP is a major factor influencing coastal land use patterns, especially among coastal residential property owners, many of whom are required to hold flood insurance as a provision of a federally backed mortgage.³

The program faces Congressional reauthorization in September, 2017,⁴ the first since major reforms were enacted in the Biggert-Waters Flood Insurance Reform Act of 2012 (BW12)⁵ and the Homeowner Flood Insurance Affordability Act of 2014 (HFIAA14).⁶ About one in five policyholders in the NFIP pay premiums below actuarial rates.⁷ Federal subsidization of coastal flood risk has played a significant role in driving development in the coastal zone over the latter

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² National Flood Insurance Act of 1968, Pub. L. No. 90-448, 82 Stat. 572 (codified as amended at 42 U.S.C. § 4001–4129 (2016)).

³ 42 U.S.C. § 4012a(b) (2016).

⁴ The NFIP’s current authorization expires on September 30, 2017.

⁵ Pub. L. No. 112-141, 126 Stat. 405 (2012).

⁶ Pub. L. No. 113-89, 128 Stat. 1020 (2014).

⁷ U.S. GOV’T ACCOUNTABILITY OFFICE, GAO-15-111, FLOOD INSURANCE: FORGONE PREMIUMS CANNOT BE MEASURED AND FEMA SHOULD VALIDATE AND MONITOR DATA SYSTEM CHANGES 7 (2014).

half century.⁸ Significant reforms are expected from Congress to shore up the ailing program, but the national policy discussion is still ongoing about precisely what shape these reforms will take.

This discussion is of particular importance to municipal policymakers and managers in coastal communities interested in increasing their resilience to climate change. Changes to the NFIP could serve as a vehicle for proactive land use reform and incentivizing private resilience behavior on the municipal level, or they could complicate ongoing municipal resilience planning. This article analyzes the state of reform proposals in the policy literature from the perspective of municipal land use management, and assesses the implications of various reform options on the ability of communities to enhance resilience.

The state of NFIP policy is critically significant to coastal municipalities' resilience planning efforts. NFIP services such as the Community Rating System (CRS) incentivize coastal municipalities to undertake flood control initiatives,⁹ and NFIP information products, especially Flood Insurance Rate Maps (FIRMs), are used by many states and municipalities as a framework for their hazard management and adaptation plans and regulations.

However, NFIP policy is currently in a state of flux. The program has been forced to draw \$24.6 billion dollars from the U.S. Treasury to cover claims resulting from two major coastal flooding disasters in the last twelve years: the 2005 hurricane season including Hurricanes Katrina and Rita and 2012's Hurricane Sandy.¹⁰ It has an outstanding debt of \$23 billion.¹¹ The program is regarded as financially unsustainable in a time when an increasing portion of the United States population and economic activity is located in coastal hazard areas, and risk exposure will only increase with

⁸ See Kenneth J. Bagstad, et al., *Taxes, Subsidies, and Insurance as Drivers of United States Coastal Development*, 63 ECOLOGICAL ECON. 285, 287-88 (2007); Walter A. Rosenbaum & Gary Boulware, *The Developmental and Environmental Impact of the National Flood Insurance Program*, in EVALUATION OF THE NATIONAL FLOOD INSURANCE PROGRAM 17 (2006).

⁹ See Abdul-Akeem Sadiq & Douglas S. Noonan, *Flood Disaster Management Policy: An Analysis of the United States Community Ratings System*, 7 J. NATURAL RES. POL. RESEARCH 5 (2014) (finding that flood risk, socio-economic characteristics, political economy, and local capacity can drive CRS participation); but see Phillip R. Berke, et al., *Impacts of Federal and State Hazard Mitigation Policies on Local Land Use Policy*, 34 J PLAN. EDUC. & RES. 60 (2014) (arguing that state policy is more influential on land use patterns).

¹⁰ U.S. GOV'T ACCOUNTABILITY OFFICE, GAO-17-317, HIGH RISK SERIES: PROGRESS ON MANY HIGH-RISK AREAS, WHILE SUBSTANTIAL EFFORTS NEEDED ON OTHERS 619 (2017) [hereinafter GAO, HIGH RISK SERIES].

¹¹ *Id.*

climate change induced sea level rise and changes in coastal storm frequency and intensity.¹² Significant reforms undertaken in 2012 and 2014 are only the beginning of major changes which will inevitably come to the program in the coming decades.

This article reviews the policy debate around NFIP reform and analyzes the implications of key reform proposals on the NFIP as a tool for municipalities to influence land use in the coastal zone. Part II examines the structure of the program, its role in municipal resilience planning, the problems which have been identified in its structure and implementation, and how those problems have shaped the conversation about reform. Part III undertakes to assess key reform proposals and their implications as tools for municipal policymakers to understand flood risks, manage coastal hazards, and enhance community resilience. Part IV highlights key opportunities and challenges that NFIP reform through the reauthorization process may present to municipal planners.

II. MUNICIPAL IMPLEMENTATION OF THE NATIONAL FLOOD INSURANCE PROGRAM

Although insurance policies under the NFIP are issued to individual property owners, participation in the program is fundamentally a municipal policy decision, impacting insurance, hazard mitigation planning, building codes, and land use regulations. The NFIP is an opt-in program available to municipalities, which join by certifying compliance with minimum flood hazard mitigation requirements under 42 U.S.C. § 4022; primarily, by instituting flood control land use ordinances.¹³ The Federal Emergency Management Agency's (FEMA) NFIP operations fall into three core activities: mapping, regulation, and insurance. The participating community in turn is responsible for using FEMA maps and its own land use regulatory authority to implement flood hazard mitigation "on the ground." This federal-local relationship gives the NFIP an important role in municipal planning activities for hazard mitigation and climate change resilience enhancement. Discussed below are the structure of the program, its role in municipal resilience planning, the problems which have been identified in its structure and implementation, and how those problems have shaped the conversation about reform.

¹² See S. Hallegatte, et al., *Future Flood Losses in Major Coastal Cities*, 3 NATURE CLIMATE CHANGE 802 (2013); Jochen Hinkel, et al., *Coastal Flood Damage and Adaptation Costs Under 21st Century Sea-Level Rise*, 111 PROC. NAT'L ACAD. SCI. 3292 (2013); Carolyn Kousky, *Informing Climate Adaptation: A Review of the Economic Costs of Natural Disasters*, 46 ENERGY ECON. 576 (2014).

¹³ See 44 C.F.R. § 60 (2016).

A. Program Structure

FEMA implements the NFIP through mapping, regulation, and insurance. FEMA produces FIRMs for all coastal areas of the United States. FIRMs delimit Special Flood Hazard Areas (SFHAs), mapping flood risk by identifying the area within which the likelihood of being inundated in any single year exceeds a certain threshold.¹⁴ SFHAs include the AE-zone, VE-zone, X-zone, and other more specialized designations.¹⁵ FEMA contractors determine the boundaries of SFHAs by conducting hydrographic modeling of flood events, using a hypothetical 1% annual likelihood storm derived from historical flood records as the threshold (commonly called the 100-year storm).¹⁶ Modelers map the Base Flood Elevation (BFE) up to which floodwaters are calculated to reach during the hypothetical storm, and use that flood envelope to draw the SFHAs. SFHA boundaries in turn mark the regulatory extent of the program, as the type of SFHA into which a structure falls controls what regulatory provisions apply to it.

FEMA's regulatory role consists of using its mapping and its insurance service to incentivize development standards and land use practices along the coast that minimize risk exposure. Insurance is only available for structures in municipalities with compliant land use flood controls within enforceable city ordinances.¹⁷ Through NFIP financial regulations, proof of flood insurance is required for any loan secured by a structure within an SFHA, including a mortgage.¹⁸ This Mandatory Purchase Requirement (MPR), enforced by the

¹⁴ By dividing the map into zones exceeding specific risk thresholds – here, the 1% and 0.2% thresholds described below – the FIRM mapping process inherently makes a decision about risk tolerance, identifying structures on one side of the SFHA boundary as “at risk” and those on the other as “not at risk.” The implications of this implicit policy decision are explored in Part C.

¹⁵ AE-zones are areas with a 1% chance or higher in any single year of experiencing flooding. VE-zones are areas with a 1% annual chance or higher of experiencing flooding by waters driven up onto land by waves and storm surge. X-zones are yet-higher risk areas with a 0.2% annual chance to experience flooding. Zones are further distinguished by the risk of experiencing sheet flow, ponding, or mudslides.

¹⁶ The 1% annual likelihood threshold was a regulatory standard instituted in 1971 by the Federal Insurance Administration, the Department of Housing and Urban Development agency that was responsible for the NFIP prior to it moving into FEMA's portfolio. *See* Gerald E. Galloway et al., *Assessing the Adequacy of the National Flood Insurance Program's 1 Percent Flood Standard*, in EVALUATION OF THE NATIONAL FLOOD INSURANCE PROGRAM (2006).

¹⁷ 44 C.F.R. § 59.22 (2016).

¹⁸ 42 U.S.C. § 4012a(b) (2016); *see* 12 C.F.R. § 22.3 (2016) (Office of the Comptroller of the Currency); 12 C.F.R. § 208.25(c) (2016) (Fed. Reserve Bd.); 12 C.F.R. § 339.3 (2016) (Fed. Deposit Ins. Corp.); 12 C.F.R. § 614.4930 (2016) (Farm Credit Admin.); 12 C.F.R. § 760.3 (2016) (Nat'l Credit Union Admin.).

lenders, makes flood insurance a *de facto* requirement for many residents of those zones. Private insurance companies and banks also impose similar requirements for other vulnerable structures.

NFIP insurance is available through a variety of products: for primary residences under the dwelling form policy, for commercial residential buildings under the residential condominium building association policy, and for second homes, rental homes, commercial buildings, and agricultural buildings under the general policy.¹⁹ Through the Write Your Own (WYO) program, these policies are sold and managed by private insurers and underwritten by the NFIP. Dwelling form policies offer \$250,000 of coverage for building damage and up to \$100,000 of coverage for contents.²⁰ The commercial policies offer \$500,000 of coverage for building damage and up to \$500,000 of coverage for contents, which does not extend to loss of business.²¹ Municipalities can earn premium reductions for its residents by attaining flood control measures above minimum standards through the Community Rating System (CRS).²²

Insurance premium rates fall into two categories: full-risk rates and subsidized rates. Full-risk rates, also called actuarial rates, reflect the likelihood of paying out under the policy. They are determined by the structural features of the property, the zone it is in, its height above BFE, and other risk factors.²³ Subsidized rates are available primarily to structures which were built code-compliant before FIRMs were published for their communities, but do not comply with tighter post-FIRM floodplain regulations.²⁴ Those rates also account for certain risk factors but do not reflect full risk in the premium. Most importantly, subsidized rates do not account for height above BFE.²⁵ This subsidy also runs with the land, ending only

¹⁹ 44 C.F.R. § 61 app. A (2016).

²⁰ *Id.*

²¹ *Id.*

²² The CRS, discussed in Part B below, gives credits to municipalities and states that implement hazard reduction policy measures above NFIP minimum requirements. Those credits in turn reduce premiums for policies within the enrolled CRS community.

²³ U.S. GOV'T ACCOUNTABILITY OFFICE, GAO-16-59, NATIONAL FLOOD INSURANCE PROGRAM: CONTINUED PROGRESS NEEDED TO FULLY ADDRESS PRIOR GAO RECOMMENDATIONS ON RATE-SETTING METHODS (2016) [hereinafter GAO, RATE SETTING].

²⁴ Until 2012, subsidized rates were set by subtracting the expected revenue of full-risk premiums from the "historical average loss year," or HALY, and distributing the difference across subsidized policies. This inherently undercapitalized the program for catastrophic loss years, during which the program was intended to use its Treasury borrowing power to cover the gap. FEMA has indicated to the Government Accountability Office that it no longer uses the HALY capital target. *Id.* at 9.

²⁵ Many properties built prior to NFIP-required building code revisions lie significantly below BFE. *See* FED. EMERGENCY MGMT. AGENCY, FACT SHEET FOR INSURANCE AGENTS: NFIP

if the structure undergoes substantial damage or substantial improvement,²⁶ or if the property owner does not maintain continuous coverage.²⁷ FEMA also allows policy holders to retain grandfathered rates if their property is mapped into a higher-risk flood zone or BFE by the FIRM update process, regardless of whether the change was because the map became more accurate with newer science or because conditions had changed to increase the property's actual risk exposure.²⁸

Ultimately, it is the municipal government, as a participating community,²⁹ which is responsible for enforcing NFIP mitigation requirements and implementing its risk-reduction policy goals,³⁰ typically through the building code, zoning codes, subdivision regulations, or an independent flood ordinance.³¹ Municipalities implement floodplain management ordinances through their zoning and police powers. The designated Floodplain Manager who administers the regulations is usually the local building inspector or zoning officer.³² The Floodplain Manager often also becomes responsible for public education, as the point of contact for homebuyers seeking to comply with building code, insurance, and rate-setting requirements.³³ Under the law as written, lending institutions have the responsibility to ensure that property owners in SFHAs subject to the MPR are aware of their obligations; however, enforcement is poor, and the building inspector often must provide the first notice to residents.³⁴

GRANDFATHER RULES (2009).

²⁶ Substantial damage is a loss where the cost of repairing the structure to pre-loss conditions exceeds 50% of the pre-loss market value of the structure. Substantial improvement is a modification or renovation with a cost greater than 50% of the pre-improvement market value of the structure. 44 C.F.R. § 59.1 (2016).

²⁷ 42 U.S.C. § 4014(g)(1) (2016).

²⁸ 44 C.F.R. § 59.1.

²⁹ "Community" is defined for the purposes of NFIP eligibility as "any State or area or political subdivision thereof, or any Indian tribe or authorized tribal organization, or Alaska Native village or authorized native organization, which has authority to adopt and enforce floodplain management regulations for the areas within its jurisdiction." 44 C.F.R. § 59.1.

³⁰ 44 C.F.R. § 60.3 (2016).

³¹ See, e.g. International Building Codes from the International Code Council, incorporating by reference ASCE 24-05 and ASCE 7-10, Minimum Design Loads for Buildings and Other Structures.

³² Roy D. Sedwick, *Who Is This Masked Individual Called the FPA?*, in FLOODPLAIN MANAGEMENT IN A MUTIFACETED WORLD (1997).

³³ *Id.*

³⁴ NAT'L RESEARCH COUNCIL, AFFORDABILITY OF NATIONAL FLOOD INSURANCE PROGRAM PREMIUMS: REPORT 1 31 (2015) [hereinafter REPORT 1].

B. *The NFIP in Municipal Planning and Climate Resilience*

NFIP planning and enforcement plays a significant role in municipal hazard mitigation planning, and can also influence municipal resilience enhancement efforts for coastal communities.

The NFIP provides key data and incentives for state and local flood hazard mitigation planning. The CRS is the NFIP's primary policy instrument to incentivize flood mitigation. Communities are rated on the extent to which they undertake collective mitigation projects such as tightening land use and building regulations, improving stormwater infrastructure, preserving open space, or educating the public on flood risks.³⁵ Communities reaching higher rating classes are awarded progressively higher premium discounts for their property owners.

This incentive has driven many of the communities with the highest proportion of insured properties to join the program;³⁶ however it has not been as successful at incentivizing communities to “climb the ladder” and undertake the higher-cost, higher-reward activities listed under the CRS's highest rating classes. Municipal policymakers do not benefit directly from undertaking CRS mitigation strategies; instead, they benefit indirectly from the political approval of residents receiving premium discounts. The marginal benefit of reaching each next rating class is not proportionate to the cost of implementing higher classes' requirements; thus, communities see diminishing returns for pursuing more expensive CRS ratings and most remain at the lower classes.³⁷ Unfortunately, significant reductions in flood claims and property damages typically manifest only at higher rating classes, meaning that the CRS does not efficiently incentivize the maximum feasible risk reduction.³⁸

Outside the NFIP, FEMA incentivizes municipalities to undertake hazard mitigation planning, including risk assessment, mitigation, and long-term implementation, by providing technical support and by conditioning certain

³⁵ See generally FED. EMERGENCY MGMT. AGENCY, FIA-15/2017, CRS COORDINATOR'S MANUAL (2017).

³⁶ This implies that the CRS effectively targets highly risk-exposed communities. FED. EMERGENCY MGMT. AGENCY, COMMUNITY RATING SYSTEM FACT SHEET (May 2016) (“Although CRS communities represent only 5 percent of the over 22,000 communities participating in the NFIP, more than 69 percent of all flood insurance policies are written in CRS communities.”).

³⁷ CAROLYN KOUSKY & LEONARD SHABMAN, A PROPOSED DESIGN FOR COMMUNITY FLOOD INSURANCE 21 (2015).

³⁸ Wesley Highfield & Samuel Brody, *Evaluating the Effectiveness of Local Mitigation Activities in Reducing Flood Losses*, 14 NAT. HAZARDS REV. 229, 235 (2013).

federal aid on the submission and implementation of a satisfactory Local Hazard Mitigation Plan.³⁹ FEMA also offers up to a 20% bonus in non-mitigation post-disaster relief to municipalities which have established an “enhanced” mitigation plan above minimum requirements.⁴⁰ NFIP regulation and insurance is tied into this policy: Stafford Act recovery funds are not available for properties which are noncompliant with NFIP requirements,⁴¹ and meeting some CRS standards contributes toward “enhanced” mitigation plan status.⁴²

Hazard mitigation planning, a long-established subject of expertise for municipal planning officials, dovetails well with the comparatively novel field of climate resilience planning. Hazard mitigation planning includes identifying and characterizing hazards, mitigating the risk of human casualty and property damage, and increasing the community’s infrastructural and economic capacity to quickly recover from disasters.⁴³ Climate resilience planning encompasses identifying and characterizing climate change threats, adapting to future climate conditions through sustainable economic and infrastructural development, and mitigating climate change impacts such as more frequent storm damages and increased infrastructure maintenance costs.⁴⁴ These two planning priorities have significant overlap.⁴⁵

Tools in the municipal toolbelt for resilience planning include both policy changes (e.g., private land use incentives and regulation) and infrastructure projects (e.g., stormwater system improvements and open space protections). Activities which municipalities may seek to undertake to enhance resilience include: obtaining better risk exposure information, conducting public education about climate impacts, enacting land use controls such as building codes, setbacks, open space requirements, and drainage regulations, incentivizing private

³⁹ 42 U.S.C. § 5165 (2016); 44 CFR § 201 (2016) (an enforceable LHMP is a prerequisite for Hazard Mitigation Grant Program funds).

⁴⁰ *Id.* §201.5(a) (2016).

⁴¹ Ernest B. Abbott, *Flood Insurance And Climate Change: Rising Sea Levels Challenge the NFIP*, FORDHAM ENVTL. LAW REV. 10, 44 (2014); see Matthew J. Kutner, *Idea: One for Ten Dollars, Two for Thirty: The Value of the National Flood Insurance Program Dwelling Policy for the Insured*, 43 HOFSTRA L. REV. 169, 175 (2014).

