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Making Soft Infrastructures a Reality in New York City: Incorporating Unconventional Storm Defense Systems as Sea Levels Rise

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MAKING SOFT INFRASTRUCTURES A REALITY IN NEW YORK CITY: INCORPORATING UNCONVENTIONAL STORM DEFENSE SYSTEMS AS SEA LEVELS RISE

LAUREN COLEMAN*

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INTRODUCTION

Over the course of the next fifty years, the New York–New Jersey Upper Bay is expected to experience a sea level rise of nearly one foot as a consequence of global warming.¹ As a result, New York City has been forced to think critically about sustainable growth and coastline development. The need for innovation has encouraged forward thinking City planners, politicians, and architects to devise methods to adapt to rising sea levels and storm water flooding.² Most recently, Mayor Michael Bloomberg has formed a multidisciplinary initiative, entitled PlaNYC, in order to prepare New York for the projected effects of climate change.³ The plan puts forth a set of key goals aimed at creating a sustainable New York, and aspiring to reduce greenhouse gas emissions by thirty percent.⁴

Although the initiative is a valuable step in fighting the effects of climate change, the plan does not focus clearly enough on fighting rising sea levels and projected increase in storm surge volume.⁵ In order for New York to not only combat climate change, but effectively adapt to climate

¹ GUY NORDENSON ET AL., ON THE WATER: PALISADE BAY 12 (Rebecca Veit ed., 2010).

² See generally THE CITY OF NEW YORK, PLANYC PROGRESS REPORT 2010: A GREENER, GREATER NEW YORK (2010), http://home2.nyc.gov/html/sbs/wib/downloads/pdf/planyc_progress_report.pdf [hereinafter PLANYC PROGRESS REPORT 2010]; see also NORDENSON ET AL., *supra* note 1, at 46.

³ See generally PLANYC PROGRESS REPORT 2010, *supra* note 2.

⁴ PlaNYC, *Climate Change*, NYC.GOV, <http://www.nyc.gov/html/planyc2030/html/theplan/climate-change.shtml> (last visited Feb. 1, 2012).

⁵ See generally PLANYC, PLANYC: A GREENER, GREATER NEW YORK 12 (2007), available at <http://www.nyc.gov/html/planyc2030/html/theplan/the-plan.shtml> [hereinafter PLANYC, PLANYC REPORT].

change's effects, the plan should incorporate soft infrastructure design in the New York–New Jersey Upper Bay area.

In an effort funded by the American Institute of Architects in conjunction with the Museum of Modern Art's exhibition entitled *Rising Currents: Projects for New York's Waterfront*, a group of architects, civil engineers, planners, students, and professors collaborated to create a comprehensive soft infrastructure design initiative that directly addresses the problem of coastal flooding in New York City.⁶ This plan is set forth in detail in their book *On the Water: Palisade Bay*.⁷

Soft infrastructure is a land use design technique that incorporates both natural and man-made landscape features to “provide new ground to eroded areas, remediation to polluted areas, and protection to areas at high risk of storm surge damage.”⁸ In contrast to highly structured and fortified designs, such as floodgates and levees,⁹ soft infrastructure allows for more resilient urban substructures to develop while focusing on ecological health.¹⁰ Soft infrastructure design is reconceptualizing how landscape architects understand the interplay of water and ecology.¹¹ As a result of this newly developing field, architects “are investigating historical maps and how the hard lines drawn to indicate solid divisions between land and water both misrepresent and prevent understanding—and appropriate response to—a landscape that in reality is in flux depending on the season, the climate, and agricultural uses.”¹² One of the main goals of soft infrastructure is “to synthesize solutions for storm defense and environmental enrichment along the coast.”¹³ Through the incorporation of such technology, New York can begin to grow with the surrounding waters, rather than struggle against the increasing sea levels.

⁶ NORDENSON ET AL., *supra* note 1, at 12.

⁷ *Id.*; see also Edna Sussman et al., *Climate Change Adaptation: Fostering Progress Through Law and Adaptation*, 18 N.Y.U. ENVTL. L.J. 55, 70–71 (2010) (providing a basic overview of the coastal zone management environment in New York but also furthering ideas similar to soft infrastructure such as “the creation of replacement natural wetlands in coastal areas that are not already built up”).

⁸ NORDENSON ET AL., *supra* note 1, at 94.

⁹ *Id.*; see also *id.* at 52–59 (explaining the hard infrastructure of other coastal and water reliant cities, including London, Venice, New Orleans, and Rotterdam). Particularly in London, the Thames River poses a large flooding threat, causing the City to experience heightened strain on floodgates and increased expenditures on new flood defense technology. *Id.* at 51.

¹⁰ *Id.* at 96; see Julie V. Iovine, *What's Holding Us Up?*, THE ARCHITECT'S NEWSPAPER (Apr. 7, 2010), http://www.archpaper.com/e-board_rev.asp?News_ID=4404.

¹¹ Iovine, *supra* note 10.

¹² *Id.*

¹³ NORDENSON ET AL., *supra* note 1, at 12.