⁴² 44 CFR § 201.5(a) (2016).

⁴³ FED. EMERGENCY MGMT. AGENCY, LOCAL MULTI-HAZARD MITIGATION PLANNING GUIDANCE (2008).

⁴⁴ Matthew Sienkiewicz, *Flood Insurance*, in LEGAL TOOLS FOR CLIMATE ADAPTATION ADVOCACY 3 (2015).

⁴⁵ FED. EMERGENCY MGMT. AGENCY, INTEGRATING HAZARD MITIGATION INTO LOCAL PLANNING (2013).

adaptation behavior, improving infrastructure, relocating development, and protecting ecosystem services such as barrier marshes and dunes from changing conditions or human disruption. Climate change adaptations implicate flood hazard mitigation because sea level rise, and the concomitant increase of flood activity it causes, will be a primary climate change impact in the next century for many coastal communities.⁴⁶

C. Program Challenges

The NFIP faces significant challenges to its fundamental capacity to achieve its statutory purpose. It has become increasingly difficult and expensive for FEMA to manage, and has been listed as a “high risk” program by the Government Accountability Office since 2006.⁴⁷ When Congress created the NFIP in 1968, it was intended to be funded by premiums collected from policyholders, not by general treasury funds. The program sought to intercede into coastal risk exposure at a time when storm experiences, in particular Hurricane Betsy in 1965,⁴⁸ were driving up private insurance rates above what economically vulnerable populations already on the coast could afford to pay.⁴⁹ Coastal land use patterns and climatic conditions have changed since then, revealing flaws and inefficiencies in the program’s design.

Financial sustainability remains the most immediate vulnerability of the NFIP. Generous subsidization, which was intended to tail off as more and more homes in the flood zone were built to modern standards, has instead accumulated as the housing stock ages in place, as well as grandfathering provisions that allow structures to hold on to low rates despite more accurate FIRMs and remain structurally noncompliant despite tightened floodplain regulations.⁵⁰ FEMA estimates that most subsidized policyholders pay between 40% to 45% of full-risk

⁴⁶ Changes in precipitation patterns may additionally increase or decrease flood activity for different coastal communities, depending on regional variability. For instance, see Effects of Climate Change on the Southeast, N.C. STATE UNIV. (Aug. 1, 2013, 1:52 PM), <http://climate.ncsu.edu/edu/k12/climatechange.SE>.

⁴⁷ GAO, HIGH RISK SERIES, *supra* note 10.

⁴⁸ Hurricane Betsy struck Louisiana as a Category 3 storm and was the first natural disaster to cause more than \$1 billion in damages, devastating an area where few property owners had flood insurance. RAWLE O. KING, CONG. RESEARCH SERV., RL32972, FEDERAL FLOOD INSURANCE: THE REPETITIVE LOSS PROBLEM 12 (2005).

⁴⁹ Erwann Michel-Kerjan, *Catastrophe Economics: The National Flood Insurance Program*, 24 J. ECON. PERSPECTIVES 165, 167 (2010); Kutner, *supra* note 41, at 170-71.

⁵⁰ Ernest B. Abbott, *Floods, Flood Insurance, Litigation, Politics – and Catastrophe: The National Flood Insurance Program*, 1 SEA GRANT L. & POL. J. 129 (2008).

rate;⁵¹ however, the extent of these properties' risk exposure due to their noncompliance with flood regulations is so great that many subsidized properties nevertheless pay higher premiums than the average full-risk policy.⁵²

Severe repetitive loss structures, properties that account for only about 1% of policies but require repeated payouts because of their particular risk exposure,⁵³ generate an average of 30% of annual claims.⁵⁴ These burdens on the program's revenue undercapitalized it, making it less capable of managing costs during catastrophic loss years such as 2005 and 2012.⁵⁵ Catastrophic loss years will only become more frequent and more severe as population density on the coast increases and coastal storm impacts become more severe.⁵⁶ Moreover, as sea level rises and increases BFE, grandfathering will prevent rates from increasing correspondingly.⁵⁷

The NFIP also makes an implicit risk tolerance decision for participating communities by basing the regulatory extent of the program on SFHAs, which do not communicate detailed risk information to residents or municipal planners and may obfuscate actual exposure. Currently, the NFIP risk assessment process simply groups flood-exposed structures into those which are inside the SFHA and those which are not. The line drawn by the SFHA, which corresponds to the probabilistic maximum flood extent during a 1% annual chance flood event, is often incorrectly perceived as the line between flood exposure and safety.⁵⁸ In reality, it is a policy-derived standard rather than a statistically or hydrologically derived threshold.⁵⁹

⁵¹ THOMAS L. HAYES & D. ANDREW NEAL, FED. EMERGENCY MGMT. AGENCY, ACTUARIAL RATE REVIEW 9 (2011).

⁵² Carolyn Kousky & Howard Kunreuther, *Addressing Affordability in the National Flood Insurance Program*, 1 J. EXTREME EVENTS 1, 3 (2013).

⁵³ Severe repetitive loss properties are those that have received cumulative payments exceeding \$20,000, or at least two claims with a cumulative total exceeding the value of the property. 42 U.S.C. § 4014(h)(1) (2014).

⁵⁴ Kousky & Kunreuther, *supra* note 52, at 19.

⁵⁵ Industry standards for private insurers include folding the potential costs of catastrophic loss years into annual premium rate determinations, or otherwise capitalizing the program to be able to withstand such blows. Until BW-12, FEMA did not fold the potential costs of catastrophic loss years into any premium rates, but instead based premium rate determinations on the HALY; *See* Highfield & Brody, *supra* note 38.

⁵⁶ Jennifer Wriggins, *Flood Money: The Challenge of U.S. Flood Insurance Reform in a Warming World*, 119 PENN ST. L. REV. 361 (2014).

⁵⁷ Abbott, *supra* note 41, at 32.

⁵⁸ Galloway et. al, *supra* note 16, at 20.

⁵⁹ *Id.* (finding that "[t]he 1 percent standard was never envisioned as an optimal standard by those who proposed and implemented it. At the time of its establishment, it represented a compromise that could be agreed upon by decision makers and the people who would be affected by its

The FIRMs' simplification of risk exposure creates a moral hazard for coastal property developers, by obfuscating actual flood risks and by suppressing the price signal of flood risk in the real estate market through subsidized rates.⁶⁰ The vast majority of structures outside the SFHA are not insured against flood perils, even though nearly 25% of NFIP claims come from outside SFHAs.⁶¹ Because primarily properties within the highest risk zone pay into the system—a form of adverse selection—and many of them receive subsidized rates, the NFIP is prevented from robustly distributing flood risk across policyholders, and taxpayers are on the hook for the balance of costs during catastrophic loss years.

D. Recent Reforms

In 2009, prompted by the 2005 hurricane season of Katrina and Rita⁶² and significant riverine flooding in the Midwest in 2008,⁶³ FEMA established a NFIP Reform Working Group to convene program stakeholders, solicit practical input on programmatic failings and opportunities for improvement, and identify key reforms to overhaul the system.⁶⁴ That Working Group released a report in 2011 identifying key potential reforms⁶⁵ including premiums increased to actuarial rates,⁶⁶ tightened mapping and regulatory standards, transition to a private market model, transition to a direct post-disaster assistance model, and community-based flood insurance.⁶⁷

implementation. It would provide a point of departure for adjustments that could reflect the differences that might exist in floodplains across the country and in the objectives of the States and localities that would implement the standard.”).

⁶⁰ Michel-Kerjan, *supra* note 49, at 180.

⁶¹ Wesley Highfield et al., *Examining the 100-Year Floodplain as a Metric of Risk, Loss, and Household Adjustment*, 33 RISK ANALYSIS 186, 189 (2012).

⁶² Katrina cost the NFIP \$16.27 billion in paid losses, the greatest damage cost of any natural disaster until that point, while Rita impacted the same region less than a month later for an additional \$470 million in paid losses. RAWLE O. KING, CONG. RESEARCH SERV., NATIONAL FLOOD INSURANCE PROGRAM: BACKGROUND, CHALLENGES, AND FINANCIAL STATUS 6 (2012).

⁶³ Major floods especially in Indiana, Iowa, and Wisconsin caused widespread damage, but did not trigger a substantial NFIP payout because program take-up in the region was very poor, highlighting the challenges faced by the program nationwide in incentivizing take-up and enforcing the MPR. RAWLE O. KING, CONG. RESEARCH SERV., MIDWEST FLOODING DISASTER: RETHINKING FEDERAL FLOOD INSURANCE? 7 (2008).

⁶⁴ FED. EMERGENCY MGMT. AGENCY, NFIP STAKEHOLDER LISTENING SESSION: FINDINGS & NEXT STEPS PHASE I REPORT (2009).

⁶⁵ FED. EMERGENCY MGMT. AGENCY, NFIP REFORM: PHASE III REPORT 4-5 (2011) [hereinafter NFIP REFORM: PHASE III REPORT].

⁶⁶ Actuarial rates would reflect the full risk of paying out on the policy, and would require ending subsidies.

⁶⁷ Community-based flood insurance, discussed further in Section III, consists of the NFIP issuing insurance policies directly to communities rather than to individual property owners.

Spurred on by the public attention surrounding FEMA's internal analysis, legislative reform proposals gained momentum in the Congress, supported by the Obama Administration⁶⁸ and a combined lobbying effort from allied environmentalist and private insurance interests.⁶⁹ This movement led to the passage of the Biggert-Waters Flood Insurance Reform Act of 2012 (BW-12),⁷⁰ which instituted broad and aggressive reforms including an immediate end to grandfathering for properties when sold, a graduated increase in premiums for other grandfathered properties to actuarial rates over five years, and a rise in all other premiums to actuarial rates at a capped pace of no more than a 25% cost increase per year.⁷¹

Within months, Sandy struck the East Coast.⁷² As catastrophic damage brought to light the breadth of subsidized properties which would lose their subsidies and see rate hikes after suffering substantial damage. This, coupled with new rate hikes introduced under BW-12, raised public concern with the NFIP.⁷³ Congress responded to these concerns with the Homeowner Flood Insurance Affordability Act of 2014 (HFIAA-14),⁷⁴ which reversed the discontinuation of grandfathering for primary residences, delayed some premium increases, and refunded monies paid in from increased premiums in the preceding two years.⁷⁵

Congress directed FEMA through BW-12 and HFIAA-14 to investigate a range of further potential systematic reforms, including privatization, a community-based flood insurance model, mitigation assistance methods, and affordability programs.⁷⁶ This program of research, including the formation of the Technical

⁶⁸ OFFICE OF MGMT. & BUDGET, STATEMENT OF ADMINISTRATION POLICY: S. 1940 – FLOOD INSURANCE REFORM AND MODERNIZATION ACT OF 2011 (June 25, 2012) (supporting the Senate bill which would become the Biggert-Waters Act).

⁶⁹ See Eli Lehrer, *Strange Bedfellows: Smartersafer.Org and the Biggert-Waters Act Of 2012*, 23 DUKE ENVTL. L. & POL. FORUM 351 (2013).

⁷⁰ Pub. L. No. 112-141, 126 Stat. 405 (2012).

⁷¹ For a comprehensive review of BW-12 reforms and their implications, see Alexander B. McDonnell, *Note: The Biggert-Waters Flood Insurance Reform Act of 2012: Temporarily Curtailed by the Homeowner Flood Insurance Act of 2014 - A Respite to Forge an Enduring Correction to the National Flood Insurance Program Built on Virtuous Economic and Environmental Incentives*, 49 WASH. U. J.L. 235 (2015).

⁷² Sandy made landfall at New Jersey as a post-tropical cyclone rather than a hurricane, although it had hurricane-force winds and an unusually intense storm surge. ERIC S. BLAKE, *et al.*, NAT'L HURRICANE CTR., AL182012, TROPICAL CYCLONE REPORT: HURRICANE SANDY (2013).

⁷³ Kousky & Kunreuther, *supra* note 52, at 6.

⁷⁴ Pub. L. No. 113-89, 128 Stat. 1020 (2014).

⁷⁵ *Id.*

⁷⁶ U.S. GOV'T ACCOUNTABILITY OFFICE, GAO-15-178, FLOOD INSURANCE: STATUS OF FEMA'S IMPLEMENTATION OF THE BIGGERT-WATERS ACT, AS AMENDED (2015).

Mapping Advisory Council (TMAC)⁷⁷ and the commissioning of several studies by the National Academies of Science⁷⁸ have shaped the reform discussion in subsequent years.

Currently, FEMA is in the process of redesigning the risk assessment and underwriting process for NFIP insurance policies,⁷⁹ including increasing the total program capitalization target when setting subsidized rates, to better handle catastrophic loss years.⁸⁰ FEMA has also announced plans to implement a five-year operational planning cycle starting in 2017.⁸¹

III. PROPOSED REFORMS FOR THE 2017 REAUTHORIZATION

The regulatory structure of the NFIP has evolved dramatically from its original form in 1968. The MPR, CRS, and WYO Program were all products of legislative reform spurred by major disasters.⁸² Therefore, there is precedent to expect significant changes to the program during legislative review. Moreover, FEMA's statutory mandate to "establish and carry out" the NFIP gives the agency broad latitude to unilaterally institute systems, regulations, and agency policy through regulatory reform.⁸³ This statutory authority is intended to provide FEMA with "flexibility in the program so that such flood insurance may be based on workable methods of pooling risks, minimizing costs, and distributing burdens

⁷⁷ The TMAC, a committee of experts and stakeholders, has issued reports and recommendations regarding FEMA's mapping and risk assessment methodology, including a comprehensive review of the mapping program, an annual report issuing recommendations for improving the creation and delivery of NFIP map products, and a report and recommendations for incorporating future conditions into FEMA methodologies.

⁷⁸ The National Academies of Science have generated two reports on potential affordability frameworks and a report on community-based flood insurance, discussed *infra* in Section IV.

⁷⁹ *The National Flood Insurance Program: Reviewing the Recommendations of the Technical Mapping Advisory Council's 2015 Annual Report: Hearing Before the S. Comm. on Banking, Housing, and Urban Affairs*, 114th Cong. 5 (2016) (statement of Roy Wright, Deputy Associate Administrator, Federal Insurance and Mitigation Administration, FEMA) [hereinafter Roy Wright Statement].

⁸⁰ GAO, RATE-SETTING, *supra* note 23, at 9 (stating that FEMA no longer uses the "historical average loss year" to set revenue targets); see 42 U.S.C. § 4015(i) (2014) (requiring FEMA to incorporate catastrophic loss years in premium calculations).

⁸¹ Roy Wright Statement, *supra* note 79, at 6.

⁸² See Rachel Lisotta, *Comment: In Over Our Heads: The Inefficiencies of the National Flood Insurance Program and the Institution of Federal Tax Incentives*, 10 LOY. MAR. L.J. 511, 516-22 (2012) ("Following each natural disaster that occurred throughout the second half of the 20th century, more federal legislation was enacted to amend the original National Flood Insurance Act of 1968 to solve the inherent problems that arose with each new flood.").

⁸³ 42 U.S.C. 4001(d) (2016).

equitably among those who will be protected by flood insurance and the general public.”⁸⁴ Consequently, proposals for NFIP reform through both new legislation and new FEMA regulation have dominated the policy debate leading up to the 2017 reauthorization.

This Part undertakes to assess key reform proposals and their implications as tools for municipal policymakers to understand flood risks, manage coastal hazards, and enhance community resilience. Key themes in the reform debate include improving risk assessment and underwriting methodologies to incorporate future conditions and to provide more detailed individual-property risk information, the conflicting goals of rate reform to keep the indebted program solvent through future catastrophic loss years versus providing affordable insurance for flood-exposed properties, mitigating the overall flood risk exposure of the U.S. housing stock, and increasing private sector participation in flood insurance.

A. Risk Assessment and Future Conditions

A primary purpose of the TMAC established by BW-12 is to improve the NFIP’s risk assessment methodology.⁸⁵ The major recommendations from TMAC which potentially affect municipal resilience planning are for FEMA to individualize the risk assessment conducted by NFIP underwriting⁸⁶ and to incorporate future conditions into risk information products.⁸⁷

TMAC recommended that FEMA transition away from the 1% annual chance basis for risk rating to a “structure-specific flood frequency determination,”⁸⁸ published through modern digital platforms. A move to structure-specific risk assessment is supported by the private insurance industry, which maintains that the NFIP’s public mapping and risk assessment activities are critical to a more open private market, but that FEMA’s current data sharing policy of releasing information on a per-community rather than per-property basis is inadequate.⁸⁹

⁸⁴ *Id.*

⁸⁵ FED. EMERGENCY MGMT. AGENCY TECHNICAL MAPPING ADVISORY COUNCIL, ANNUAL REPORT, 2016 4 (2016) [hereinafter TMAC ANNUAL REPORT].

⁸⁶ *See generally id.*

⁸⁷ FED. EMERGENCY MGMT. AGENCY TECHNICAL MAPPING ADVISORY COUNCIL, FUTURE CONDITIONS RISK ASSESSMENT AND MODELLING (2016) [hereinafter TMAC FUTURE CONDITIONS RISK ASSESSMENT].

⁸⁸ TMAC ANNUAL REPORT, *supra* note 85, at Recommendation 10.

⁸⁹ However, FEMA has indicated that Privacy Act (5 U.S.C. § 552a) requirements restrict the agency from providing detailed NFIP policy and claims data to private insurers. U.S. GOV’T ACCOUNTABILITY OFFICE, GAO-16-611, FLOOD INSURANCE: POTENTIAL BARRIERS CITED TO

FEMA has not affirmatively committed to this radical shift, but it has begun studying the reform as a long-term goal alongside its ongoing revision of the rate-setting process.⁹⁰ It has also begun to send annual letters to policyholders, starting in January 2017, explaining their real risk exposure and how it may not fully be reflected by their rates, pursuant to a requirement of HFIAA-14.⁹¹

Better, more specific risk information from FEMA would be helpful to municipal planners for communicating risk to homeowners and as a decision support tool for targeting local resilience projects. Under the current system, conflicts over the strict delineation of SFHAs dominate the FIRM revision process,⁹² because placement inside a SFHA has a negative impact on property values, especially for lower priced homes.⁹³ However, the 1% annual exceedance threshold which determines SFHA boundaries is essentially an arbitrary cut-off, and implicitly makes risk tolerance decision on behalf of participating communities. A transition away from line-drawing to structure-specific risk determinations could improve public risk communication and reduce political controversy around FIRM revisions. It could also partially remedy the current lack of price signal for flood risks in the real estate market, bolstering local land use policies to disincentivize development in exposed areas.

TMAC also recommended that FEMA produce risk assessments for future conditions, especially for the impact of sea level rise on storm frequency and severity.⁹⁴ Importantly, TMAC explicitly recommended that FEMA *not* incorporate future conditions into FIRMs, but instead to publish separate, non-regulatory information products.⁹⁵

INCREASED USE OF PRIVATE INSURANCE 32 (2016) [hereinafter GAO, POTENTIAL BARRIERS].

⁹⁰ Roy Wright Statement, *supra* note 79, at 5.

⁹¹ FED. EMERGENCY MGMT. AGENCY, FEMA LETTERS: FLOOD RISK AND POLICY OPTIONS (2017), available at <https://www.fema.gov/cost-of-flood>.

⁹² See, e.g., Mark Scheifstein, *Tulane Professor's Op/Ed on Flood Maps Draws Critique from Public Officials*, TIMES PICAYUNE (June 1, 2016) (summarizing public controversy over new FIRMs which place many areas of New Orleans outside the SFHA).

⁹³ Okmyung Bin et al., *Flood Hazards, Insurance Rates, and Amenities: Evidence From the Coastal Housing Market*, 75 J. OF RISK AND INSURANCE 63 (2008) (finding that location within a flood zone lowers property value); Lei Zhang, *Flood Hazards Impact on Neighborhood House Prices: A Spatial Quantile Regression Analysis*, 60 REGIONAL SCI. AND URBAN ECON. 12 (2016) (finding that the negative impact of flood hazards on property values are stronger among lower-priced homes). Bin et al. note a common finding in the literature “that location within a floodplain lowers property value from 3 to 12 percent.” *Id.* at 65.

⁹⁴ TMAC FUTURE CONDITIONS RISK ASSESSMENT, *supra* note 87.

⁹⁵ TMAC FUTURE CONDITIONS RISK ASSESSMENT, *supra* note 87.

Municipalities must plan for the flood risk exposure over the entire lifetime of coastal structures when making land use policy. Climate resilient communities may seek to disincentivize new development in areas which are currently low-risk but will see greater risk in the future. Municipal governments must also anticipate the effects of changing real estate prices on the local economy and on property tax revenues. A SFHA on a FIRM published today indicates the area with at least a 1% chance of being flooded this year, and does not model or account for changes in that risk as sea level rises. This means that municipalities cannot rely on SFHAs alone for planning information over either the 30-year period of a typical mortgage or the 50-year and longer planning horizons necessary for many infrastructure investment decisions. A snapshot of annual risk exposure today may be appropriate for the FIRM's core purpose of insurance rate-setting on one-year policies, but more information beyond that is necessary for long-term planning. FEMA pilot studies on sea level rise flooding risks may, if implemented nationwide, provide some of that additional information.

B. Rate Reform

Flood insurance reform must confront the fundamental conflict in policy between keeping the NFIP financially solvent across catastrophic loss years and keeping flood insurance broadly available and affordable for property owners.⁹⁶ The NFIP has, throughout its existence, offered substantially subsidized insurance to coastal development through subsidized and grandfathered rates, which has undercapitalized the program for catastrophic loss years. In order to sustain this policy choice favoring affordability and broad participation over the program's financial stability, FEMA retained authority to borrow from the U.S. Treasury to make up shortfalls; the agency rarely had to exercise this authority before 2005, but high-cost catastrophic loss years like 2005 and 2013 are now understood to likely be more frequent as coastal development density increases and climate changes.⁹⁷

A central prong of BW-12 reforms was to end subsidies and grandfathering and raise rates to actuarial levels. Proposals for NFIP reform still emphasize achieving actuarial rates for a variety of policy goals, including to enable competition by private insurers, secure program financial solvency, create an accurate price signal for flood risk, and end inequitable subsidization of coastal flood risks by taxpayers.⁹⁸ Although FEMA is not able to precisely determine by

⁹⁶ See Abbott, *supra* note 50.

⁹⁷ See Abbott, *Flood Insurance and Climate Change*, *supra* note 41, at 14-20.

⁹⁸ See, e.g., ASS'N OF STATE FLOODPLAIN MANAGERS, FLOOD INSURANCE AFFORDABILITY: ASFPM RECOMMENDATIONS TO ADDRESS THE IMPACT OF NFIP REFORM 2012 (BW-12) (2013)

how much rates would increase,⁹⁹ ending subsidies would require increasing many existing subsidized premiums by 200% to 250%,¹⁰⁰ without accounting for future changes in risk exposure from sea level rise.

For coastal municipalities with high flood risk exposure, changes to the NFIP that shift the balance in favor of program solvency over affordability can have strong impacts on the local economy. Increased insurance rates imply decreased property values, negatively effecting the local economy as well as property tax revenue.¹⁰¹ The potential tax impact of rate hikes is especially significant for coastal towns which rely on the property tax revenues from high-value, high-exposure beachfront property. Municipalities in ten out of twenty-three coastal states rely on property taxes for 30% or more of their revenue.¹⁰² For some coastal towns in these states, the first row of homes represent a significant fraction of the entire town's taxable property value. These properties are also often the most risk exposed and most likely to see significant premium hikes. NFIP reform to end grandfathering on these structures may affect the market value of these properties and in turn impact municipal revenue.

(recommending raising rates to secure the program's finances and inform property owners of flood risks) [hereinafter ASFPF]; McDonnell, *supra* note 71 (recommending raising rates to end taxpayer subsidization of flood risks); SMARTER SAFER, NATIONAL FLOOD INSURANCE PROGRAM REFORM PRIORITIES (2016) (recommending raising rates to create a more accurate price signal of flood risk); MARSH, REFORMING THE NATIONAL FLOOD INSURANCE PROGRAM (2015) (recommending raising rates to enable private competition); RACHEL CLEETUS, UNION OF CONCERNED SCIENTISTS, OVERWHELMING RISK 16 (2014).

⁹⁹ FEMA is unable to calculate full-risk rates without an Elevation Certificate confirming the structure's height above BFE, and applicants for subsidized policies are not required to obtain one. The agency estimates that it would cost "several hundred million dollars" to obtain the missing elevation information. U.S. GOV'T ACCOUNTABILITY OFFICE, GAO-16-190, NATIONAL FLOOD INSURANCE PROGRAM: OPTIONS FOR PROVIDING AFFORDABILITY ASSISTANCE 33-34 (2016) [hereinafter GAO, AFFORDABILITY ASSISTANCE].

¹⁰⁰ FEMA estimates that most subsidized policies pay 40% to 45% of full-risk rates. HAYES & NEAL, *supra* note 51, at 9.

¹⁰¹ Municipalities must prepare for not just the magnitude but also the pace of rate increases. HFIAA-14 stopped BW-12's 5-year increase to actuarial rates for primary homes due to public blowback, meaning that future rate increases are likely to be more gradual.

¹⁰² Those states are: Rhode Island (51%), New Hampshire (51%), New Jersey (50%), Connecticut (49%), Maine (46%), Massachusetts (44%), Hawaii (37%), North Carolina (35%), Oregon (33%), and Virginia (30%). NAT'L LEAGUE OF CITIES, CITIES AND STATE FISCAL STRUCTURE 18 (2015).

Increased rates also disproportionately affect low-income households.¹⁰³ The risk of foreclosure for these properties is particularly acute: if a grandfathered rate is set to increase to actuarial levels too high for a resident to afford, the cost of that mandatory insurance may also decrease the value of the property below the outstanding debt of the mortgage,¹⁰⁴ stranding homeowners in at-risk properties they can afford neither to live in nor to sell.¹⁰⁵ Such properties represent candidates for homeowners assistance programs as well as potential targets for mitigation, relocation assistance, and open space acquisition projects. Overall decreases in property values in flood prone areas also serve to decrease development pressure there.

C. Incentivizing Mitigation and Assisting Affordability

To soften the negative impacts of rate increases, BW-12 and HFIAA-14 directed FEMA to investigate options for assisting with flood insurance affordability, which resulted in a two-part National Academies of Science affordability study.¹⁰⁶ Some affordability options which have gained traction in the reauthorization discussion include means-tested vouchers, tax credits,¹⁰⁷ higher deductibles,¹⁰⁸ premium caps,¹⁰⁹ and mitigation assistance. Methods which mitigate the flood risk exposure of individual insured structures are especially popular, as they serve multiple policy goals at once: reducing actuarially correct premiums and so making the program more affordable, reducing overall NFIP payouts by improving the resilience of the national housing stock, and protecting public safety.¹¹⁰

¹⁰³ Earthea Nance, *Exploring the Impacts of Flood Insurance Reform on Vulnerable Communities*, 13 INT. J. OF DISASTER RISK REDUCTION 20 (2015) (finding that low-income neighborhoods saw greater market value decreases immediately after the implementation of BW-12 than other nearby neighborhoods).

¹⁰⁴ The effect of the rate hike on home values may be sensitive to how quickly the rate increases and whether a subsequent purchaser can inherit the graduated rate with the property or must immediately accept full-risk rates. Complicating the issue, flood insurance rates typically are not disclosed until closing.

¹⁰⁵ Abbott, *supra* note 41, at 54.

¹⁰⁶ REPORT 1, *supra* note 34; NAT'L RES. COUNCIL, AFFORDABILITY OF NATIONAL FLOOD INSURANCE PROGRAM PREMIUMS REPORT 2 (2016).

¹⁰⁷ See ASFPM, *supra* note 98, at 3.

¹⁰⁸ See REPORT 1, *supra* note 34, at 106 (also additionally proposing the use of tax-deductible "disaster savings accounts" to hold income for paying off deductibles).

¹⁰⁹ GAO, AFFORDABILITY ASSISTANCE, *supra* note 99, at 18.

¹¹⁰ For most subsidized properties, the most effective mitigation option in terms of reducing risk exposure is elevation to above BFE; however, this is also a very expensive modification. See Kousky & Kunreuther, *supra* note 52, at 12.

Means-tested vouchers, which would tether the level of federal assistance to the financial ability of the property owner, replace grandfathering and subsidized rates by separating affordability assistance from the rate-setting system, allowing the NFIP to create an accurate price signal for flood risk while still assisting homeowners and promoting broader insurance participation.¹¹¹ The advantage of this approach is that it connects assistance to the income needs of the policyholder rather than the history of the insured structure, and would not run with the land at sale. FEMA has noted, however, that implementing a means test could significantly complicate the enrollment process, which may increase the implementation burden for the local floodplain manager.¹¹²

Some commentators have suggested combining means-tested subsidization with individual mitigation assistance.¹¹³ For instance, means-tested vouchers could be used to cover both increased premiums and a low-interest mitigation loan from the Small Business Administration or Hazard Mitigation Grant Program to bring the structure into compliance with building codes.¹¹⁴ This setup would advantage municipalities pursuing resilience enhancement planning, as such a program could be used in concert with local mitigation incentives or to assist compliance with enhanced building regulations.

A related proposal by the Natural Resource Defense Council (NRDC) for a Voluntary Buyout Commitment Program (VBCP) integrates means-tested payment assistance with buyout programs.¹¹⁵ Existing programs funded through the Repetitive Flood Claims and Flood Mitigation Assistance grant programs assist municipalities to identify repetitive loss or high exposure properties for buyouts.¹¹⁶ However, participation is low.¹¹⁷ Under the NRDC proposal, instead of approaching private property owners directly with an offer of sale,¹¹⁸ this program purchases a commitment, bound to the land, to buy-out the property at

¹¹¹ See REPORT 1, *supra* note 34, at 103; GAO, AFFORDABILITY ASSISTANCE, *supra* note 99, at 10.

¹¹² GAO, AFFORDABILITY ASSISTANCE, *supra* note 99, at 14.

¹¹³ Kousky & Kunreuther, *supra* note 52, at 14; *see also* Jennifer Wriggins, *In Deep: Dilemmas of Federal Flood Insurance Reform*, 5 U.C. IRVINE L.REV. 1443, 1461 (2015); ASFPM, *supra* note 98, at 2.

¹¹⁴ Kousky & Kunreuther, *supra* note 52, at 14.

¹¹⁵ B. Hayat & R. Moore, *Addressing Affordability and Long Term Resiliency Through the National Flood Insurance Program*, 45 ENVTL. L. REP. 10338 (2015).

¹¹⁶ *See, e.g.* NAT'L RES. COUNCIL, A COMMUNITY-BASED FLOOD INSURANCE OPTION 34 (2015).

¹¹⁷ Cleetus, *supra* note 98, at 17-18.

¹¹⁸ Typical buyout programs offer to purchase the property but do not, for instance, assist with moving expenses. U.S. DEP'T HOUSING & URBAN DEV., HUD-1041-CPD, WHEN A PUBLIC AGENCY ACQUIRES YOUR PROPERTY 2 (2005).

the next occasion it experiences substantial damage in exchange for an opportunity to retain subsidized premiums when rates rise.¹¹⁹ By agreeing to relocate after the next major storm, the property owner locks in an affordable rate and guaranteed minimum proceeds on the sale to the government at pre-casualty market value.¹²⁰

The NRDC proposal is designed to achieve managed retreat from coastal areas exposed to mounting threats from sea level rise. By purchasing a commitment from property owners long before a catastrophe, the VBCP manages expectations and avoids the difficult situation of government officials attempting to negotiate a buy-out within weeks after a traumatizing and economically disruptive emergency. Because the commitment puts a shelf life on occupancy of the property, it likely would decrease its market value, implicating all the attendant municipal revenue concerns discussed in Part B above. However, because it mitigates the exponentially increasing monthly costs of ending subsidies, the decrease should be less severe than in the absence of affordability assistance. As more buy-out commitments in at risk areas are honored, the municipality can reduce development in exposed areas and the burden of providing infrastructure and services there. A VBCP reform would grant significant leverage to a municipality's capacity for neighborhood-scale resilience planning, in exchange for an increased administrative burden.¹²¹ As with other affordability reforms, it would not however reduce the net costs of the national program or assist it with financial solvency.

D. Community Based Flood Insurance

Community-Based Flood Insurance (CBFI) proposes a voluntary alternative for communities participating in the NFIP to directly purchase a flood insurance policy which covers the entire jurisdiction, relegating individual policies to a form of supplemental coverage.¹²² Coverage under this community policy would insure against the same perils as under the present system. The

¹¹⁹ Hayat & Moore, *supra* note 115, at 10,339.

¹²⁰ Hayat & Moore, *supra* note 115, at 10,339.

¹²¹ To participate, municipalities would need to identify eligible properties and formulate a plan for targeted acquisition. However, the post-storm administrative burden would be decreased. The present buyout system is costly, time-consuming, and burdensome, requiring eligibility documentation and multiple rounds of property owner commitment. Under a VBCP, the municipality would be able to execute funding obligations and eligibility confirmation during normal operations, while deferring direct costs until the window after a disaster when federal assistance is at its highest.

¹²² See KOUSKY & SHABMAN, *supra* note 37; *see also* Kousky, *supra* note 12.

community would negotiate what types of properties would be covered, including individual homes and businesses, community infrastructure, continuity of services, and municipal equipment.¹²³ The community would pay premiums to the NFIP, at a rate determined by the aggregate monetary value of individual risk assessments for all the structures in the covered area,¹²⁴ and distribute the costs of coverage to the policy's private beneficiaries through its tax power. After a flood, the NFIP would issue a payout both to the community, which would be used to cover damages to public property, and directly to owners of covered private property.¹²⁵ Most importantly, a community with a policy would have the opportunity to lower its premium through mitigation measures, including resilience enhancing projects and policies.¹²⁶

Proposals for CBFI have gained traction in the conversation on NFIP reform within the last decade.¹²⁷ CBFI was one of four policy alternatives developed by FEMA's NFIP Reform Working Group in 2011, leading up to BW-12.¹²⁸ Congress has called for a study of CBFI as a potential reform opportunities multiple times, including prior to BW-12¹²⁹ and in the text of HFIAA-14.¹³⁰ Fulfilling its requirement under HFIAA-14, FEMA convened an expert committee through the National Academies of Science in 2015 to "prepare a consensus report on the future prospects for a CBFI option."¹³¹ FEMA's report to Congress, which included the NAS study, concluded that CBFI should not be implemented through NFIP regulations as currently authorized.¹³² The agency cited high implementation costs compared to benefits, lack of community interest, and lack of resources as factors in not pursuing the option administratively.¹³³ Congress could still pursue the proposal legislatively, however.

¹²³ MICHAEL DEPUE ET AL., COMMUNITY-BASED FLOOD INSURANCE: IMPACTS ON THE FLOOD HAZARD MANAGEMENT CYCLE 4 (2014).

¹²⁴ *Id.* at 5.

¹²⁵ KOUSKY & SHABMAN, *supra* note 37, at 15.

¹²⁶ DEPUE ET AL., *supra* note 123, at 4.

¹²⁷ See Michael DePue, *A Conceptual Approach to Floodplain Management 2050*, in FLOODPLAIN MANAGEMENT 2050 67-69 (2007) [hereinafter DePue, *A Conceptual Approach*].

¹²⁸ NFIP REFORM: PHASE III REPORT, *supra* note 65, at 5.

¹²⁹ 42 U.S.C. 4001(d) (2016).

¹³⁰ Pub. L. No. 113-89 § 23 (2014) ("The Administrator shall conduct a study to assess options, methods, and strategies for making available voluntary community-based flood insurance policies through the National Flood Insurance Program.").

¹³¹ DEPUE, *supra* note 123.

¹³² U.S. GOV'T ACCOUNTABILITY OFFICE, GAO-16-766, FLOOD INSURANCE: REVIEW OF FEMA STUDY AND REPORT ON COMMUNITY-BASED OPTIONS (2016).

¹³³ *Id.* at 16.

Under a CBFI program, the volunteering municipality takes responsibility for buying and funding a single umbrella insurance policy,¹³⁴ which it can extend to structures within its jurisdiction. Communities can also further spread the risk by entering into risk pools with other CBFI communities, which is a particular advantage for communities where a major part of structures are in floodplains.¹³⁵

Because the municipal government directly negotiates the terms of the policy, CBFI offers the community more flexibility and leverage to control costs and incentivize resilience.¹³⁶ The community can fine-tune its requirements and incentives for private resilience-building activity by setting the regulations for individual property payouts, including rate setting – essentially mirroring the CRS on a local scale. This gives municipalities more options to undertake joint community/private adaptation projects, such as targeted landscape improvement in a neighborhood with poor drainage and to avoid undesirable land-use.