Although somewhat of an abstract idea in its general conception, soft infrastructure has begun to develop a tangible set of techniques, especially when applied to New York City. The *Palisade Bay* project utilizes several methods that combine practicality with design, emphasizing a back-to-nature approach.¹⁴ One of the primary implementation tools is the construction of man-made barrier islands clustered around the shoreline as a means of both absorbing the wave energy created by storm systems and providing habitats for plants and animals, having a net effect on harbor health.¹⁵ Further, the archipelago design set forth in the project emphasizes the use of “environmentally sound and sustainable methods,” potentially creating the islands out of “clean dredge spoils.”¹⁶ In designing the specific island structure, *Palisade Bay* planners considered shipping paths and created “transition zones” within the harbor, creating a gradual shift from land to water.¹⁷

The design plan incorporates other sustainable methods as well. In addition to barrier islands, the plan uses the construction of new wetlands, typically in areas where marshlands formerly existed.¹⁸ This technique “creates a broad, soft fringe where the city grid abuts the watery void.”¹⁹ Similarly to the archipelago design, the wetlands design incorporates “texture, plant life, and depth of wetlands” to provide a “natural buffer that adjusts fluidly to flood events and sea level rise.”²⁰ Lastly, the *Palisade Bay* project incorporates the use of piers and slips to reduce the intensity of wave velocities.²¹ Using both piers and slips, the design implements a feathered shoreline as a means of dispersing wave energy created during storms and providing a “protective zone” along the shore’s edge.²² Taken together, these three main techniques, as well as smaller projects such as oyster beds, are designed to create a new system that will “generate habitat, energy, and a sense of place that is the Upper Bay.”²³

This Note will assess both the legal needs and realities of New York as the City prepares to implement new programs and regulations. Further, this Note attempts to reconcile the goals of the *Palisade Bay* research with

¹⁴ See *id.* at 94–101.

¹⁵ *Id.* at 112–23.

¹⁶ *Id.* at 112.

¹⁷ *Id.* at 120.

¹⁸ NORDENSON ET AL., *supra* note 1, at 102–04.

¹⁹ *Id.* at 102.

²⁰ *Id.*

²¹ See *id.* at 106–10.

²² See *id.* at 110.

²³ See NORDENSON ET AL., *supra* note 1, at 98, 130.

current ocean and coastal law in order to encourage the application of this innovative technology as a means for reducing storm surges and accommodating general sea level rise. Part I discusses the current climate change data for New York and existing mitigation projects in place. Part II critically examines ocean and coastal law, including the federal Coastal Zone Management Act, the 1953 Submerged Lands Act, the Coastal Barrier Resources Act, and relevant New York State laws that govern the estuarine region in question. Lastly, Part III provides recommended changes to the laws discussed in Part II, eliminating any legal barriers these laws present to innovation. In addition, Part III will argue that other coastal cities are confronted with the same problem and could likely benefit from similar design projects. Ultimately, this Note highlights the legal conflicts and barriers present in coastal law and proposes practical solutions as a means to encourage soft infrastructure design.

I. DEFINING THE URBAN CLIMATE CHANGE PROBLEM: SCOPE AND PROPOSED SOLUTIONS

A. *The Current Climate Change Problem in New York City*

According to the United States Census Bureau, in July of 2009, New York City's population was 8,391,881.²⁴ Population projections estimate that the City will likely keep growing, suggesting that by 2030 the five boroughs will be home to over nine million people.²⁵ The broader metropolitan area encompasses approximately twenty million people.²⁶ Geographically, New York City developed around the New York–New Jersey Bay. The Bay itself is attached to the Hudson River and the Atlantic Ocean through the Verrazano Narrows and the Long Island Sound.²⁷

The coastal landscape, coupled with the dense population, makes New York City infrastructure vulnerable to the effects of climate change.²⁸ In 2008, Mayor Bloomberg, with funding from the Rockefeller Foundation, commissioned the New York City Panel on Climate Change (“NYPCC”) to

²⁴ *Population: Current Population Estimates*, N.Y.C. DEP'T OF CITY PLANNING, <http://www.nyc.gov/html/dcp/html/census/popcur.shtml> (last visited Feb. 1, 2012).

²⁵ *The Population of New York City: Looking Toward the Future*, DEP'T OF CITY PLANNING: CITY OF NEW YORK 2 (Mar. 2009), http://www.nyc.gov/html/dcp/html/census/events_patterns.shtml.

²⁶ NORDENSON ET AL., *supra* note 1, at 12.

²⁷ *Id.*

²⁸ *See id.*

serve as the technical authority on climate change information and issues.²⁹ Through extensive research, the panel made statistical projections on a broad range of climate change conditions, including changes in precipitation and temperature.³⁰

More specifically, the panel also focused on projecting sea level rise and analyzing the future of extreme weather.³¹ According to NYPCC forecasts, sea levels are predicted to rise two to five inches by the 2020s, seven to twelve inches by the 2050s, and twelve to twenty-three inches by the 2080s.³² The report also notes that the projected sea level rise statistics are “characterized by greater uncertainty than the temperature projections, due largely to the possibility that future dynamical changes in polar ice sheets not captured by the GCMs [Global Climate Models] may accelerate melting beyond currently projected levels.”³³ Further, the report states that higher than average sea levels are “extremely likely,” and that increased and intensified coastal flooding was “very likely” to occur.³⁴