Beyond providing more management options, CBFI *directly incentivizes* municipalities through the CRS not only to undertake proactive resilience-building programs, but to incorporate resilient policies into day-to-day decision-making. Under the current CRS, communities are *politically* incentivized to seek CRS premium discounts for property owners, but are not *financially* incentivized to participate. The CBFI program rewards communities which achieve higher CRS ratings by granting premium discounts directly to the community rather than to individual property owners, more strongly incentivizing the municipality to undertake projects and providing new funds to encourage private projects. Moreover, because premiums are determined by the aggregate monetary value of individual risk assessments for all the structures in the covered area, the municipality has a price signal for individual land use decisions, such as subdivision permitting, incentivizing it to minimize risk exposure on private property.¹³⁷

¹³⁴ Municipalities have several options to pay for premiums. They may opt to extract premium costs from those properties which benefit the most from coverage, either through property taxes or through utility fees, or they may spread the risk across the whole population, through sales and business taxes. Costs could also be collected by stormwater utility districts, water and sewage utilities, watershed or levee districts, or dedicated flood districts with appropriate taxing authority, allowing the municipality to target specific flood-prone areas. In choosing which method to use to recover costs, the municipality must make an up-front policy decision about how to spread the risk. A direct fee, proportionate to risk exposure and property value, creates a price signal for risk on the land; however, setting such a fee accurately may be technically challenging, politically divisive, and limited by the municipality's existing fee-setting authority.

¹³⁵ DePue, *A Conceptual Approach*, *supra* note 127, at 68.

¹³⁶ DePue, *A Conceptual Approach*, *supra* note 127, at 68.

¹³⁷ KOUSKY & SHABMAN, *supra* note 37, at 21-22.

Undertaking a CBFi policy would however have administrative burden implications for the municipal government.¹³⁸ Contrary to a common misconception,¹³⁹ municipalities would not have to receive a single lump-sum payout after a flood and then process payments to all of its covered properties; as with the present NFIP, insurance payments can be handled by an WYO insurer. The municipality would, however, need to institute a pricing system that meets its policy goals for risk allocation and covers the premium it must pay, which may involve new tax regulations such as creating a utility district. Some CBFi proposals envision the state or local government taking on more of FEMA's mapping and risk assessment functions in implementing community policies,¹⁴⁰ which would require either increased technical capacity or outside expert consultation.¹⁴¹

E. Privatization

Privatization of flood risk exposure has become a central topic in the 2017 reauthorization discussion,¹⁴² following a FEMA study of privatization options mandated in BW-12.¹⁴³ The federal government originally instituted the NFIP to fill a gap in coverage availability in exposed floodplains because the private insurance industry perceived the segment as too subject to adverse selection and too predictable to adequately cover risk through market penetration and

¹³⁸ A CBFi policy could make the immediate post-disaster administrative burden lighter, however, by quickly and reliably infusing municipal coffers with recovery funds. This can make post-flood permitting and economic recovery more efficient, because insurance generally pays out sooner than federal aid, and because the insured would not need to first identify and secure matching funds. *Id.* at 9.

¹³⁹ *Id.* at 15; see *supra* note 24.

¹⁴⁰ DePue, *A Conceptual Approach*, *supra* note 127, at 69 ("States would be the primary developer and keeper of technical data under this plan.").

¹⁴¹ One option to reduce the complexity of implementing a CBFi policy is to use a parametric design for the policy, where payout is triggered by a predefined event, such as a threshold flood stage, and automatically pays out a fixed sum to covered properties which can demonstrate damage in fact. Inspections are simpler under this design because on-site valuation is not necessary; often sufficient damage to qualify can be established with a photograph. The fixed payout incentivizes individual property mitigation investments to reduce actual damage closer to the payout level, but may nevertheless require supplemental individual coverage to reach MPR requirements for more exposed structures. See KOUSKY & SHABMAN, *supra* note 37, at 10.

¹⁴² See, e.g., Flood Insurance Market Parity and Modernization Act, H.R. 1442, 115th Cong. (as reported by committee June 21, 2017) (allowing private policies, including surplus line policies, to fulfill the MPR); Taxpayer Exposure Mitigation Act of 2017, 115th Cong. (as reported by committee, June 21, 2017) (requiring FEMA to cede risk to private markets).

¹⁴³ FED. EMERGENCY MGMT. AGENCY, REPORT TO CONGRESS ON REINSURING NFIP INSURANCE RISK AND OPTIONS FOR PRIVATIZING THE NFIP (2015).

diversification.¹⁴⁴ Insurers and the government were concerned that catastrophic shocks to the insurance network could drive firms to insolvency.¹⁴⁵ Today, market interest in the sector has increased because risks can be more accurately quantified, and more sophisticated financial instruments such as reinsurance, risk pooling, and catastrophe bonds reduce the threat posed by sudden shocks.¹⁴⁶ Although significant barriers to private involvement in the sector remain,¹⁴⁷ some private flood insurance is already available. Excess coverage on high-value properties is offered through the surplus lines market,¹⁴⁸ and Lloyds of London has introduced a primary coverage product through the surplus lines market in fifteen states through a Florida agency.¹⁴⁹

The federal government has flexibility in how much control over the flood insurance process it might opt to retain or privatize through the reform process, ranging from purchasing reinsurance for private risk diversification to ceding entire blocks of business to the private industry.¹⁵⁰ Under existing statutory authority, FEMA can cede risk to the private market through reinsurance or risk pooling. The agency used that authority twice in 2016, first to place \$1 million with three reinsurers in September, and then again in December to place \$1.042 billion with twenty-five reinsurers through January 1, 2018.¹⁵¹ Privatization reforms could go further to open the primary coverage market for private insurers. New legislation could achieve this by subsidizing risk, securing insurer holdings, or relaxing MPR regulations. Given adequate access to the primary coverage market and investment from the capital markets, private insurers can absorb the majority of the housing stock which can be insured profitably, leaving the

¹⁴⁴ JEFFERY CZAJKOWSKI et al., A METHODOLOGICAL APPROACH FOR PRICING FLOOD INSURANCE AND EVALUATING LOSS REDUCTION MEASURES: APPLICATION TO TEXAS (2012).

¹⁴⁵ *Id.* at 8.

¹⁴⁶ *Id.*

¹⁴⁷ See GAO, POTENTIAL BARRIERS, *supra* note 89.

¹⁴⁸ Surplus lines insurance is insurance available from insurers not licensed in the state where the policy is issued, and is used to insure high risks or risks with unusual underwriting requirements where insurers would not be able to profitably offer coverage complying with state regulations. They are not covered by state insolvency funds. For a description of surplus lines insurance, see U.S. GOV'T ACCOUNTABILITY OFFICE, GAO-14-136, PROPERTY AND CASUALTY INSURANCE: EFFECTS ON THE NONADMITTED AND REINSURANCE REFORM ACT OF 2010 (2014).

¹⁴⁹ See Andrew G. Simpson, *Private Flood Insurance Agency Now Selling in 15 States*, INS. J. (Feb. 10, 2014).

¹⁵⁰ For a succinct summary of the spectrum of options, see FED. EMERGENCY MGMT. AGENCY, *supra* note 143, at Appendix C.

¹⁵¹ FED. EMERGENCY MGMT. AGENCY, HQ-17-001, FEMA'S 2017 REINSURANCE PROGRAM BETTER MANAGES FUTURE FLOOD RISK (Jan. 3, 2017).

unprofitable remainder to the NFIP as a residual program.¹⁵² Alternately, the federal government could reduce its role in primary coverage further by converting to a reinsurance backstop program or exiting the market entirely.

Privatization implicates changes to the municipality's leverage over mitigation incentives. Presently, towns can obtain premium discounts for residents by participating in the CRS; there is unlikely to be a directly comparable mechanism for municipal governments to influence or improve private insurance rates by pursuing mitigation projects.¹⁵³

IV. OPPORTUNITIES AND CHALLENGES FOR MUNICIPAL RESILIENCE EFFORTS

The NFIP reform proposals assessed in Part III implicate changes to the way municipal and state governments manage risk in coastal hazard areas. Some changes may incentivize and assist coastal municipalities to increase their climate change resilience, or even provide a framework for new adaptations. Others may complicate municipal resilience initiatives. This Part highlights key opportunities and challenges that NFIP reform may present municipal planners through the reauthorization process.

A. More Advanced Risk Information

FEMA will continue to improve its systems for updating, digitizing, and publishing FIRMs and other risk assessment products pursuant to existing statutory directives. Program reform in 2017 may also add new risk information responsibilities to that portfolio, such as individual property risk assessments, elevation certifications for all properties, future condition modelling, or needs-testing for income-based financial assistance. Alternately, reforms may empower communities to substitute their own maps and risk information for FIRMs.¹⁵⁴

¹⁵² FED. EMERGENCY MGMT. AGENCY, *supra* note 143, at 37.

¹⁵³ Municipalities would continue to have their interests represented by state insurance commissioners.

¹⁵⁴ *See, e.g.*, Taxpayer Exposure Mitigation Act of 2017, 115th Cong. (as reported by committee June 21, 2017) (allowing communities to submit maps to FEMA for approval, upon which the maps would “be considered the flood insurance rate map in effect for all purposes of the National Flood Insurance Program”); 21st Century Flood Reform Act, H.R. 2874, 115th Cong. (as reported by committee June 15, 2017) (requiring FEMA to use “other risk assessment data and tools, including risk assessment models and scores from appropriate sources” in rate-setting).

Better information about risk can help municipal planners make decisions about new resilience initiatives. Investments in infrastructure ranging from road and utilities maintenance to installing new coastal protection or stormwater management systems require robust information about current hydrological conditions, property conditions and levels of exposure, and future changes such as sea level rise, coastal erosion, and development intensity. FEMA, through its NFIP mapping activities, is a critical source of this information.¹⁵⁵

Better public information about flood risk will also have significant impacts on the real estate market, and consequently may also impact property tax revenue. As sea level rises, SFHAs will expand, placing MPRs on many more structures. If coupled with rate reform that creates a more accurate price signal for risk, this expansion of flood premiums will make the price of coastal living increase. More broadly, better mapping and public education will more robustly inform property buyers about present and future flood risks, dampening the moral hazard that has artificially inflated development and buying pressures on the coast. This threat has loomed over the real estate market for decades and may take decades more to take full effect,¹⁵⁶ but a change in NFIP pricing, especially a rapid one, risks accelerating the effect.¹⁵⁷

These changes to a more risk-aware marketplace are a blessing and a curse for municipal planners. A more accurate pricing signal assists private individuals to make better, more informed decisions and reduces development pressure on vulnerable areas. This provides an opportunity for municipalities to target vulnerable areas for costly adaptation investments such as buyouts, open space preservation, or ecosystem rehabilitation. However, it also threatens to depress local real estate economies and reduce property tax revenues. In affluent coastal areas, decreased

¹⁵⁵ Currently about 30-60% of FEMA mapping activities are funded by policy fees rather than Congressional appropriations. *Flood Insurance Reform: A Community Perspective: Hearing Before the Hous. and Ins. Subcomm. of the H. Comm. on Fin. Servs.*, 115th Cong. (2017) (statement of Chad Berginnis, Exec. Dir., Ass'n of State Floodplain Managers). If privatization leads to a decrease in policies under the NFIP or FEMA's budget is significantly reduced, these mapping activities may contract rather than expand. This has led some advocates to propose adding a mapping fee to all private flood policies as well.

¹⁵⁶ For instance, Freddie Mac's Economic and Housing Research Group reported while considering mid- and long-term effects of climate change on the coast that "... rising sea levels and spreading flood plains nonetheless appear likely to destroy billions of dollars in property and to displace millions of people. The economic losses and social disruption may happen gradually, but they are likely to be greater in total than those experienced in the housing crisis and Great Recession." Sean Beckett & Brock Lacy, *Life's A Beach*, FREDDIE MAC ECON. & HOUSING RES. INSIGHT 6 (2016).

¹⁵⁷ This fear of a burst housing bubble triggered by rapid rate hikes was a major factor in HFIAA-14 reversing and delaying many of the rate reforms in BW-12.

tax revenues could dramatically cut into town budgets. In economically challenged coastal areas, falling house prices could impair property owners' abilities to sell their homes or pay off mortgages.

B. Increasing Individual Property Resilience

Communities committed to increasing coastal resilience have an array of tools to incentivize and assist in helping private property owners protect their own assets. Those tools include public education about climate impacts; land use controls such as building codes, set-backs, open space requirements, and drainage regulations; financial incentives such as grants, loans, and tax credits; and legal agreements such as conservation easements or buyout commitments. NFIP reforms could provide support for these activities.

Currently, simple floodplain code compliance is a serious challenge for municipalities, as significant portions of structures are grandfathered out of or otherwise not in compliance with elevation and other requirements.¹⁵⁸ NFIP policies currently include Increased Cost of Compliance coverage, which provides up to \$30,000 for noncompliant properties to come into compliance when so required after experiencing substantial damage.¹⁵⁹ Various other grants exist to assist mitigation without requiring flood damage as a prerequisite.

However, new targeted affordability programs such as low-interest mitigation loans could assist municipalities target the highest-risk properties and incentivize voluntary individual investment by directly tying it to a reduction in premiums. Municipalities could use these incentives to increase compliance or supplement them to encourage building resilience on the individual-property scale beyond compliance with NFIP minimum building codes, much as the CRS does on the community-wide scale. Programs which give municipalities more control over insurance costs, such as CBFI, would give them even more latitude to craft incentives to the particular needs of private property owners.¹⁶⁰ These

¹⁵⁸ In 2006, FEMA found that approximately 37% of structures in a sampled floodplain were not compliant with NFIP standards, and in particular 11% of structures were not properly elevated. Jacquelyn Monday et al., *An Evaluation of Compliance with the National Flood Insurance Program Part A: Achieving Community Compliance*, in EVALUATION OF THE NATIONAL FLOOD INSURANCE PROGRAM 27 (2006).

¹⁵⁹ See, e.g., 44 C.F.R. § 61 App. A(1), Coverage D (2009).

¹⁶⁰ Conversely, reforms which transfer more risk into the private market may reduce the ability of municipalities to leverage rates as resilience incentives. Currently, the CRS gives communities a direct lever on NFIP premium rates. Private policies likely would not be mandated to follow similar incentive schemes so as to keep rate-setting independent, although insurers may opt to

incentives could include local tax credits, premium or deductible reductions, and technical assistance.

C. Area-Based Mitigation

NFIP reforms can also support community-wide resilience building efforts. New risk information based on more detailed mapping, future condition modeling, actuarial rates, and affordability assistance programs could provide a wealth of data to municipal planners about the aggregate risk exposure of geographic areas within their jurisdictions. This data could be used in decision tools to make choices for targeting public education, financial assistance, and infrastructure investments. Municipalities could use flood models for siting protective infrastructure investments such as hardened barriers or nature-based flooding buffers, as well as for supporting funding applications. Model data and claims information could also be used to make investment decisions about stormwater infrastructure improvements and long-term maintenance strategies – including identifying zones where development pressure may ease and make the upkeep of roads and utilities disadvantageous. New programs such as the VBCP and CBFJ would augment new data with new policy tools like premium discounts to preserve open space and strengthen building codes.

D. Municipal Implementation Responsibilities

Although the NFIP is a federal program administered by FEMA and enforced by mortgage lenders, much of the technical and public-facing implementation of flood mitigation policies and insurance requirements regularly fall on the shoulders of floodplain managers, who are often local building inspectors or zoning officers. Many innovative program reforms provide novel opportunity for municipalities to enact resilience-building initiatives, but would require more, and sometimes a great deal more, staff training and hours to implement. Rate reforms and affordability assistance proposals are based on requiring the collection of more information on each property at the time of sale, including elevation certifications for all properties or means-testing for vouchers, grants, and loans. That information is intended to be obtained by property owners, but may still need to be enforced by code officers to comply with local law. Changes in MPR terms, such as expanding the range of private insurance policies which fulfill the requirement, could create confusion between property owners and lenders.

voluntarily develop incentive schemes of their own if they perceive the resulting risk reductions to be advantageous. Additionally, if flood policies continue to be offered primarily on surplus lines as they are now, state insurance commissioners would not have as direct influence over policy terms as they do with admitted carriers.

For example, under reforms proposed in one bill recently reported out of the House Financial Services Committee, communities with 50 or more repetitive loss structures would be required to “identify the areas within the community” with repeated flood losses and “develop a community-specific plan for mitigating continuing flood risks.”¹⁶¹ The bill requires FEMA to provide communities with claims information on repetitive loss structures, and allows it to “consider the extent to which a community has complied with this subsection and is working to remedy problems with addressing repeatedly flooded areas” when reviewing mitigation grant applications. This bill holds communities accountable for areas repetitively damaged by floods by creating additional implementation responsibilities for the municipal government and essentially conditioning future mitigation assistance on a policy commitment to abating repetitive loss structures.

New programs, such as targeted mitigation loans, voluntary buyout commitments, and community-based insurance policies, call for dramatic investments of time and effort by local decision makers to identify candidate properties, as well as work with property owners to generate new technical information and execute binding legal agreements. Nevertheless, for coastal communities that have already committed to investing in increasing community resilience, these programs would provide support and technical assistance for reaching that goal.

V. CONCLUSION

The policy debate around national flood insurance reform leading up to the 2017 reauthorization of the NFIP foreshadows extensive, fundamental changes to the program as it evolves to handle rising seas, more frequent and more expensive catastrophic loss years, and mounting programmatic debt. With both chambers of Congress and the White House controlled by a single party in 2017, and a new administration taking control at FEMA, there is significant opportunity for major program changes in the near-term. Many innovative structural reforms offer opportunities for municipalities to incentivize individual mitigation and pursue community-wide resilience planning. However, reforms may also confront municipalities with the challenges of protecting tax revenues from real estate market shocks and on the ground program implementation.

¹⁶¹ Repeatedly Flooded Communities Preparation Act, H.R. 1558, 115th Cong. (as reported by committee June 21, 2017).

COMPARING POLICIES FOR ENCOURAGING RETREAT FROM THE
MASSACHUSETTS COAST

Michael Graikoski and Porter Hoagland¹

I. INTRODUCTION

Along the U.S. Atlantic coast, the lands and infrastructure located on barrier islands and beaches and in backbay estuarine environments face mounting threats from king tides, storm surges, and sea-level rise.² From the late 19th century to the present, sea-level rise on the United States' Atlantic coast has been more rapid than any other century-scale increase over the last 2,000 years.³ Even slight increases in sea-level rise now have been hypothesized to significantly increase the risks of coastal flooding in many places.⁴

In New England, some of the most severe northeast storms ("nor'easters") have become notorious for consequent extreme losses of coastal properties. Some of the better known examples are the Blizzard of '78 (February 1978), the Halloween

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² James E. Neumann, Kerry Emanuel, Sai Ravela, Lindsay Ludwig, Paul Kirshen, Kirk Bosma & Jeremy Martinich, *Joint Effects of Storm Surge and Sea-level Rise on US Coasts: New Economic Estimates of Impacts, Adaptation, and Benefits of Mitigation Policy*, 129 CLIMATE CHANGE 337 (2015) (presenting a simulation framework, conflating three models of tropical cyclones, storm surges, and economic impacts and adaptation, used to estimate the effects of storm surge and sea-level rise on the U.S. Atlantic coast through 2100; finding a capitalized estimate of impacts of nearly \$1 trillion, net of adaptation).