In addition to projected sea level rise, the NYPCC found that the coastal flooding typically coupled with storms will “very likely increase in intensity, frequency, and duration.”³⁵ This phenomenon, usually resulting from hurricanes and nor’easters, is characterized by storm surges and extreme flooding.³⁶ By 2100, the predicted increase in sea level suggests that coastal floods, which currently occur once per decade on average, may start to manifest every one to three years.³⁷

B. *Potential Effects of Rising Sea Levels*

If these projections eventually materialize, New York City faces serious implications for both existing environmental features and infrastructure. Wetlands in the region are at risk of heightened inundation and

²⁹ N.Y.C. PANEL ON CLIMATE CHANGE, CLIMATE RISK INFORMATION 3 (2009), available at http://www.nyc.gov/html/om/pdf/2009/NPCC_CRI.pdf [hereinafter CLIMATE RISK INFORMATION].

³⁰ See *id.* at 16–17.

³¹ See *id.* at 17–21.

³² *Id.* at 17 tbl.1.

³³ *Id.* at 18.

³⁴ CLIMATE RISK INFORMATION, *supra* note 29, at 26 tbl.4. According to the report, “extremely likely” equates to greater than a ninety-five percent probability of occurrence and “very likely” is defined as a greater than ninety percent probability of occurrence. *Id.* at 7 fig.1.

³⁵ *Id.* at 21.

³⁶ NORDENSON ET AL., *supra* note 1, at 17–18. Due to the physical and geographical development of the New York–New Jersey Upper Bay, the New York City metropolitan area is particularly susceptible to storm surges. *Id.* at 18.

³⁷ CLIMATE RISK INFORMATION, *supra* note 29, at 21.

loss, which will, in turn, impact the habitats of many types of wildlife.³⁸ This is particularly damaging because wetlands play a vital role in “conveying, filtering, and storing storm water,” and “attenuat[ing] coastal storm surge.”³⁹ Beach erosion will also likely intensify, with beach erosion rates doubling or tripling by the 2020s alone.⁴⁰ Lastly, flooding in unprotected waste sites and brownfields may contribute to elevated levels of pollution.⁴¹

Damage to infrastructure is also a paramount concern.⁴² The NYPCC suggests that rising sea levels may cause increases in “street, basement and sewer flooding,” as well as an “[i]ncrease in flood risk of low-elevation infrastructure.”⁴³ Moreover, much of New York’s infrastructure, including the subway, roads, and tunnels, is located at low elevations, leaving it vulnerable to heightened incidents of flooding.⁴⁴ Further, a great deal of real estate, including some of the City’s most valuable property, sits just above sea level.⁴⁵ Consequently, the projected increases in flooding will affect many of the properties in these low lying areas, potentially subjecting them to serious harm.⁴⁶ New York’s wastewater treatment systems will also face adverse impacts because a portion of vital equipment, such as water pollution control plants and water pumps, is located on the flood plain.⁴⁷ The water supply may also be affected by an “increase of [the] salt front up the Hudson and Delaware Rivers,” ultimately reducing amounts

³⁸ Climate Change Info. Res., *What Major Climate Change Impacts are Projected for the Coming Decades?*, COLUMBIA UNIV. EARTH INST., http://ccir.ciesin.columbia.edu/nyc/ccir-ny_q2b.html (last modified Mar. 29, 2005) (noting that the wetlands in Jamaica Bay have already experienced serious marshland loss likely resulting from already emerging sea level rise); see also Climate Change Info. Res., *How Might Climate Change Affect the Coastal Environment and Coastal Communities?*, COLUMBIA UNIV. EARTH INST., http://ccir.ciesin.columbia.edu/nyc/ccir-ny_q2c.html (last modified Mar. 29, 2005) [hereinafter *Coastal Environment and Coastal Communities*].

³⁹ N.Y.C. DEP’T OF ENVTL. PROT., ASSESSMENT AND ACTION PLAN 40 (2008), available at http://www.nyc.gov/html/dep/pdf/climate/climate_complete.pdf [hereinafter N.Y.C. DEP’T OF ENVTL. PROT., ASSESSMENT AND ACTION PLAN].

⁴⁰ *Coastal Environment and Coastal Communities*, supra note 38.

⁴¹ CLIMATE RISK INFORMATION, supra note 29, at 27; see also NORDENSON ET AL., supra note 1, at 14.

⁴² PLANYC, PLANYC REPORT, supra note 5, at 7.

⁴³ CLIMATE RISK INFORMATION, supra note 29, at 27. The panel cites other potential risks, including an increased “need for use of emergency management procedures.” *Id.*

⁴⁴ Climate Change Info. Res., *How Will Climate Change Affect the Region’s Transportation System?*, COLUMBIA UNIV. EARTH INST., http://ccir.ciesin.columbia.edu/nyc/ccir-ny_q2d.html (last modified Mar. 29, 2005).

⁴⁵ NORDENSON ET AL., supra note 1, at 12–13.

⁴⁶ *Id.* In addition, over 500,000 New Yorkers live within the City’s flood plain. PLANYC, PLANYC REPORT, supra note 5, at 8.

⁴⁷ See N.Y.C. DEP’T OF ENVTL. PROT., ASSESSMENT AND ACTION PLAN, supra note 39, at 40.

of drinking water.⁴⁸ When taken cumulatively, all of these risk factors could affect both the public health and the functionality of the City as a whole, eventually resulting in calamitous effects for the nation's largest city.⁴⁹

C. *Current Climate Change Programs in New York City*

In response to climate change predictions, the City has undertaken several initiatives in order to manage the rising sea levels. Projects range from City-wide, government-sponsored initiatives to smaller scale plans, such as parks and revitalized wetlands.⁵⁰ This Note will discuss the two largest programs currently working towards solving New York's climate change problem.

1. PlaNYC 2030

The most inclusive plan to combat the effects of climate change is the City-sponsored PlaNYC.⁵¹ Started as an effort to accommodate the City's increasing needs associated with continued growth in a limited geographic space,⁵² the plan has been expanded to include the broader goal of achieving sustainability for New York.⁵³ Under this plan, the City has identified three major challenges: "growth, an aging infrastructure, and an increasingly precarious environment."⁵⁴ In order to tackle these problems, the City has identified and focused on essential areas to address the challenges, namely: land, water, transportation, energy, air quality, and climate change.⁵⁵

PlaNYC also contains a commitment to addressing water-related issues. In addressing these concerns, the City is aiming to "[o]pen 90% of [its] waterways to recreation by preserving natural areas and reducing pollution."⁵⁶ Second, the City is focusing on "[d]evelop[ing] critical backup

⁴⁸ CLIMATE RISK INFORMATION, *supra* note 29, at 27.

⁴⁹ *See id.*; *see also* Edward L. Glaeser, *Urban Colossus: Why Is New York America's Largest City?* 11 FED. RESERVE BANK OF NEW YORK ECON. POL'Y R. 7, 7 (2005) (highlighting New York's status as the nation's largest city for 200 years).

⁵⁰ NORDENSON ET AL., *supra* note 1, at 48–50.

⁵¹ *See generally* PlaNYC, *Home*, NYC.GOV, <http://www.nyc.gov/html/planyc2030/html/home/home.shtml> (last visited Feb. 1, 2012).

⁵² PlaNYC, PLANYC REPORT, *supra* note 5, at 10.

⁵³ *Id.*

⁵⁴ *Id.* at 4.

⁵⁵ *Id.* at 11.

⁵⁶ *Id.* at 53.

systems for [its] aging water network to ensure long-term reliability.”⁵⁷ Within each of these broader goals, the plan enumerates specific initiatives aimed at making the goals a reality.⁵⁸

However, the plan fails to adequately address strategies to accommodate the general rising sea levels.⁵⁹ For example, the plan focuses on reducing pollution and managing wastewater.⁶⁰ The plan presents mainly infrastructural changes to the wastewater system as a means of coping with increased storm surges, rather than incorporating a variety of different strategies to handle the storm water both at the shore and within the City.⁶¹

Although the City did set forth initiatives to expressly focus on wetlands preservation and create more green spaces within the city to reduce the amount of storm water runoff entering the sewer systems, the policy goals are simply not focused enough on the problem to mitigate projected sea level rise.⁶² Although these two strategies may generally ease storm water inundation by absorbing water runoff and incorporating water into the urban infrastructure, they are only one part of the puzzle.⁶³ Generally, these policy objectives are aimed at increasing public access to New York’s waterways, ensuring high quality drinking water, and rebuilding vital water infrastructure.⁶⁴

As the plan has progressed, policymakers have had to reassess its goals and implementation. In 2010, the PlaNYC task force issued an annual progress report discussing the status of the program.⁶⁵ The most significant progress in handling excess water has been investments in hard and green infrastructure.⁶⁶ The City has achieved its goal for hard infrastructure through increased investments in wastewater treatment plants.⁶⁷

⁵⁷ PLANYC, PLANYC REPORT, *supra* note 5, at 63.

⁵⁸ *See id.* at 56–61, 66–71 (outlining a wide array of initiatives).

⁵⁹ *Id. passim.*

⁶⁰ *Id.* at 53–61 (addressing techniques to reduce runoff and filter out water impurities).

⁶¹ *See id.* at 53–61.

⁶² *See* PLANYC, PLANYC REPORT, *supra* note 5, at 57, 61.

⁶³ *See* ARUP, WATER RESILIENCE FOR CITIES 18, 24 (2010), *available at* http://www.arup.com/Homepage_C40_UrbanLife.aspx (click “find out more about Water Resilience for Cities”) (containing professional input from a well-established international design firm, noting that improved drainage may be particularly helpful for coastal cities).

⁶⁴ *See* PLANYC, PLANYC REPORT, *supra* note 5, at 61, 66 (noting in the conclusion that the City must “creatively reclaim [its] waterways for public use”).

⁶⁵ *See generally* PLANYC PROGRESS REPORT 2010, *supra* note 2.

⁶⁶ *Id.* at 30.

⁶⁷ *Id.* (noting that the City is intending to build an additional two storm water holding plants by the end of 2011).