³ Andrew C. Kemp, Benjamin P. Horton, Jeffrey P. Donnelly, Michael E. Mann, Martin Vermeer & Stefan Rahmstorf, *Climate Related Sea-level Variations Over the Past Two Millennia*, 108 PROC. NAT. ACAD. SCI. 11017 (2011).

⁴ David L. Kriebel, Joseph D. Geiman, & Gina R. Henderson, *Future Flood Frequency Under Sea-Level Rise Scenarios*, 31 J. COASTAL RES. 1078 (2015).

Eve Storm of October 1991 (also known as the Perfect Storm), and Winter Storm Juno (January 2015).⁵ In coastal Massachusetts, 150 of the 389 “severe repetitive [flooding] loss” properties, which are properties that have had four or more flood loss claims on a policy issued by the U.S. National Flood Insurance Program—are located on the shorefront of Scituate, a town on the state’s east-facing South Shore. One Scituate property may have filed claims at least 14 times.⁶

The built environment of coastal communities in Massachusetts comprises residential, business, and government properties, such as homes and other buildings. It also includes public and utility infrastructures, such as roads, electric utilities, water mains, natural gas lines, and sewage systems. This physical capital has become increasingly vulnerable to flooding and erosion due to storm events and possible inundation from sea-level rise.⁷ Some of the Commonwealth’s most exposed communities are situated on coastal barriers located along its east-facing shores, including Plum Island (Newbury), Nantasket (Hull), Humarock (Scituate), Brant Rock (Marshfield), North Duxbury Beach (Duxbury), and Town Neck Beach (Sandwich).⁸ This heightened vulnerability has compelled property owners and municipal officials alike to argue for building either “soft” or “hard” coastal protections (beach replenishments or engineered structures such as seawalls, respectively)⁹ as well as adopting strategies for the potential removal of the built environment away from the coast, known as retreat.¹⁰

⁵ See, e.g., Duncan M. FitzGerald, Sytze van Heteren & Todd M. Montellot, *Shoreline Processes and Damage Resulting from the Halloween Eve Storm of 1991 Along the North and South Shores of Massachusetts Bay, U.S.A.*, 10 J. COAST. RES. 113 (1994) (finding that, during a strong, prolonged northeast storm, sandy beaches protected by seawalls or revetments experienced greater (erosive) changes than beaches with wide berms or adjacent dunes).

⁶ Beth Daley & Shan Wang, *As Storm Flood Damage Swells, a Growing, Controversial Call to Buy Out Homeowners*, NEW ENGLAND CENTER FOR INVESTIGATIVE REPORTING & WGBH (Feb. 8, 2015), <http://news.wgbh.org/post/storm-flood-damage-swells-growing-controversial-call-buy-out-homeowners> [hereinafter *Call to Buy Out*].

⁷ CLIMATE CENTRAL, FACTS AND FINDINGS: SEA LEVEL RISE AND STORM SURGE THREATS FOR MASSACHUSETTS (2012); MASSACHUSETTS COASTAL HAZARDS COMMISSION (MCHC), PREPARING FOR THE STORM: RECOMMENDATIONS FOR MANAGEMENT OF RISK FROM COASTAL HAZARDS IN MASSACHUSETTS (2007), <http://www.mass.gov/eea/docs/czm/stormsmart/chc-final-report-2007.pdf> [hereinafter PREPARING FOR THE STORM].

⁸ MASSACHUSETTS COASTAL EROSION COMMISSION (MCEC), REPORT OF THE COASTAL EROSION COMMISSION (2015), <http://www.mass.gov/eea/docs/czm/erosion-commission/cec-final-report-dec2015-complete.pdf> [hereinafter MCEC].

⁹ PREPARING FOR THE STORM, *supra* note 7.

¹⁰ See JAMES E. TITUS, U.S. ENVTL. PROT. AGENCY, ROLLING EASEMENTS (2011), <http://papers.risingsea.net/rolling-easements.html> [hereinafter ROLLING EASEMENTS]; James E. Titus, *Rising Seas, Coastal Erosion, and the Takings Clause: How to Save Wetlands and Beaches Without Hurting Property Owners*, 57 MD. L. REV. 1279 (1998) [hereinafter *Rising Seas*]; JESSICA

Historically, public policies directed at the problem of coastal erosion in Massachusetts focused on options for modernizing or expanding coastal engineering structures, such as seawalls, revetments, or bulkheads to protect the built environment. The Commonwealth's Wetlands Protection Act (WPA) of 1972 included provisions that were designed to mitigate the unwanted consequences of coastal engineering structures.¹¹ The grandfathering of some coastal properties (some of which qualify due to their location on "coastal banks") and the continued tolerance of the emplacement of hard structures has resulted in uneven progress, however. Given the widespread use of seawalls and other hard protections prior to the WPA, some recent policies continue to support strategies aimed at maintaining hard protections. For example, the legislative provisions of the 2014 Massachusetts Environmental Bond, include funding for seawall repair.¹²

Hard structural protections can be a costly means of responding to coastal hazards, however. In many situations, seawalls or other coastal engineering structures may offer only short-term solutions to the protection from coastal hazards.¹³ Further, when these types of protections are overwhelmed—and catastrophic damage occurs—the costs to federal and state governments resulting from emergency responses and disaster assistance can be significant.¹⁴

GRANNIS, GEORGETOWN CLIMATE CTR., ADAPTATION TOOLKIT: SEA LEVEL RISE AND COASTAL LAND USE (2011) [hereinafter ADAPTATION TOOLKIT]; Jessica Grannis, *Coastal Management in the Face of Rising Seas: Legal Strategies for Connecticut*, 5 SEA GRANT L. & POL'Y J. 1 (2012).

¹¹ See the discussion *infra* at notes 37-65.

¹² 2014 Mass. Acts 1, AN ACT PROVIDING FOR THE PRESERVATION AND IMPROVEMENT OF LAND, PARKS AND CLEAN ENERGY IN THE COMMONWEALTH, ch. 286, <https://malegislature.gov/Laws/SessionLaws/Acts/2014/Chapter286> [hereinafter ENVIRONMENTAL BOND]. In the Governor's Executive Office of Energy and Environmental Affairs, a program for Dam or Seawall Repair or Removal has been established. EXECUTIVE OFFICE OF ENERGY AND ENVIRONMENTAL AFFAIRS, DAM AND SEAWALL REPAIR OR REMOVAL PROGRAM: ANNUAL REVIEW FISCAL YEAR 2015 (2015), available at <http://www.mass.gov/eea/docs/eea/wrc/2015-annual-review.pdf>.

¹³ See MCEC, *supra* note 4 for some preliminary estimates of the values of capital infrastructure at risk to coastal erosion in Massachusetts. See also Fitzgerald et al., *supra* note 5.

¹⁴ Six of the ten most costly natural disasters in U.S. history have involved coastal storms. NAT'L CENTERS FOR ENVTL. INFO. (NCEI), NAT'L OCEANIC & ATMOSPHERIC ADMINISTRATION, BILLION-DOLLAR WEATHER AND CLIMATE DISASTERS: TABLE OF EVENTS (2017), <https://www.ncdc.noaa.gov/billions/events>. As an example, in April 2013, a major disaster was declared for the Massachusetts Severe Winter Storm, Snowstorm, and Flooding (DR-4110) in early February of 2013, resulting in nearly \$53 million in public assistance grants for communities to respond to and recover from the storm.

Over the long term, property owners, government agencies at all levels, and the public may need to consider the potential effectiveness of other policies, such as those that encourage retreat.¹⁵ In particular, policies that provide financial incentives for coastal property owners to retreat arguably might be more effective from society's standpoint than regulatory approaches that allow property owners to remain.¹⁶ Comparisons across policy alternatives, market-based or other, could help facilitate the identification and selection of the most effective policies.¹⁷

Rolling easements are one type of policy that could be employed to influence human responses to shoreline change.¹⁸ A rolling easement moves with the shoreline, either landward, as a consequence of the erosion of land, or seaward, as a consequence of the accretion of land. Typically, a rolling easement requires that shorefront property owners cannot build "hard" protective structures, such as a seawall. Other buildings or infrastructure, including public utilities, must be located landward of a rolling design boundary.

When erosion is the dominant hazard, however, under a rolling easement the owner's property rights may become increasingly compressed.¹⁹ Some properties may even be squeezed out of existence. Consequently, under such a policy, the shorefront property owner who benefits from the waterfront amenities also bears the risks of erosion, entailing damage to or loss of their property. Under unusual circumstances, as discussed below in the case of Plum Island, Massachusetts, the incentives can be large enough to cause property owners and municipalities to

¹⁵ Carolyn Karp, *When Retreat is the Better Part of Valor: Analysis of Strategies to Incentivize Retreat from the Shore*, PROC. SHIFTING SEAS SYMPOSIUM (2012); Kenneth J. Bagstad, Kevin Stapleton, & John R. D'Agostino, *Taxes, Subsidies, and Insurance as Drivers of United States Coastal Development*, 63 ECOLOGICAL ECON. 285 (2007) (identification, characterization, and qualitative analysis arguing for the reform of tax, subsidy, and insurance programs affecting coastal development and disaster relief).

¹⁶ The Commonwealth's Environmental Bond does provide for up to \$20 million for "buy-outs" of coastal properties from willing sellers (ENVIRONMENTAL BOND, *supra* note 12, at §2B, subsidiary 2000-7060). This amount is regarded by observers as unreservedly inadequate. *Call to Buy Out*, *supra* note 6.

¹⁷ Robert J. Johnston, Mahesh Ramachandran & George R. Parsons, *Benefit Transfer Combining Revealed and Stated Preference Data: Nourishment and Retreat Options for Delaware Bay Beaches*, in R.J. Johnston, J. Rolfe, R. Rosenberger, & R. Brouwer (eds.), *BENEFIT TRANSFER OF ENVIRONMENTAL AND RESOURCE VALUES: A GUIDE FOR RESEARCHERS AND PRACTITIONERS* (2015) (comparing the net costs of alternative responses to shoreline erosion including beach replenishment, planned (strategic) retreat, idiosyncratic (basic) retreat, and doing nothing).

¹⁸ ROLLING EASEMENTS, *supra* note 10.

¹⁹ *Rising Seas*, *supra* note 10.

flout regulatory constraints on the construction of protective hard structures.²⁰

Market-based policies could be more palatable for shorefront property owners because they shift onto others some or all of the risks of property losses due to erosion. Such policies might gain political traction, especially if they encourage or facilitate retreat from the coast, thereby potentially reducing the costs of public emergency or disaster responses.

One market-based complement to a rolling easement encompasses conservation easements,²¹ where governments, non-governmental organizations, or local community groups could purchase any extant rights from a private landowner to construct hard or soft structural protection.²² These rights then would remain unexercised.

Two other market-based policies are a buyout, through which a property could be purchased from its owner, or a buyout-leaseback, involving a property purchase and subsequent rental of the property back to its original owner or to another tenant.²³ The latter may have the potential for mitigating some of the fiscal costs of a government program to encourage eventual retreat from the coast.

In this paper, we identify erosion hotspots in coastal Massachusetts that may be leading candidates for policies to encourage retreat. Transferring the results of hedonic pricing approaches,²⁴ which can be used to estimate the marginal implicit prices of housing attributes that affect the risks of shoreline changes, we develop rough estimates of the fiscal costs to government for implementing these policies.

The budgetary (fiscal) costs of implementing alternative policy approaches are highly relevant to decision-making about protection or retreat, particularly for cash-strapped municipalities and state agencies. A characterization of the scale

²⁰ See the discussion *infra* at notes 83-93.

²¹ See Grannis, ADAPTATION TOOLKIT, *supra* note 10, at 50; ROLLING EASEMENTS, *supra* note 10, at 49; and the discussion *infra* at note 70. In Massachusetts, conservation easements are known as conservation restrictions. MASSACHUSETTS DIVISION OF CONSERVATION SERVICES (DCS), MASSACHUSETTS CONSERVATION RESTRICTIONS HANDBOOK (2008).

²² Other forms of compensation for such transfers might involve various forms of tax relief.

²³ See the discussion *infra* at notes 71-82.

²⁴ See, e.g., Warren Kreisel, Craig Landry & Andrew Keeler, *Coastal Erosion Hazards: The University of Georgia's Results in* THE HEINZ CENTER FOR SCIENCE, ECONOMICS, AND THE ENVIRONMENT (THC), EVALUATION OF EROSION HAZARDS (2000); Di Jin, Porter Hoagland, Donna Au, & Jun Qiu, *Shoreline Change, Seawalls, and Coastal Property Values*. 114 OCEAN & COASTAL MGMT. 185 (2015).

and incidence of potential costs could help to elucidate the incentives and distributional consequences faced by both property owners and governments. We argue that the potential scale of these costs and their likely patterns of incidence across property owners and over different levels of government could render certain policies that encourage retreat from the coast problematic to implement.

In Section II, we review the heterogeneous distribution of shoreline changes and hazards, focusing on Massachusetts as a relevant example. The ways in which the WPA restricts the construction of coastal engineering structures as a protection against erosion are characterized in detail in Section III. Four possible policy approaches to encourage retreat from the coast, including the status quo, are discussed in Section IV.

As a relevant example, we investigate the case of the Plum Island barrier, which comprises a coastal dune resource in the municipality of Newbury, Massachusetts. Plum Island is the location of one of the Commonwealth's 22 recognized coastal erosion hotspots. In Section V, we make estimates of the scales of the fiscal costs of implementing each of the four policy approaches for Plum Island, and we identify some potential sources for funding the alternative approaches. Finally, we conclude in Section VI with a discussion of the incentives, distributional effects, and reasons why market-based policies may not be implemented.

We argue that it is becoming increasingly important to examine alternative policies to encourage the retreat of property owners from a dynamic and ever more hazardous coastline in Massachusetts. Coastal communities are likely to focus on the fiscal costs—and not necessarily the net economic welfare changes—involving a set of feasible policy alternatives that encourage retreat. For the case we examine, estimates of the scales of fiscal costs and their distributions across shorefront property owners and levels of government suggest that market-based approaches to adapt to shoreline change seem unlikely to be implemented soon. As a consequence, retreat from the coast may not be encouraged, thereby mitigating adaptation to shoreline change and increasing the risks of continued human habitation along the coast.

II. THE NATURE OF SHORELINE HAZARDS

The vulnerability of coastal shorefront property and infrastructure has been the focus of numerous recent studies. A general perception exists that the built environment along the U.S. Atlantic coast has become increasingly

vulnerable to coastal hazards, as a consequence of sea-level rise²⁵, higher high tides²⁶, storm surges²⁷, damages from waves²⁸, and high winds.²⁹ This perception, abetted by observations of damages from superstorms like Hurricane Sandy in October 2012, suggests that the situation is ubiquitously dire. Recent work suggests, however, that the extent to which coastal communities are vulnerable may depend chiefly upon idiosyncratic factors, such as the local topography or the presence of both soft and hard structural protections.³⁰

Risk mapping undertaken by the U.S. Geological Survey paints a complex picture of the risks of shoreline change in Massachusetts, using historical data on the geographic position of shorelines.³¹ Nearly one-third of the coastal towns in Massachusetts have experienced net accretion (a gain of material to beaches and an increase in their width) during the last 30 years.³² The short-term shoreline change data include high levels of uncertainty due to the influence of storms, however, so they may not be fully reflective of a longer-term trend.³³ On the other hand, the long-term shoreline change data may not fully encompass recent nonlinear increases in the rate of sea-level rise induced by climate change and the growing shoreline losses that are likely to result.

²⁵ Neumann et al., *supra* note 2.

²⁶ Erika Spanger-Siegfried, Melanie Fitzpatrick & Kristina Dahl, ENCROACHING TIDES: HOW SEA-LEVEL RISE AND TIDAL FLOODING THREATEN US EAST AND GULF COAST COMMUNITIES OVER THE NEXT 30 YEARS (2014); Stephanie Krue, *The Impacts of Sea-level Rise on Tidal Flooding in Massachusetts*, 32 J. COASTAL RES. 1302 (2016).

²⁷ See PREPARING FOR THE STORM, *supra* note 7.

²⁸ Robert Dolan & Robert E. Davis, *An Intensity Scale for Atlantic Coast Northeast Storms*, 8 J. COASTAL RES. 840 (1992).

²⁹ Quanwang Lia, Cao Wang & Hao Zhang, *A Probabilistic Framework for Hurricane Damage Assessment Considering Non-stationarity and Correlation in Hurricane Actions*, 59 STRUCTURAL SAFETY 108 (2016); Daniel R. Petrolia, Joonghyun Hwang, Craig E. Landry & Keith H. Coble, *Wind Insurance and Mitigation in the Coastal Zone*, 91 LAND ECON. 272 (2015); Stephen Farber, *The Value of Coastal Wetlands for Protection of Property against Hurricane Wind Damage*, 14 J. ENVTL. ECON. & MGMT. 143 (1987).

³⁰ Erika E. Lentz, E. Robert Thieler, Nathaniel G. Plant, Sawyer R. Stippa, Radley M. Horton & Dean B. Gesch, *Evaluation of Dynamic Coastal Response to Sea-level Rise Modifies Inundation Likelihood*, 6 NATURE CLIMATE CHANGE 696 (2016) (using information about coastal elevations, vertical land movements, and land covers, the authors specify probabilistic shoreline response models for the Atlantic coastline, finding that 70% of the coast is able to respond dynamically to sea-level rise, and suggesting that static inundation models over-predict the submergence of coastal lands).

³¹ E. Robert Thieler, Theresa L. Smith, Julia M. Knisel & Daniel W. Sampson, MASSACHUSETTS SHORELINE CHANGE MAPPING AND ANALYSIS PROJECT, 2013 UPDATE (USGS OFR 2012-1189) (2013).

³² MCEC, *supra* note 8, at 3-3 to 3-5.

³³ Thieler et al., *supra* note 31.

Shoreline change within a community is nonuniform, and there are several locations known to be erosion hot spots where erosion occurs more rapidly than elsewhere. There are at least 22 such hotspots that have been recognized in coastal Massachusetts, many of which are located in towns that otherwise have revealed only slow erosion or slow accretion over time.³⁴

The work on historical rates of shoreline change undertaken by the U.S. Geological Survey is vital because it highlights a range of coastal vulnerabilities across Massachusetts towns. These vulnerabilities are influenced by the position at any location of the built environment, especially private residences and public infrastructures, and the presence and conditions of protective structures or practices, such as seawalls, revetments, groins, jetties, gabions, coir bags, restored dunes, beach replenishments, and beach scraping.³⁵ An extensive literature exists on the advantages and drawbacks of these human responses to shoreline change.³⁶

The fact that vulnerabilities vary along the coastline implies that locational priorities could be established for implementing approaches to reduce the risks of shoreline change. For example, a policy to compensate coastal property owners (e.g., to acquire their properties or “buy them out”) in order to carry out a retreat from the coast could begin at a small scale, focusing on those shorefront properties located at the most vulnerable locations (possibly at the hotspots where erosion rates are highest). As experience accumulates and learning takes place, a successful buy-out program could be expanded, possibly rendering it more effective and thereby mitigating coastal shorefront vulnerabilities over time.