Additionally, the progress report addresses the push for green infrastructure, meaning those infrastructures that use vegetation and permeable surfaces to keep storm water out of the City's sewer systems, by highlighting a sub-plan entitled the *Sustainable Storm Water Management Plan*, released in December of 2008.⁶⁸ The push for greener solutions to storm water management is relevant to sea level rise because when the city is hit with large storms, the water will collect within the city and generally exacerbate flooding problems.⁶⁹ Although this plan does present the most current information about PlaNYC's progress, it still neglects soft infrastructure changes needed to combat the projected rise in sea level.⁷⁰

2. Vision 2020: N.Y.C. Comprehensive Waterfront Plan

In addition to PlaNYC, the Department of City Planning has taken initial steps to create a comprehensive waterfront plan with the aim of developing a more sustainable coastline.⁷¹ The plan revises the original comprehensive waterfront plan, issued in 1992, and examines the waterfront "within the lens of . . . Four Functional Categories—the Natural, Public, Working, and Redeveloping— . . . Waterfronts."⁷² In addition to these areas, the plan introduces a new sphere entitled "The Blue Network,"⁷³ designed to address water usages, including a special new focus on the "challenges of global warming and sea-level rise."⁷⁴ Further, the New York City Department of City Planning has issued their revised comprehensive waterfront plan detailing the general outline for the City as it moves forward with waterfront planning.⁷⁵

⁶⁸ *Id.* at 31. However, as noted previously, the greening initiatives by themselves are not enough to address the severity of the rising currents and projected storm surges. *See supra* note 61 and accompanying text.

⁶⁹ *See* ARUP, *supra* note 63, at 18, 24.

⁷⁰ *See generally id.* (summarizing various hard infrastructure changes needed to combat rising sea levels but neglecting to mention soft infrastructure changes).

⁷¹ *See* Presentation: Vision 2020 New York City Comprehensive Waterfront Plan, N.Y.C. Dep't of City Planning (Apr. 8, 2010), <http://home2.nyc.gov/html/dcp/html/cwp/presentation.shtml> [hereinafter Presentation: Vision 2020].

⁷² *Id.* at 32; *see also* N.Y.C. Dep't of City Planning, *Vision 2020: New York City Comprehensive Waterfront Plan Overview*, NYC.GOV, <http://www.nyc.gov/html/dcp/html/cwp/index.shtml> (last visited Feb. 1, 2012).

⁷³ Presentation: Vision 2020, *supra* note 71, at 33.

⁷⁴ *Id.*

⁷⁵ N.Y.C. DEP'T OF CITY PLANNING, VISION 2020: NEW YORK CITY COMPREHENSIVE WATERFRONT PLAN (2011), *available at* http://www.nyc.gov/html/dcp/pdf/cwp/vision2020_nyc_cwp.pdf.

Although the revised waterfront plan is broad in scope, the Department of City Planning does pay particular attention to increasing climate change “resilience.”⁷⁶ In a promising step towards the incorporation of soft barrier infrastructure, New York City planners expressly recognize the utility of soft barrier technology.⁷⁷ Within the resilience discussion, the report focuses both on more conventional storm defense mechanisms, such as seawalls and dikes, and newer adaptation approaches, including restored wetlands and “soft edges.”⁷⁸ Additionally, the plan specifically endorses the research of Guy Nordenson, Katherine Seavitt and Adam Yarinsky—the research that provides many of the foundational principles of this Note.⁷⁹ The plan, while recognizing the contributions of this research, also notes that “more information will be needed.”⁸⁰

Expanding upon the policy goal of incorporating innovative adaptation techniques, the plan also lists several recommendations, including “conduct[ing] a city-wide strategic planning process for climate resilience,” and devising a dynamic and collaborative design process that has the flexibility to adjust with the newest information and projections.⁸¹ Further, the plan advocates for a diverse approach to the implementation of resilience strategies, allowing for the creation of:

an inventory of adaptation strategies with potential applicability for New York City and [the ability to] evaluate strategies based on a full range of costs and benefits. Options to be considered include the potential strategies identified in this plan as well as additional innovative strategies to be identified through engagement with practitioners.⁸²

Although the comprehensive waterfront plan is merely an advisory document, Vision 2020 presents the most hospitable and forward looking “home” for the soft barrier technologies furthered in the *Palisade Bay* design project. The plan recommendations make specific mention of soft infrastructure approaches to coastline preservation and protection,⁸³ highlighting the notoriety of such an approach and potentially underscoring the

⁷⁶ *Id.* at 106.

⁷⁷ *Id.* at 110.

⁷⁸ *Id.*; *see also id.* at 109.

⁷⁹ *Id.* at 111.

⁸⁰ VISION 2020: NEW YORK CITY COMPREHENSIVE WATERFRONT PLAN, *supra* note 75, at 111.

⁸¹ *Id.* at 112.

⁸² *Id.*

⁸³ *Id.* at 110.

success of the *Palisade Bay* project, which was ultimately publicized by several New York and design publications.⁸⁴ Despite this notable acknowledgment of the technology, the recommendations' mere mention of soft infrastructure is still a broad policy goal with no concrete plan or enforcement mechanism.