III. LIMITS ON THE POTENTIAL FOR COASTAL PROTECTION

In Massachusetts, private ownership of shorefront property typically extends down to the mean low water mark.³⁷ On the intertidal lands and seaward

³⁴ MCEC, *supra* note 8, at 3-5.

³⁵ James T. Carley, Thomas D. Shand, Ian R. Coghlan, Matthew .J. Blacka, Ronald J. Cox, Adam Littman, Ben Fitzgibbon, Grant McLean & Phil Watson, BEACH SCRAPING AS A COASTAL MANAGEMENT OPTION (2010), <http://coastalconference.com/2010/papers2010/James%20Carley%20full%20paper.pdf>.

³⁶ The full range of coastal engineering structures and their levels of effectiveness are introduced, described, and analyzed in J. WILLIAM KAMPHUIS, INTRODUCTION TO COASTAL ENGINEERING AND MANAGEMENT (2nd ed. 2010).

³⁷ Boston Waterfront Development Corporation v. Commonwealth of Massachusetts, 378 MASS. 629 (1979). *See also* Jack Potash, *The Public Trust Doctrine and Beach Access: Comparing New Jersey to Nearby States*, L. SCH. STUDENT SCHOLARSHIP 738 (2016), http://scholarship.shu.edu/student_scholarship/738

of the mean low water mark, public trust rights exist, including the public's interest in navigation, fishing, fowling, and potentially other public interests.³⁸ As the shoreline shifts, due to erosion or accretion, the boundary between private and public interests also may shift—or at least become less certain. In Massachusetts, eight public interests that may be impacted by a fluctuating boundary have been articulated explicitly in the language of the WPA. They include public or private water supply; groundwater supply; flood control; storm damage prevention; prevention of pollution; protection of land containing shellfish; and protection of fisheries and wildlife habitat.³⁹

A primary objective of the WPA has been to ensure that the actions of private owners to protect their shorefront properties from the hazards of flooding and erosion, such as through the construction of coastal engineering structures, be carried out only if they do not adversely impact these eight public interests.⁴⁰ With respect to the public's specific interests in both flood control and storm damage prevention, a leading concern is that the source of supply to the coast of sediments, sand, or other materials from coastal beaches, dunes, and banks remain unhindered.⁴¹ In fact, coastal engineering structures are designed specifically to alter sediment transport processes.⁴² Coastal dunes on barrier beaches, the primary frontal dunes along other shorelines, and coastal banks all have been designated in regulations implementing the WPA as *per se* significant to the interests of flood control and storm damage prevention because of their capabilities for supplying sediments, sand, or other materials and their heights relative to storm waves and surges.⁴³

Beginning in the late 19th century, but especially during a period of rapid coastal barrier and shorefront development in the mid-twentieth century, many

³⁸ Joseph L. Sax, *The Public Trust Doctrine in Natural Resource Law: Effective Judicial Intervention*, 68 MICH. L. REV. 471 (1970).

³⁹ MASS. GEN. LAWS. ch. 131, § 40 (1972).

⁴⁰ MASS. OFFICE OF COASTAL ZONE MGMT. (MCZM), POLICY GUIDE 15 (October 2011).

⁴¹ *Id.* at 19-24. Massachusetts Coastal Hazard Policy No. 1 holds that it is enforceable state policy to “[p]reserve, protect, restore, and enhance the beneficial functions of storm damage prevention and flood control provided by natural coastal landforms, such as dunes, beaches, barrier beaches, coastal banks, land subject to coastal storm flowage, salt marshes, and land under the ocean.” *Id.* at 19.

⁴² 310 MASS. CODE REGS §10.28(1) (2014). 310 MASS. CODE REGS §10.23 defines the term “coastal engineering structure” as meaning, but not limited to, “any breakwater, bulkhead, groin, jetty, revetment, seawall, weir, riprap or any other structure that is *designed to alter wave, tidal or sediment transport processes* in order to protect inland or upland structures from the effects of such processes” (emphasis added).

⁴³ *Id.* §10.28(1), §10.30(1).

significant stretches of the Massachusetts coastline had been armored with coastal engineering structures, including seawalls, revetments, and other hard structures, in order to protect residences or other buildings from flooding during storms and loss of land due to erosion.⁴⁴ This infrastructure has been mapped and inspected recently by the Commonwealth, revealing a range of physical conditions—and therefore a range of effectiveness—and a mix of ownership, from private to public to unknown.⁴⁵ Much of this infrastructure now is recognized by the Commonwealth to be badly in need of upgrades or replacement.⁴⁶

Under provisions of the WPA, rules were modified with respect to the siting of coastal engineering structures.⁴⁷ The WPA was enacted in part to “ensure that development along the coastline [was] located, designed, built and maintained in a manner that protects the public interests in the coastal resources.”⁴⁸ Under the WPA, specific types of “resource areas” were characterized, and precautionary rules were put in place for siting coastal engineering structures in each resource area (Table 1).⁴⁹ These rules require that project proponents show clearly that a proposed structure plays no role in adversely affecting public interests in coastal resources, and it requires an authority issuing permission for siting the structure, which except in rare instances is the relevant municipal Conservation Commission, to make a written determination to that effect.⁵⁰

⁴⁴ MASS. DEP’T OF CONSERVATION AND RECREATION (DCR), OFFICE OF WATERWAYS, MASSACHUSETTS COASTAL INFRASTRUCTURE INVENTORY AND ASSESSMENT PROJECT (2009) at 4.

⁴⁵ MASS. OFFICE OF COASTAL ZONE MGMT. (MCZM), STORMSMART COASTS—INVENTORIES OF SEAWALLS AND OTHER COASTAL STRUCTURES (2016), <http://www.mass.gov/eea/agencies/czm/program-areas/stormsmart-coasts/seawall-inventory/>. See also, Jeremy Fontenault, Nathan Vinhateiro & Kelly Knee, MAPPING AND ANALYSIS OF PRIVATELY-OWNED COASTAL STRUCTURES ALONG THE MASSACHUSETTS SHORELINE (2013), <http://www.mass.gov/eea/docs/czm/stormsmart/seawalls/private-coastal-structures-2013.pdf>.

⁴⁶ DCR, *supra* note 44.

⁴⁷ The WPA was drafted on a foundation of earlier Massachusetts legislation and local zoning efforts to mitigate the adverse effects of constructing coastal engineering structures on wetlands. See Alexandra D. Dawson, *Massachusetts Wetlands and Floodplains Revisited*, 4 W. NEW ENG. L. REV. 623 (1982).

⁴⁸ 310 MASS. CODE REGS. §10.21 (2014).

⁴⁹ *Id.* §10.25-§10.35.

⁵⁰ *Id.* §10.02-§10.03.

Table 1: Massachusetts Wetlands Protection Act (WPA) Provisions Regarding the Siting of Coastal Engineering Structures within some of the Relevant Resource Areas

RESOURCE AREA	COASTAL ENGINEERING STRUCTURES	CITATION
Land under the Ocean	Allowed in Designated Port Areas if adverse effects on coastal banks or coastal engineering structures in adjacent resource areas are minimized	310 MASS. CODE REGS §10.26(4)
Tidal Flat	Allowed if clear showing of no role ^a	310 MASS. CODE REGS §10.27(3)
Coastal Beach	Allowed if clear showing of no role ^b	310 MASS. CODE REGS §10.27(3)
Barrier Beach	Allowed if clear showing of no role ^{b,d} , follows rules for coastal beaches and coastal dunes	310 MASS. CODE REGS §10.28(3)
Rocky Intertidal	Allowed if clear showing of no role ^c	310 MASS. CODE REGS §10.31(1)
Coastal Dune	Not allowed	310 MASS. CODE REGS §10.28(4)
Coastal Bank	Allowed for “grandfathered” properties ^d	310 MASS. CODE REGS §10.30(3)

^a Does not play a role adversely affecting the protection of marine fisheries or land containing shellfish.

^b Does not play a role adversely affecting storm damage prevention, flood control, or protection of wildlife habitat.

^c Does not play a role adversely affecting storm damage prevention, flood control, protection of marine fisheries or wildlife habitat, and, where there are shellfish, the protection of land containing shellfish.

^d A coastal engineering structure shall be permitted when required to prevent storm damage to buildings constructed prior to August 10, 1978.

The built environment on coastal barriers and other exposed landforms, especially buildings that constitute shorefront residences, occurs in WPA resource areas known as barrier beaches, coastal dunes, or coastal banks.⁵¹ As seen in Table 1, except for coastal banks, the presence of these resource areas in any specific case involving prospective development entails significant restrictions on the extent to which coastal engineering structures can be built or modified.⁵²

Here, from a policy-analytic perspective, we interpret these restrictions as encompassing a *de facto* form of rolling easement in Massachusetts, because shorefront property owners may be barred by regulation from protecting their buildings and lands with hard structures from the shoreline changes caused by storms or sea-level rise.⁵³ As shoreline erosion takes place, shorefront properties may become increasingly compressed between an advancing shoreline and the next row of properties located immediately behind the shorefront.⁵⁴ Should buildings be damaged as a consequence of flooding or erosion, property owners desiring to rebuild may be required under the provisions of the Commonwealth's building code or local bylaws to elevate their buildings on pilings or to set the buildings back further away from the shorefront.⁵⁵ Eventually, a building may be damaged or lost due to the inundation caused by a storm or higher high tides, or both the building and the land may be lost to erosion during a storm.⁵⁶

Properties located on coastal banks face similar restrictions, except for those properties with buildings that were constructed prior to August 1978.⁵⁷ For the latter, the construction and maintenance of coastal engineering structures may be permitted in order to prevent storm damage to buildings perceived to be at risk.⁵⁸ The coastal bank grandfathering provision potentially creates

⁵¹ Resource areas comprise coastal wetlands, defined in the WPA as "...any bank, marsh, swamp, meadow, flat or other lowland subject to tidal action or coastal storm flowage." MASS. GEN. LAWS ch. 131 §40 (2016). The specific resource areas are further defined in the regulations implementing the WPA at 310 MASS. CODE REGS. §10.04 (2016).

⁵² 310 MASS. CODE REGS. §10.28(1), §10.29 (2014).

⁵³ Cf. ROLLING EASEMENTS, *supra* note 10.

⁵⁴ Cf. *Rising Seas*, *supra* note 10, at 1316.

⁵⁵ Appendix 120.G of the 7th Edition of the Massachusetts State Building Code "establishes special administrative, design and construction requirements for new and existing buildings and structures located in flood-hazard zones (A Zones); high hazard zones (V Zones) or in coastal wetland resource areas containing coastal dunes that are deemed significant to the public interests of flood control or storm damage prevention." 780 MASS. CODE REGS. App. 120.G (2008).

⁵⁶ Cf. *Rising Seas*, *supra* note 10, at 1315-1317.

⁵⁷ For any town, the relevant grandfathering date relates to the date of the adoption of town bylaws to implement the WPA. These dates typically occurred well after August 1978.

⁵⁸ 310 MASS. CODE REGS. §10.20 (2014).

circumstances where older properties continue to be protected by coastal engineering structures, but more recent downdrift properties or public lands do not—thereby increasing the risks of shoreline change for the latter.⁵⁹

The potential for increased risks depends very obviously upon the dynamics of the geological environment vis-à-vis the location of the human built environment.⁶⁰ Notwithstanding the potential for increased risks, WPA rules require that persons applying to construct a coastal engineering structure must determine that there exist no other means of protecting a building and that “...a coastal engineering structure or a modification thereto shall be designed and constructed so as to minimize, using best available measures, adverse effects on adjacent or nearby coastal beaches due to changes in wave action...”⁶¹

The WPA restrictions on the construction of coastal engineering structures in coastal resource areas have been subject to the threat of litigation by some Massachusetts shorefront property owners concerned with the risks of property losses against which they are unable to protect themselves.⁶² One argument that has been put forward is that the WPA restrictions constitute a taking without just compensation in violation of the 5th Amendment of the U.S. Constitution.⁶³ In the case of the WPA regulations or local zoning decisions restricting the construction of coastal engineering structures, property owners have argued that the restrictions may represent a “passive” taking of private property. They contend that unimpeded encroachment by the ocean, leading to the shoreward movement of public trust lands, is in effect a case of a public taking of private property.⁶⁴ While the existence of passive takings remains a theoretical concept,⁶⁵ the possibility of litigation over the issue seems very real to both municipal and state government agencies.

⁵⁹ Porter Hoagland & Lisa Granquist, *Shoreline Change in Urban Massachusetts: Time for Retreat?*, PROC. AAAS ANNUAL MEETING (February 2013), available from the author.

⁶⁰ Shoreline change comprises a natural hazard that is jointly determined by humans and nature. See generally Clifford S. Russell, *Losses From Natural Hazards*, 46 LAND ECON. 383 (1970).

⁶¹ 310 MASS. CODE REGS. §10.30(3) (2014).

⁶² Gabrielle Gurley, *Plum Island at Risk*, COMMONWEALTH (July 7, 2015), <http://commonwealthmagazine.org/environment/plum-island-at-risk/>.

⁶³ Todd Gaziano, *Protecting Your Home v. Letting it Crash Into the Sea*, LIBERTY BLOG (Mar. 13, 2015), <http://blog.pacificlegal.org/protecting-your-home-v-letting-it-crash-into-the-sea/>.

⁶⁴ *Id.* See also Christopher Serkin, *Passive Takings: The State's Affirmative Duty to Protect Property*, 113 MICH. L. REV. 345 (2014) (arguing that natural hazards, such as sea-level rise, may compel the government to respond either by protecting property or by compensating property owners for resulting damages).

⁶⁵ Cf. Robin Kundis Craig, *Public Trust and Public Necessity Defenses to Takings Liability for Sea Level Rise Responses on the Gulf Coast*, 26 J. LAND USE & ENVTL. L. 395 (2011) (arguing that, in addition to broad police powers, doctrines of state public trust and public necessity support a type of state regulation of private coastal properties that does not constitute a taking).

IV. POLICY APPROACHES

We compare estimates of the fiscal costs of the status quo and three market-based policies to encourage retreat from the coast. Except for the circumstances of pre-WPA properties located within 100 feet of a coastal bank with permitted coastal engineering structures, we assume that the status quo policy comprises a rolling easement that restricts the emplacement of protective hard structures.⁶⁶

To help substantiate our focus on fiscal costs, we observe that coastal managers regularly make decisions over the choices of policies on the basis of potential impacts to budgets; only rarely are such decisions made on the basis of estimates of changes in economic net benefits. Developing estimates of the latter can be problematic, requiring specific expertise that often can be unavailable at the relevant decision-making levels. In this study, we are not arguing that the costs reflect welfare (economic surplus) losses. Rather, we suggest that these estimates can affect the set of incentives faced by property owners and governments, thereby affecting the ultimate choice of policy.

The potential implementation of alternative policies depends upon the relevant WPA resource area, the physical locations of privately owned shorefront properties and public infrastructures, the presence or absence of historical coastal engineering structures, and the consequent risks of inundation or property loss. For each policy, we characterize the likely distributions of the financial damages of storms or erosion due to shoreline change across stakeholders.

Whether policies of any type should be implemented to help encourage coastal shorefront property owners to retreat from the coast in certain areas is fundamentally a question of the redistribution among private property owners and society of the benefits of property ownership and the costs of damage due to storms or erosion.⁶⁷ Arguments could be made that society should step in to encourage retreat, through either regulations or fiscal policies, because of (i) external effects, such as when the shoreline protection of individual properties limits the downdrift supply of sediments, sand, or other materials; (ii) concerns for public health or safety, especially where property owners are in immediate danger during extreme storm events; (iii) the relative costs of bearing the risks of property damages or losses due to erosion; and (iv) the costs of public disaster assistance, embodied in emergency responses and rebuilding efforts.

⁶⁶ Cf. ROLLING EASEMENTS, *supra* note 10.

⁶⁷ Often, this issue is framed in terms of the need for government to engage in adaptive planning and management. See ADAPTATION TOOLKIT, *supra* note 10, at 8.

We consider the following policies:

a) *Maintain the status quo.* The *status quo* involves the existing baseline situation in which individual coastal shorefront property owners benefit from their locations along the coast but also bear the risks of shoreline change. Under the status quo, WPA rules regarding the placement of coastal engineering structures are enforced, implying that shorefront property owners would be unable to site hard structures to protect shorefront properties from flooding or erosion due to storm events or longer term sea-level rise. Only owners of pre-WPA properties on coastal banks would be able to construct or maintain hard structures to protect their buildings and land.

Although the risks of property damage or loss are borne by the property owner under the *status quo*, there are situations in which state or federal disaster assistance becomes available to ameliorate some of the costs resulting from severe storms. Thus, even though shorefront property owners bear the costs of the loss of properties due to storm events, there is some likelihood that the federal and state governments also would bear significant costs, including emergency responses, rebuilding or relocation assistance, repair of public infrastructure, including roads and water or sewer lines, or removal and disposal of debris.

In recent memory, the Blizzard of '78 in February 1978 (\$200 million) and Hurricane Bob in August 1991 (\$250 million) resulted in very significant combined flooding and erosion damage to both private and public properties in coastal Massachusetts.⁶⁸ Relying upon historical disaster assistance estimates and including these extreme events, during the 36-year period from 1978 to 2013, statewide average annual damages to private and public properties were on the order of \$16 million. Ignoring these extreme events, during the 22-year period from the Perfect Storm in October 1991 through 2013, statewide average annual damages were on the order of \$6 million. Based upon these historical damages, which do not include damages resulting from undeclared disasters, a conservative estimate of the capitalized costs to the public of coastal disaster assistance in Massachusetts is on the order of \$200-500 million.⁶⁹

b) *Purchase conservation easements.* The placement of coastal engineering structures in areas where high rates of shoreline change occur likely adds value to a shorefront property. Under WPA rules, shorefront property owners typically may find it difficult to demonstrate that the placement of hard

⁶⁸ MCEC, *supra* note 8, at 4-3.

⁶⁹ Massachusetts statewide damages of \$6 million per year capitalized as a perpetuity using a discount rate of 3% yields an estimate of \$200 million. Incorporating disaster assistance for extreme events increases the estimated capitalized damages to more than \$500 million.

structures plays no adverse role in affecting downdrift properties. Consequently, these individuals apparently would have no legal basis to protect their properties with hard structures. Nevertheless, some property owners have argued for implementing soft structural alternatives immediately prior to storm arrivals, such as beach scraping, and others have threatened litigation based on inventive legal theories of passive takings in order to permit the siting of hard structures.