In a close working relationship with Vision 2020, Mayor Bloomberg launched the Waterfront Vision and Enhancement Strategy ("WAVES"), a program designed to facilitate interagency policy development for New York's susceptible waterfront.⁸⁵ The complementary program is spearheaded by the New York City Economic Development Corporation.⁸⁶ WAVES, in its entirety, will consist of a three-year Action Agenda for implementing water goals and the creation of a Waterfront Management Advisory Board.⁸⁷ Under the Action Agenda, the City will create a working implementation plan that will set forth more specific steps towards managing the coastline, in effect creating constantly evolving policy.⁸⁸ Additionally, the Waterfront Management Advisory Board will consist of "12 mayoral appointees" who will develop the Action Agenda and advise the Department of City Planning on the Vision 2020 Program.⁸⁹

In conjunction with the publication of the Vision 2020: New York Comprehensive Waterfront Plan and in line with the original goals set forth for the program, WAVES issued its "Waterfront Action Agenda," outlining 130 upcoming projects for the New York Coastline.⁹⁰ Specifically tailored to the goal of mitigating climate change, the Agenda outlines goals similar to those of the Vision 2020 plan, including providing "[s]upport [to] coastal communities' efforts to undertake local resilience planning."⁹¹ Lastly, the agenda also provides for a strategic planning process, as mirrored in the previously discussed Vision 2020 plan.⁹²

⁸⁴ See Nicolai Ouroussoff, *Imagining a More Watery New York*, N.Y. TIMES, Mar. 25, 2010, <http://www.nytimes.com/2010/03/26/arts/design/26rising.html>; Iovine, *supra* note 10.

⁸⁵ *Projects & Opportunities: Waterfront Vision and Enhancement Strategy*, NYCEDC.COM, <http://www.nycedc.com/ProjectsOpportunities/CurrentProjects/Citywide/WaterfrontVisionAndEnhancementStrategy/Pages/WaterfrontVisionandEnhancementStrategy.aspx> (last visited Feb. 1, 2012).

⁸⁶ *Id.*

⁸⁷ *See id.*

⁸⁸ *See id.*

⁸⁹ *Id.*

⁹⁰ WATERFRONT VISION & ENHANCEMENT STRATEGY, WATERFRONT ACTION AGENDA: TRANSFORMING NEW YORK CITY'S WATERFRONT 2, *available at* <http://www.nycedc.com/sites/default/files/filemanager/Projects/WAVES/WAVESActionAgenda.pdf>.

⁹¹ *Id.* at 7.

⁹² *See id.*; *see also supra* Part I.C.2.

Ultimately, the initiative could be a strong government collaborative move if implemented correctly. The program's focus on specific steps to develop coastal protection could provide a hospitable policy foundation for soft infrastructure design. However, like much of the legal framework in the realm of coastal management, Vision 2020 and WAVES state broad policy goals and delegate power to other authorities.

II. OCEAN AND COASTAL LAWS GOVERNING THE NEW YORK–NEW JERSEY BAY

The various laws governing the New York–New Jersey Bay are far from straightforward. Within this one harbor, both federal and state law converge to govern the ownership, management, and development of coastal resources.⁹³ In order for soft infrastructure projects to reach successful implementation, they must comply with both state and federal law. First, this section will evaluate the federal laws on point, including the 1953 Submerged Lands Act, The Coastal Zone Management Act, and the Coastal Barrier Resources Act. After the analysis of federal law, this section will also survey relevant state legislation and actors, analyzing New York's Coastal Zone Management Program, New York City's Waterfront Revitalization Plan, and the Local Waterfront Revitalization Plan currently in place for New York City. Lastly, this section will attempt to reconcile each of these laws in order to paint a complete picture of the legal environment governing the bay.

A. *Federal Laws and Actors Governing the Coastal Zone*

1. The Submerged Lands Act of 1953

Adopted in 1953, the Submerged Lands Act (“SLA”)⁹⁴ cedes title from the federal government to individual state governments for “the waters and submerged lands lying beyond the low-water mark out to three nautical miles.”⁹⁵ Further, the Act provides for state ownership of

⁹³ See *infra* Part II.A–B.

⁹⁴ 43 U.S.C. § 1312 (2006).

⁹⁵ LAURA K. WELLES ET AL., CONG. RESEARCH SERV., RL 32912, FEDERAL-STATE MARITIME BOUNDARY ISSUES 6 (2005); see also Silvia Quast & Michael A. Mantell, *Role of the States*, in OCEAN AND COASTAL LAW AND POLICY 69 (Donald C. Baur et al. eds., 2007) (explaining that the SLA defines the coastline as “the line of [the] ordinary low water along that portion of the coast which is in direct contact with the open sea and the line marking the seaward limit of inland waters”) (quoting *United States v. Maine*, 469 U.S. 504, 512–13 (1980)).

all improvements and natural resources located on the land.⁹⁶ As a result of this shift in ownership, the SLA provides the states with explicit power to rent, develop, and administer the natural resources located within their respective subsoil, ocean bottoms, and waters.⁹⁷ The SLA's grant of land beneath the navigable waters to the state was a return to common law coastal principles after the Supreme Court's contrary decision in *United States v. California (California I)*.⁹⁸ In this case, the Court held that the federal government "owned all submerged land seaward of the ordinary low water mark."⁹⁹