One option to preclude beach scraping or the threat of litigation is for a third party, such as a government agency or a non-governmental organization, to recognize an implied legal right to undertake any type of shoreline stabilization project, and to purchase that right through a conservation easement.⁷⁰ Once a conservation easement has been consummated, the right to construct or rehabilitate a coastal engineering structure would not be exercised. The purchase of conservation easements for preventing shoreline stabilization may be the most obvious and workable in cases of pre-WPA buildings located on properties situated on coastal banks where hard structures may be allowed.

c) *Acquire (“buyout”) shorefront properties.* An alternative is for a third party, such as the Commonwealth—or even a non-governmental organization to acquire a shorefront property, known as a buyout. The sale of the property by its owners could be voluntary, or the Commonwealth could take the property by eminent domain.⁷¹ Ideally, such a purchase would occur prior to property loss or damage due to shoreline change. Practically, it seems more likely that the purchase of a shorefront property might occur subsequent to significant flooding or erosion damage.⁷² After the purchase, the building and any coastal engineering structures could be removed at additional cost.⁷³ The purchase of shorefront properties has been contemplated by the Commonwealth, which has passed an

⁷⁰ See ADAPTATION TOOLKIT, *supra* note 10, at 50. See also ROLLING EASEMENTS, *supra* note 10, at 49.

⁷¹ The Commonwealth’s legislation establishing the buyout program expressly prohibits using buyout funds to take land by eminent domain. ENVIRONMENTAL BOND, *supra* note 12, at §2000-7060 (“...funds from this item shall not be used to compensate land owners for lands taken by eminent domain...”). One possible reason for this prohibition in the legislation is that an exercise of eminent domain over shorefront properties could establish a precedent that the Commonwealth in effect would be recognizing shoreline change as a type of “passive” taking.

⁷² This scenario has been suggested for certain shorefront lots on Plum Island, where buildings had been lost to coastal erosion during nor’easters. Christian Wade, *Lots Eyed for State Buyback*, THE DAILY NEWS OF NEWBURYPORT (July 23, 2015), http://www.newburyportnews.com/news/local_news/lots-eyed-for-state-buyback/article_a78b9d00-589c-5636-921f-f0be1f0b54d4.html.

⁷³ Typical costs of razing and disposal of residential buildings range from \$8,000 - \$15,000. See *House Demolition Costs*, COST HELPER, <http://home.costhelper.com/house-demolition.html>.

Environmental Bond authorizing up to \$20 million for purchases of high risk shorefront properties. Given the many hotspots and extensive shorefront built environment in Massachusetts, these funds appear to be inadequate.

A Hazard Mitigation Grant Program administered by the Federal Emergency Management Agency (FEMA) includes provisions that allow for the acquisition of coastal properties damaged by floods.⁷⁴ In order for the provisions of the FEMA buyout program to be carried out, the state, or regions within the state, must have an approved Hazard Mitigation Plan in place. Where an area has been declared by the President of the United States to be a national disaster, and where the cost of repairing a property is determined to be more than 50% of its value, a willing seller can offer the property to government agencies for sale. Funding for the program is split between FEMA (75%) and state and local sources (25%). Upon its sale, the property cannot be redeveloped and must be used for open space, recreation, or wetlands management.

These provisions of the federal Hazard Mitigation Grant Program capture the intent of a coastal buy-out policy, but they apply only to *flood* losses *ex post*, not to coastal properties that have been or might conceivably be damaged by erosion or high winds.⁷⁵ Consequently, a policy to buy-out *ex ante* shorefront properties at risk of erosion remains unsettled.⁷⁶

d) Acquire (“buyout”) the shorefront property and offer it for rent (or lease it back). This approach was suggested more than two decades ago by James Titus at the U.S. Environmental Protection Agency. Under a “buyout-leaseback” policy, a property owner who is a willing seller would be offered a one-time, lump-sum payment for her property at fair market value. If the offer is accepted, then the property would belong to the Commonwealth, but it could be leased back

⁷⁴ 42 U.S.C. §5170c (b) (2012).

⁷⁵ See U.S. GOV’T ACCOUNTABILITY OFF. (GAO), HURRICANE SANDY: AN INVESTMENT STRATEGY COULD HELP THE FEDERAL GOVERNMENT ENHANCE NATIONAL RESILIENCE FOR FUTURE DISASTERS (2015) (finding that most hurricane disaster assistance is available only after a disaster and recommending a program of investments in pre-disaster resilience). There are some very limited federal grant funds available for pre-disaster mitigation, including for the acquisition of properties. FED. INS. AND MITIGATION ADMIN. (FIMA), U.S. DEP’T OF HOMELAND SEC., FY 2016 PRE-DISASTER MITIGATION GRANT PROGRAM FACT SHEET (2016), <http://www.fema.gov/media-library/assets/documents/114667>.

⁷⁶ But see Christine A. Fazio & Ethan I. Strell, *Government Property Acquisition in Floodplains after Hurricane Sandy*, N.Y.L.J. (2013), <http://www.newyorklawjournal.com/id=1202590055801> (in the aftermath of Hurricane Sandy, New York Governor Mario Cuomo established a program of incentives, albeit funded with federal hurricane disaster assistance, to encourage homeowners who resided in extremely vulnerable areas to sell their undamaged homes).

to the original property owner—or possibly to another lessee—for a fixed, predetermined period of time. Under a lease agreement, the new lessee would be precluded from redeveloping, maintaining, or altering the property in any manner. A leaseback policy would have the same initial cost as a buyout, but the government could recover some proportion of the purchase cost over time. Such a policy would benefit both the Commonwealth and the lessees; the state would be remunerated in part, and the occupants could continue residing in their formerly owned property and experiencing the benefits of shorefront coastal amenities.⁷⁷

The lease agreement would need to include language pertaining to the terms of the lease and the disposition of the property in the event of significant storm damage. Should a leased property be rendered partially or completely destroyed by a coastal storm or need federal disaster assistance to repair, then the lease should be voided, requiring the lessees to relocate. Because the lease would expire when a property is severely damaged or destroyed, the state would then lose the future stream of rental payments from the property.

A potentially relevant example of a federal buyout-leaseback program concerns the management of inholdings within the boundary of a national park.⁷⁸ For example, many of the U.S. National Seashores have implemented programs of life tenancies or life estates, through which private property rights within a park are acquired from their owners and then leased back for the duration of the owners' lives.⁷⁹ Another possibility is the acquisition and leasing back of other retained rights for varying terms, also known as tenancies in years.⁸⁰ In some instances, the buildings that are acquired and leased are done so for historical interpretive purposes, such as the historical dune shacks located in the Cape Cod National Seashore, Massachusetts, or for recreational purposes, such as the beach

⁷⁷ One option is for a lease agreement to include a tenure period of ninety-nine years, expiring at the end of that time or earlier upon the death of the lessee. Katherine R. Candler, *LIFE TENANCY AND THE NATIONAL PARK SERVICE—A TOOL FOR CULTURAL RESOURCE MANAGEMENT* (2015) (master's thesis, Univ. of Ga., Athens, Ga.).

⁷⁸ See generally Joseph L. Sax, *Helpless Giants: The National Parks and the Regulation of Private Lands*, 75 MICH. L. REV. 239 (1976). The National Park Service does not have a general authority for acquiring private property, such as inholdings, but the legislation establishing some national parks, such as the national seashores, includes such authority within the boundaries of the relevant park. CAROL H. VINCENT, LAURA B. COMAY, M. LYNNE CORN & KATIE HOOVER, CONG. RESEARCH SERV., RL34273, *FEDERAL LAND OWNERSHIP: CURRENT ACQUISITION AND DISPOSAL AUTHORITIES* (2012).

⁷⁹ See Candler, *supra* note 77.

⁸⁰ Candler, *supra* note 77, at 2.

clubs at the Gateway National Recreation Area on Sandy Hook, New Jersey.⁸¹ In general, however, programs for acquiring and leasing inholdings are used to defray the costs to the federal government of assembling the lands within a park's boundaries so that they can be managed in a consistent fashion.⁸²

V. CASE STUDY: PLUM ISLAND, MASSACHUSETTS

Plum Island is an east-facing, inlet-associated, coastal barrier located on the North Shore of Massachusetts, near the Massachusetts-New Hampshire border, and situated immediately to the south of the Merrimack River delta. Plum Island runs from Newburyport in the north, through Newbury and Rowley, and down to Ipswich in the south. The undeveloped federal Parker River National Wildlife Refuge is located on the barrier and in the salt marsh behind the barrier to the south of Newbury. The barrier protects the extensive Great Marsh wetland ecosystem, which is one of the largest, relatively undeveloped salt marsh systems remaining in Massachusetts.⁸³

The dynamic coastal geomorphology of the Plum Island barrier system commonly entails areas of accretion on the barrier beach in Newburyport near the mouth of the Merrimack River and areas of erosion along the shorefront in Newbury to the south. Coastal geologists continue to study the dynamic geology of the barrier, however, and several theories have been posited about the apparent cyclical nature of erosion there. In particular, there is a longstanding debate about the implications for shoreline erosion on Plum Island of two jetties that extend seaward from the mouth of the Merrimack River, which were constructed and are maintained by the U.S. Army Corps of Engineers in order to keep a navigation channel open in the river.⁸⁴ One novel geological theory relates the position of an offshore bar proximate to the barrier shorefront in Newbury, which is supplied periodically with sediment from a deposit off the mouth of the Merrimack River, to longterm cycles of erosion and accretion occurring along different Newbury shoreline segments at different times.⁸⁵

⁸¹ NAT'L TRUST FOR HISTORIC PRES., HISTORIC LEASING IN THE NATIONAL PARK SYSTEM (September 2013).

⁸² Candler, *supra* note 77.

⁸³ MASS. EXEC. OFFICE OF ENERGY AND ENVTL. AFFAIRS (EEA), GREAT MARSH RESOURCE SUMMARY (2016), <http://www.mass.gov/eea/agencies/dcr/conservation/ecology-acec/great-marsh.html>.

⁸⁴ Gurley, *supra* note 62.

⁸⁵ Andrew R. Fallon, Christopher J. Hein, Peter S. Rosen & Haley L. Gannon, *Cyclical Shoreline Erosion: The Impact of a Jettied River Mouth on the Downdrift Barrier Island*, PROC. 11TH INT'L SYMP. ON COASTAL ENGINEERING AND SCI. OF COASTAL SEDIMENT PROCESSES 239-252 (2015).

Beginning in the 1930s, and accelerating rapidly in the post-World War II period, the Plum Island barrier was heavily developed with residential properties in both Newburyport and Newbury. More than 1,200 buildings, comprising mainly private residences, exist currently on the barrier (Figure 1). On the Newbury shorefront, the coastal barrier has been classified under the provisions of the WPA as a coastal dune resource area. Along this portion of the barrier, residential buildings are located adjacent to the shoreline, and they become exposed during severe storms, such as nor'easters and hurricanes.



Figure 1: Map of Plum Island (Newburyport, to the north, and Newbury, to the south, are separated by the diagonal border across the land) showing the housing stock (green dots), the locations of protective structures of different types (red lines), and the geological transects that are used to help measure shoreline changes over time.

Several Plum Island buildings have been lost to erosion in the last few decades, but it is difficult to make a full and reliable accounting of these losses. For example, after two severe nor'easters occurred in February and March 2013, reports described six homes that had to be demolished and seven that were "too dangerous to be occupied," implying that thirteen homes had been lost.⁸⁶ Later reports listed the loss of only six buildings.⁸⁷ Based on historical data gathered from the Newbury Conservation Commission and from media sources, we assume that eight buildings were lost over the decade from 2006 to 2015, implying that an average of 0.8 shorefront buildings (about one percent of the shorefront housing stock) may be lost to storms each year in Newbury.⁸⁸ Thus, on average, Newbury may lose about \$0.64 million in residential housing value to shoreline erosion each year.⁸⁹

There are sixty-eight shorefront properties with buildings on the Newbury section of the Plum Island barrier, with an estimated average market value of \$800,000 per property.⁹⁰ These buildings are located on a coastal dune resource, so the WPA prohibition on emplacing structural protections should be in effect. Notwithstanding the WPA rules, about two-thirds (45) of the Newbury shorefront

⁸⁶ Jess Bidgood, *It's Move It or Lose It in Path of a Nor'easter*, N.Y. TIMES, Mar. 18, 2013, at A17.

⁸⁷ Dyke Hendrickson, *'Stigma' Gives Plum Island Homeowners a Tax Break*, THE DAILY NEWS OF NEWBURYPORT (Dec. 4, 2013), http://www.newburyportnews.com/news/local_news/stigma-gives-plum-island-homeowners-a-tax-break/article_d611a8b9-c623-5ced-9c05-0e84f1500ce4.html.

⁸⁸ We used an estimate of eight shorefront buildings destroyed by coastal storms during the 10-year period from 2006 to 2015 to calculate this rate of loss. Personal communication with Doug Packer, Newbury Conservation Commission via Prof. Peter Rosen, College of Science, Northeastern University (August 16, 2016). For media reports, see Billy Baker, *On Plum Island, Another Punishing Storm*, BOSTON GLOBE (28 December 2012); Billy Baker, *Storm Devastating to Plum Island*, BOSTON GLOBE (March 9, 2013); Dyke Hendrickson, *On Island, 40 homes Deemed 'At Risk'*, THE DAILY NEWS OF NEWBURYPORT (March 12, 2013).

⁸⁹ This estimate of lost value includes the "waterfront" premium associated with the location of the properties. Importantly, this premium typically is *not* lost when a building is destroyed; it accrues to the property and building located immediately behind the former waterfront property. Based upon the results of a hedonic pricing model, an average waterfront premium on Plum Island is on the order of \$80,000, about 10% of an average shorefront property's value. Andrew R. Fallon, Porter Hoagland, Di Jin, William Phalen, G. Gray Fitzsimons & Christopher J. Hein, *Adapting Without Retreating: Responses to Shoreline Change on an Inlet-Associated Coastal Beach*. 45 COASTAL MGMT. (forthcoming 2017).

⁹⁰ The actual number of Plum Island shorefront properties vulnerable to erosion in the near-term is uncertain, and the identities of vulnerable properties depend crucially upon the dynamics of coastal geological changes. Here, we focus on all sixty-eight of the Newbury shorefront properties, although at least one source suggests that the number of properties "at risk" could be as small as forty. Dyke Hendrickson, *Walls built to fight sea*, THE DAILY NEWS OF NEWBURYPORT (March 19, 2013). Shorefront property values were estimated using the online real estate valuation assessment tool at <http://www.zillow.com/>.

properties are shielded already in part by either private or public structures, including coir bags, riprap, groins, or jetties. Based upon the results of a hedonic pricing model, the capitalized value of structural protections is on the order of 5-8% (\$36,000-\$67,000) of the value of an average oceanfront property on Plum Island.⁹¹

Some of these protective structures had been put in place prior to the WPA rules. Many may not have been modified during the last three to four decades. Over the years, a wide range of approaches have been used in an attempt to mitigate flooding and erosion, including beach replenishment, using dredge spoils from the mouth of the Merrimack River or sand “mining” from onshore sources; junked cars and trucks; hay bales; concrete seawalls; sand bags; revetments; emplacement of assorted sizes of rocks (“riprap”); 100-foot long coir (coconut fiber) tubes filled with sand; grass plantings; and others. In recent years, on several occasions, some of the shorefront property owners have engaged in beach scraping to create sacrificial dunes in front of their properties in anticipation of winter nor’easters or immediately prior to severe storm events.

Further, during the late spring of 2013, subsequent to a March nor’easter that caused the loss of six homes and the temporary condemnation of seven others, several of the shorefront property owners put in place massive rock embankments (riprap comprising piles of rocks of various sizes) and symmetric stone walls to forestall erosion along 400 feet of the coastal dune.⁹² With the forbearance of Newbury’s Conservation Commission and the underlying threat of litigation over a potential passive taking should WPA rules be interpreted and enforced strictly—causing the Massachusetts Department of Environmental Protection to acquiesce—the riprap project moved forward.⁹³ These actions indicate clearly that the shorefront property owners were behaving as if they possess legal rights, albeit implied ones, to protect their shorefront properties.

We estimated the potential fiscal costs to government agencies of implementing policies to encourage retreat (Figure 2). If implemented, these fiscal costs would involve actual expenditures of public funds for the various alternatives (including the status quo). We argue that the scales of these costs help us to appreciate some of the issues surrounding how the risks of shoreline change are distributed between society and property owners.

⁹¹ This estimate was developed using a model of factors contributing to the assessed values of all Plum Island residential properties. Fallon et al., *supra* note 89.

⁹² See Hendrickson, *supra* note 90.

⁹³ John Macone, *On Plum Island, Rocky Beach Causing Problems*, THE DAILY NEWS OF NEWBURYPORT (July 21, 2015), http://www.newburyportnews.com/news/local_news/on-plum-island-rocky-beach-causing-problems/article_2fe33c0b-49af-5b75-8bc8-4613ac75182b.html.

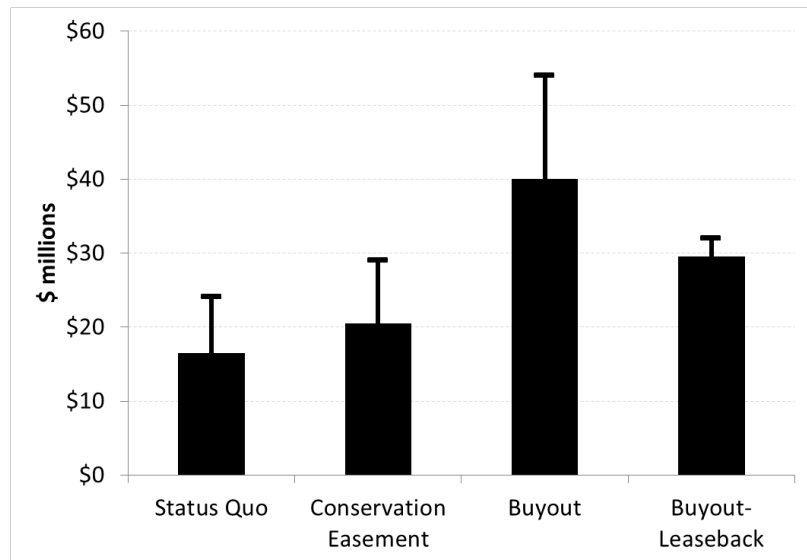


Figure 2: Comparison of the fiscal costs to government of alternative market-based approaches to encourage retreat from the Plum Island shoreline.