With the passage of the SLA, Congress preserved federal control over coastal waters in several instances.¹⁰⁰ First, the Act maintains that all resources lying seaward of the SLA-created boundary remained within the purview of federal authority.¹⁰¹ Additionally, the SLA creates exceptions for lands obtained by the federal government, lands explicitly held by the federal government when the state entered the Union, and lands "occupied by the federal government under a claim of right."¹⁰² Lastly, the SLA reserves the federal government's right to control the waters and land, exerting its constitutional powers, including utilizing its powers over "commerce, navigation, national defense, and international affairs."¹⁰³

More broadly, the SLA implicates issues of federal and state definitions of maritime boundaries. One primary concept is classification of "inland waters," a particularly relevant issue for the New York–New Jersey Upper Bay. Although not directly set forth in the Act itself, the definition of "inland waters" is addressed by the Supreme Court in *United States v. California (California II)*.¹⁰⁴ In this case, the Court granted a supplemental decree to construe the meaning of "inland waters," ultimately holding that Congress intended to leave construction of the term to the courts and, further, that the term should comply with the definition included

⁹⁶ 43 U.S.C. § 1311 (2006).

⁹⁷ 43 U.S.C. § 1311(a) (2006); see also WELLES ET AL., *supra* note 95, at 6.

⁹⁸ See *United States v. California*, 332 U.S. 19 (1947); Quast & Mantell, *supra* note 95, at 69 (explaining the "curtailment of the states' authority was brief" as Congress passed the Submerged Lands Act soon after the California decision).

⁹⁹ Quast & Mantell, *supra* note 95, at 69; see also WELLES ET AL., *supra* note 95, at 6.

¹⁰⁰ 43 U.S.C. §§ 1313–14 (2006).

¹⁰¹ WELLES ET AL., *supra* note 95, at 7.

¹⁰² *Id.* at 7. The claim of right clause of the SLA aims to protect the imperfect claims of federal title from elimination under U.S.C. § 1311's general "conveyance or quitclaim or assignment." *Id.* at 7 n.42.

¹⁰³ 43 U.S.C. § 1314 (2006); see also WELLES ET AL., *supra* note 95, at 7.

¹⁰⁴ *United States v. California*, 381 U.S. 139, 148–49 (1965).

in the Convention on Territorial Sea and the Contiguous Zone.¹⁰⁵ With this holding, the Court adopted a “24-mile closing line rule for bays and a semicircle test for the sufficiency of water enclosed as the definition of inland waters.”¹⁰⁶

The SLA, read along with *California II*, provides that the states own and control the rights to waters for three geographical miles off their shores.¹⁰⁷ Further, current law provides that the states also control the submerged lands located within the inland waters.¹⁰⁸

2. Coastal Zone Management Act

The SLA, as discussed above, granted more power to the states to control adjacent coastal waters.¹⁰⁹ Conversely, the Coastal Zone Management Act (“CZMA”) provides recommendations for a voluntary adoption of a coastal management plan in exchange for funding as a means to coordinate the development and preservation of coastal waters and shoreline.¹¹⁰ Enacted in 1972, the Act was a congressional response “to widespread public concern about estuarine and oceanfront degradation.”¹¹¹ Congress has since reauthorized or amended the CZMA on many occasions in response to changing environmental concerns while still allowing states to manage their coastal interests.¹¹² The Act lists some of the main goals of the CZMA as “to preserve, protect, develop, and where possible, to restore or enhance, the resources of the Nation’s coastal zone for this and succeeding generations.”¹¹³

The CZMA’s basic structure is the voluntary development and execution of local Coastal Zone Management Programs (“CZMPs”).¹¹⁴ In exchange for the development of such programs, states receive funding from the Office of Ocean and Coastal Resources Management, located within the National Oceanic and Atmospheric Administration.¹¹⁵ In order

¹⁰⁵ *Id.* at 163–65; see also RICHARD G. HILDRETH & RALPH W. JOHNSON, OCEAN AND COASTAL LAW 172 (Ellen W. Caughey & Paula Martinac eds., 1983).

¹⁰⁶ HILDRETH & JOHNSON, *supra* note 105, at 172–73.

¹⁰⁷ See *California II*, 381 U.S. at 148; 43 U.S.C. § 1312 (2006).

¹⁰⁸ See *California II*, 381 U.S. at 148.

¹⁰⁹ See *supra* Part II.A.1.

¹¹⁰ HAROLD F. UPTON, CONG. RESEARCH SERV., RL 34339, COASTAL ZONE MANAGEMENT: BACKGROUND AND REAUTHORIZATION ISSUES 2–3 (2010).

¹¹¹ *Id.* at 1.

¹¹² *Id.* at I (summary page).

¹¹³ 16 U.S.C. § 1452 (2006).

¹¹⁴ Quast & Mantell, *supra* note 95, at 75.