Nevertheless, we caution that estimates and comparisons of these costs do not comprise a formal cost-benefit analysis of alternative policies. Undertaking the latter would require incorporating additional information about potential losses in amenities to shorefront property owners and gains to the public of increased access to the shorefront or increases in the economic values of public trust uses and other public interests. In particular, making such estimates would depend critically upon observations or models of the volume of sand on the barrier and the shape and position of shorelines in the future.

a) *Status quo (\$9-24 million).* The status quo involves ongoing costs of emergency response and disaster assistance borne by government agencies, including those at local, state, and federal levels. These aggregate costs can be estimated for the entire state, but they are difficult to allocate across specific locations, such as the Plum Island barrier, and to ascribe to different levels of government. Estimates of costs using only declared disasters may underestimate the actual costs to government; such estimates ignore lesser categories of (non-disaster) hazards. On the other hand, estimates of disaster assistance costs using declared disasters may overestimate the costs of shoreline change due only to erosion, as they may also include the costs of disaster due to wind damage and flooding.

Using an estimate of statewide federal disaster assistance, including assistance for disasters as a consequence of flooding, erosion, and wind, and assuming that these damages were spread uniformly across the Commonwealth's twenty-two erosion hotspots, we estimated disaster assistance to Plum Island of \$300-700 thousand per year. Capitalizing these costs at three percent, the costs of coastal disaster assistance range from \$9-24 million. Note that individual property owners also face costs due to the actual losses of land and buildings, as well as costs of the risks of such losses, which may already be capitalized into home values.⁹⁴

b) *Conservation easements (\$12-29 million).* Assuming that the implied legal rights to protect a shorefront property could be defended successfully, the implementation of a policy of conservation easements involving the purchase of the rights to protect the heretofore unprotected shorefront properties (23 buildings) would cost the Commonwealth between \$0.8-1.5 million.⁹⁵ Note that the purchase of conservation easements on only a subset of shorefront properties could lead to a situation in which those properties continue to be deprived of sediments, sand, or other materials for which movement would be constrained by existing protective structures in front of updrift shorefront properties. In order to prevent accelerated erosion of the downdrift properties with easements, conservation easements could be purchased on all 68 of the shorefront properties at a cost to the Commonwealth of \$2.5-4.6 million.

We assume further that the costs to government of emergency responses or disaster assistance, as estimated for the Status Quo alternative above, would continue to be incurred.⁹⁶ An argument could be made, however, that, with the removal of structural protections, a more natural geological regime would mitigate some of the damages resulting from coastal storms.

Conservation easements should include conditions precluding beach scraping and requiring the removal of existing coastal engineering structures. Some of the protective structures are publicly owned, and therefore they may require public financial or technical assistance in their removal. Regardless of the degree of public assistance, implementing an effective program of conservation easements could be problematic if the program relies upon the voluntary

⁹⁴ See Kreisel et al., *supra* note 24.

⁹⁵ This calculation was made using the results of the hedonic pricing model of the value of oceanfront coastal engineering structures to a shorefront property on Plum Island of between \$36,000 and \$67,000.

⁹⁶ In order to make this calculation, the costs of purchasing the conservation easements on all sixty-eight of the shorefront properties are added to the costs of the status quo.

participation of shorefront property owners. Partial participation is especially concerning if only a subset of property owners choose to offer conservation easements for purchase voluntarily.

c) *Buyouts (\$26-54 million)*. In order to implement a buyout policy, the purchase of all shorefront properties on the Newbury Plum Island barrier would cost the Commonwealth approximately \$54 million. Because we estimated that only 0.8 percent of the shorefront housing stock is lost each year on average, a buyout policy could be arranged so that it is carried out in stages, perhaps focusing on shorefront properties believed to be at the highest risk of erosion and inundation first. To be conservative, assume that the annual risk of the loss of property to the shorefront housing stock is two percent. A plan to acquire properties by purchase over the next 25 years would lead to the acquisition of roughly half of the 68 Newbury shorefront properties on Plum Island and cost the Commonwealth about \$26 million.⁹⁷

d) *Buyouts-leasebacks (\$28-32 million)*. Several of Newbury's shorefront properties could represent viable candidates for a buyout-leaseback policy. Based on a capitalization rate of 3%, the average shorefront property could be rented back to its original owners for \$2,000 a month. After a period of twenty-five years, which might be regarded as a typical lease term, and assuming that the average property has not been lost to storm or erosion damage during that period, the Commonwealth would recover 75% (about \$600,000) of the original purchase cost. After thirty-four years, the Commonwealth would have recovered the full buyout costs of the average property.

We assume that there would not be a need for disaster assistance subsequent to a damaging event, so we do not include the costs of such assistance. A shorefront property could not continue to be rented after a damaging event occurs, however. Consequently, there is the likelihood in each year that the future stream of rental income would be lost completely from that period forward. It is reasonable to assume that, as erosion occurs and shorefront properties get nearer to the coast, the chances of losing the future stream of rental income would increase. We employ the results of a regional hedonic pricing model⁹⁸ to simulate the increased risks of erosion losses to the future stream of rental income (Figure 3).

⁹⁷ At an assumed loss of two percent of the sixty-eight shorefront buildings per year (or 1.36 buildings per year), thirty-four buildings (one-half of the total) would be lost over twenty-five years. For heuristic purposes, in estimating the costs of both the buyout and buyout-leaseback programs, we assume that inflation in the real estate market just equals the rate of discount, so there is no need to convert these estimates into present value terms.

⁹⁸ See Kreisel et al., *supra* note 24.

Our approach suggests that, over the thirty-four year period required to recover buyout costs in the absence of a damaging event, the expected cost to the government is on the order of 12% of the original buyout cost. Thus, we estimate that the risks of lost rental payments through the implementation of a buyout-leaseback policy would cost the Commonwealth approximately \$7 million.

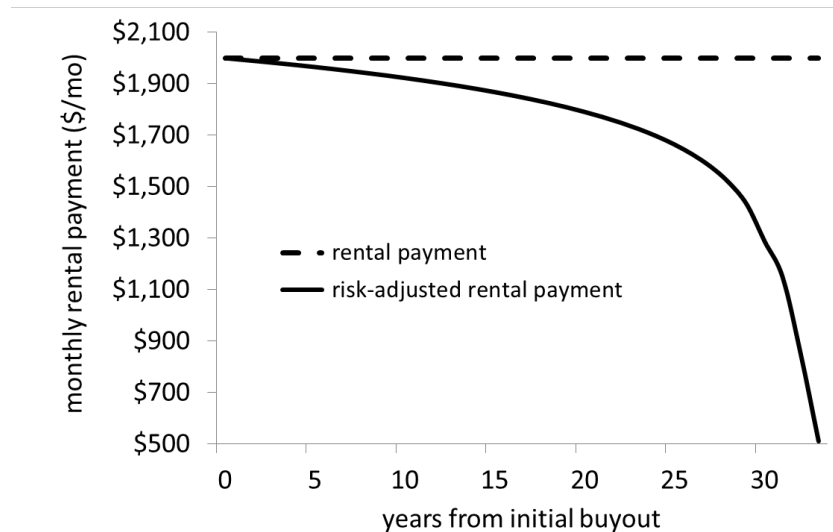


Figure 3: Constant monthly rental payment compared to a risk-adjusted monthly rental payment. The difference between the two curves is a measure of the fiscal cost to the government of implementing a buyout-leaseback policy. The risk adjusted rental payment accounts for the increasing risk over time that a storm event will lead to a discontinuation of future rental payments.

A buyout-leaseback policy also would incur significant costs of property management, which we estimate at 38-45% of the capitalized value of the average property.⁹⁹ Consequently, property management costs would add \$20-24 million to the total costs of a buyout-leaseback policy. We assume that there are no costs of disaster assistance. There may be costs of demolition and disposal for properties that are lost during the thirty-four year period, however. These costs would increase the policy costs by another \$0.5-1.0 million.

⁹⁹ Leonard Baron, *Investing 101: Estimating Rental Property Expenses* (Aug. 24, 2012), <http://www.zillow.com/blog/investing-101-estimating-rental-property-expenses-94824/>.

Although not modeled for this study, the buyout-leaseback policy, like the buyout policy, could be implemented in stages. With a staged approach, the selection of properties to participate in the policy is critical, as those shorefront properties at the greatest risk are those properties for which the future streams of rental income are most likely to be cut short prematurely.

e. *Potential funding sources.* Two potential sources of funding might be used for implementing the policies described in this study. Further, the FEMA Hazard Mitigation Grant Program, focused on flood damages, also could be used to encourage retreat.¹⁰⁰ The existence of these funding sources suggests that, in principle, policies to encourage retreat through buyouts or buyouts-leasebacks could be feasible. The scale of available funding, however, would greatly limit their effect.

1. *Massachusetts Environmental Bond.* In 2014, over \$2 billion was appropriated through the Massachusetts Environmental Bond¹⁰¹ to fund projects such as the removal of dams, the repair of seawalls, or the restoration of public parks. 6% (\$117 million) of the bond was designated for use on coastal projects.¹⁰² While the general understanding of the Massachusetts legislature was that these monies would be used mainly to repair failing seawalls, in principle, they also could be used to initiate programs to fund buyouts or a buyout-leaseback program. It appears unlikely that the monies would be used to purchase conservation easements, as the position of the Commonwealth is that the rolling easement policy embodied in the WPA is established law. The appropriation includes language to allocate \$20 million to be used for voluntary buyouts of coastal properties.¹⁰³

¹⁰⁰ See the discussion *supra* at notes 74-76.

¹⁰¹ See ENVIRONMENTAL BOND, *supra* note 12.

¹⁰² *Id.* §2800-7107. Specifically, these monies are to be directed toward "... the design, construction, reconstruction, improvement or rehabilitation of department or navigable coastal and inland waterways projects including, but not limited to, coastal protection, structures, dredging, river and stream cleaning, coastal structure maintenance, piers, dune stabilization, culvert repair, renourishment, erosion control, waterfront access and transportation improvements and related facilities and equipment."

¹⁰³ *Id.* §2000-7060. Specifically, these monies are to be directed toward "... the acquisition of land for the purposes of open space, recreation and conservation, to be protected pursuant to Article 97 of the Amendments to the Constitution, which lands are located near or adjacent to the mean high water mark of coastal areas, on coastal barrier beaches or in coastal high risk flooding zones and which lands or structures thereon suffer repeated damage by flooding or are otherwise impacted catastrophically by severe weather events and pose a high risk to public health, safety or the environment; provided, that funds shall be available to purchase adjoining coastal parcels next to such acquired land which is necessary to protect the environment; and provided further, that funds from this item shall not be used to compensate land owners for lands taken by eminent domain."

2. Federal Land and Water Conservation Fund. A second potential source of funding is the annual appropriation to Massachusetts under the federal Land and Water Conservation Fund (LWCF). Importantly, appropriations from the LWCF go mainly to 50:50 federal-state matching grants for land and water conservation projects, but these monies also could be used for other purposes, which may include private land conservation grants.¹⁰⁴ To the extent that buyouts result in increased public access to coastal areas, the use of LWCF appropriations for shorefront buyouts would appear to be a sensible application of the Massachusetts share of the monies. The LWCF is authorized at \$900 million per year, but historically only a small proportion of the annual authorization is appropriated by the U.S. Congress to carry out the Fund's purposes, averaging \$40 million per year for the entire United States. Further, the share of total LWCF appropriations that accrues to individual states is uncertain.¹⁰⁵ During the past decade, Massachusetts has received on average only about \$1 million per year.¹⁰⁶

VI. DISCUSSION AND CONCLUSIONS

Our study is an initial attempt at characterizing the fiscal costs of implementing alternative policies to encourage the retreat of property owners from a dynamic and increasingly hazardous coastline in Massachusetts. Under provisions of the WPA, we argue that extant coastal law embodies a *de facto* policy of rolling easements, where shorefront property owners must respond to shoreline change by retreating from and not protecting their property. We note that this form of rolling easement may be weakened in certain exigent circumstances, such as has been the situation on Plum Island.

We focused on Plum Island, which constitutes only one of the Commonwealth's 22 recognized coastal erosion hotspots. We considered three market-based approaches to retreat, including conservation easements, buyouts, and buyouts-leasebacks. We compared the fiscal costs to governments of undertaking these policies to the status-quo. These costs are relevant to decision-makers at all levels of government, but especially for state and municipal agencies, as they weigh alternative approaches for responding to the hazards of shoreline change.

¹⁰⁴ CAROL H. VINCENT, CONG. RESEARCH SERV., RL33531, LAND AND WATER CONSERVATION FUND: OVERVIEW, FUNDING HISTORY, AND ISSUES (2014).

¹⁰⁵ Phil Taylor, *Conservation: How States Lost the Battle for LWCF Cash*, ENVIRON. & ENERGY DAILY (Nov. 4, 2015), <https://www.eenews.net/stories/1060027408>.

¹⁰⁶ SALLY JEWELL, LAND AND WATER CONSERVATION FUND FY2015 REGULAR APPORTIONMENT TO THE "STATES" OF \$42,000,000 (Aug. 11, 2015) (the 2002-2015 apportionments are accessible at <https://www.nps.gov/nrcr/programs/lwcf/funding.html>).

Notably, for the Commonwealth, we found that these alternatives appeared to be significantly more costly than the status-quo. This result suggests that it may be problematic from a fiscal—and therefore political—point of view to put in place market-based policies that could help encourage shorefront property owners to retreat. The status quo constitutes a rolling easement for property owners, backed up by the prospect of emergency or disaster assistance funded mainly at the federal level. Plum Island represents a case that may become increasingly common as sea-level rise accelerates, and property owners refuse to abide a policy of rolling easement.

Importantly, further work is needed to refine our estimates so that more rigorous comparisons can be made of the potential costs of policies encouraging retreat. One possible means of spreading the costs out over time could involve setting priorities over locations where market-based approaches might be implemented. This may become increasingly feasible with an emergent understanding of the geographic distribution of coastal erosion hotspots.

In Table 2, we present a qualitative comparison of these policies, including descriptions of the types of risks and the costs that would be borne by shorefront property owners and government agencies at different levels of government. This comparison may help to clarify the complex mix of motivations faced by a diverse set of stakeholders.

Table 2: Comparison of the Distribution of Impacts of Alternative Policies for Encouraging Retreat from the Coast

	STATUS QUO	CONSERVATION EASEMENT	BUY-OUT	BUY-OUT, LEASE-BACK
PROPERTY OWNER	Enjoys coastal amenity value; bears risks of erosion due to regulatory restrictions on the construction of coastal engineering structures	Enjoys coastal amenity value; bears risks of erosion due to inability to construct coastal engineering structures but is compensated for these risks	Loses coastal amenity value but is compensated for this loss	Enjoys coastal amenity value for a limited period; compensated for loss of coastal property; bears costs of rental payments; bears costs of depreciating living conditions
TOWN	Captures portion of coastal amenity value with property tax; bears some risks of emergency response and infrastructure repair (roads, sewers)	Captures portion of amenity value with property tax; bears some risks of emergency response and infrastructure repair (roads, sewers)	Loses property tax proceeds	Captures portion of amenity value with property tax for a limited period; property tax proceeds may diminish with depreciation; bears some risks of emergency response and infrastructure repair (roads, sewers)
STATE*	Bears some risks of emergency response and disaster assistance costs	Bears some risks of emergency response and disaster assistance costs; bears costs of purchase of conservation easement	Bears cost of purchase of coastal property; bears cost of razing and disposal of structures; bears administrative costs of managing natural areas	Bears cost of purchase of coastal property; bears administrative costs of renting, including making tax payments; bears risk of lost future rental payments due to erosion
NATION	Bears most of the risks of disaster assistance costs	Bears most of the risks of disaster assistance costs		

*In principle, the costs borne by the State under the various alternatives could be shared with non-governmental organizations, the town, or the nation.

For example, under the present system of rolling easements, shorefront property owners are likely to push hard for the right to build coastal engineering structures in order to protect their properties. On Plum Island, the shorefront property owners have been observed both to scrape up sacrificial dunes as coastal storms bear down on the barrier and to emplace massive riprap structures. Coastal property owners also may continue to threaten litigation to enable the construction of even more permanent structures. Local municipalities have a stake in protecting the public services that they own or manage, including roads and water and sewer lines, to ensure that property taxes from high-assessed properties continue to be paid.¹⁰⁷ Consequently, even if they are not required to contribute financially, a buyout policy would not be particularly attractive to the municipalities.

The Commonwealth likely would argue against the need for implementing a policy of conservation easements, as the WPA provisions currently place the risk of shoreline change on the shoulders of shorefront property owners. The Commonwealth might prefer a buyout-leaseback policy, although the property management costs associated with being a landlord are unlikely to be trivial, and, when combined with the risks of the loss of rental payments from damaged properties, could well approach the costs of outright buyouts.

Considering our results, it is difficult to conclude that market-based approaches to rolling easements would be implemented in coastal Massachusetts in the near future. Even more concerning however, and consistent with this conclusion, is there appears to be little evidence of human retreat. A recent editorial in the *Newburyport Daily News* describes the contemporary situation on Plum Island:

It's a strange dichotomy—in Newburyport City Hall they are discussing how this coastal community will cope with the ravages of rising sea levels and storm surges, while along the fragile coast of Plum Island, a new batch of enormous homes is rising, some on land where homes were destroyed by storms just three years ago... [T]he days when Plum Island was populated by simple cottages are long gone. Now, much of the new construction is enormous and expensive, much taller, and more resilient to the ravages of nature thanks to their impressive anchors—steel pilings driven deep into the ground... Today, engineering has allowed for the construction of buildings that are far larger...and more solid than anything in the past. They are built to withstand the maelstrom. Yet the ground underneath them remains the same, an unpredictably shifting landscape that the best engineering in the world can't tame.¹⁰⁸

¹⁰⁷ Some of the Plum Island shorefront property owners have argued for property tax abatements due to reduced market values that are the consequence of coastal erosion. Although abatements have been minor for the most part, they reinforce the stake that municipalities have in perpetuating the shorefront properties. See Hendrickson, *supra* note 90.

¹⁰⁸ Anonymous, *On Plum Island, a Regretful Decision*, THE DAILY NEWS OF NEWBURYPORT (May 12, 2016), http://www.newburyportnews.com/opinion/editorials/on-plum-island-a-regretful-decision/article_cf67cdb4-46c3-51fb-8536-a6c7daa2de8d.html (arguing that state legal

As has been the pattern in other coastal locations,¹⁰⁹ retreat from the coast seems less likely to take place through careful planning, the adoption of reasoned policies, or even financial incentives. Instead, it may be more likely to occur as the inevitable reaction to future, punctuated occurrences of major natural catastrophes.

requirements to construct water and sewer lines to meet public health and water quality standards on Plum Island unintentionally led to continued or expanded coastal development).

¹⁰⁹ HURRICANE SANDY REBUILDING TASK FORCE, HURRICANE SANDY REBUILDING STRATEGY (Pre-Publication Ed.) 2013). Among other steps, the Task Force “[e]ncourag[ed] homeowners and other policy-holders to take steps to mitigate future risks, such as elevating their homes and businesses above flood levels, which [would] not only protect against the next storm but also make their flood insurance premiums more affordable.”