¹¹⁵ See UPTON, *supra* note 110, at 4; Patricia E. Salkin, *Integrating Local Waterfront Revitalization Planning and Zoning*, 22 PACE ENVTL. L. REV. 207, 210 (2005); see also

to obtain funding, the state's CZMP must be approved by the U.S. Secretary of Commerce.¹¹⁶ State CZMP plans must include several items. First, an approved CZMP must contain a definition of the geographic zone and boundaries that will be controlled by the plan, as well as a description of the legitimate land and water usages within the zone.¹¹⁷ Further, the plan must provide a viable definition and access plan specifically for beaches.¹¹⁸ The Act also requires an inventory of both highlighted problem areas and relevant state law.¹¹⁹ Moreover, states must also provide "[b]road guidelines on priorities of uses in particular areas, including specifically those uses of lowest priority."¹²⁰ Lastly, the applicant program must create planning processes for energy facilities located within the prescribed zone and a study and restoration of areas faced with shoreline erosion.¹²¹ Although each of these requirements contribute to overall coastal management, the elements of the plan neglect any specific focus on maintaining a sea level rise action plan.

Furthermore, the CZMA's primary goal is to ensure that U.S. coastal areas are managed consistently, including interaction from unrelated federal and state projects.¹²² Section 307 of the CZMA provides that each state participant must receive an opportunity to certify that all federal actions within its coastal zone are consistent with the already federally approved CZMP.¹²³ Comparatively, there is also a provision of the Act that requires the state CZMP to cooperate with other state bodies to ensure that all actions are consistent with overarching state policy.¹²⁴ Not only is cooperation between state entities a goal, it is a requirement for CZMP project approval, recognizing that in order for the Act to be successful, local and municipal collaboration is necessary.¹²⁵

Laurina M. Spolidoro, Note, *Area Contingency Plans: Is The Coastal Zone Management Act on a Collision Course with Unfettered Oil Spill Response?*, 27 WM. & MARY ENVTL. L. & POL'Y REV. 755, 760-62 (2003). Note that the Office of Ocean and Coastal Resources Management is a subdivision of the National Oceanic and Atmospheric Administration ("NOAA"). See *About Us: Divisions*, OCEAN & COASTAL RESOURCE MGMT., <http://coastalmanagement.noaa.gov/about/divisions.html> (last visited Feb. 1, 2012).

¹¹⁶ See Salkin, *supra* note 115, at 210.

¹¹⁷ 16 U.S.C. § 1455(d)(2)(A)-(B) (2006).

¹¹⁸ *Id.* § 1455(d)(2)(G).

¹¹⁹ *Id.* §§ 1455(d)(2)(C)-(D).

¹²⁰ *Id.* § 1455(d)(2)(E).

¹²¹ *Id.* §§ 1455(d)(2)(H)-(I).

¹²² 16 U.S.C. § 1456 (2006); see Salkin, *supra* note 115, at 210; UPTON, *supra* note 110, at 5.

¹²³ UPTON, *supra* note 110, at 5.

¹²⁴ Salkin, *supra* note 115, at 210.

¹²⁵ *Id.* at 210-11.

Although the CZMA's reach is expansive, there are several provisions that are especially relevant and may be particularly useful to the implementation of soft infrastructure design. First, the Act provides for several different grants, including "Coastal Zone Enhancement Grants."¹²⁶ This grant is reserved for nine specific purposes, with the most relevant purposes being "protecting and enhancing wetlands," "addressing natural hazards," "fostering special area management planning," "planning for ocean resources,"¹²⁷ and most importantly, "anticipating and managing the effects of potential sea level rise."¹²⁸

Additionally, the CZMA's general scope has been amended to acknowledge the mounting importance of climate change and sea level rise. In the congressional findings located at the beginning of the Act, Congress noted that because global warming "may result in a substantial sea level rise with serious adverse effects in the coastal zone, coastal states must anticipate and plan for such an occurrence."¹²⁹ Further, in the Act's statement of policy, Congress states that the Secretary should in some instances facilitate coastal planning for sea level rise.¹³⁰ Both of these amendments acknowledge the likely impact of sea level rise and indicate that Congress may be open to even more aggressive planning for sea level rise. In this regard, the CZMA may be open for further amendments in support of sea level rise planning.

Ultimately, the CZMA is the most notable federal Act pertaining to U.S. coastal policy. Although the Act sets forth guidelines for voluntary participation, it still provides a great deal of latitude for states and local government agencies to implement and emphasize the programs of their choosing.¹³¹

3. Coastal Barrier Resources Act

The final federal act related to coastal management is the Coastal Barrier Resources Act ("CBRA"), which sets aside "undeveloped coastal barriers and adjacent areas" from increased development.¹³² The Act accomplishes this by limiting federal spending and assorted financial support programs that encourage further construction and expansion on coastal

¹²⁶ 16 U.S.C. § 1456b (2006); UPTON, *supra* note 110, at 4.

¹²⁷ UPTON, *supra* note 110, at 4.

¹²⁸ 16 U.S.C. § 1456b(a)(2) (2006).

¹²⁹ 16 U.S.C. § 1451(l) (2006).

¹³⁰ 16 U.S.C. § 1452(2)(K) (2006).

¹³¹ UPTON, *supra* note 110, at 6.

¹³² *Id.* at 15; *see also* Kristin M. Fletcher, *Managing Coastal Development*, in OCEAN AND COASTAL LAW AND POLICY 147, 167–68 (Donald C. Baur et al. eds., 2007).

barriers.¹³³ Additionally, the Act explicitly limits the development or purchase of “any structure, road, airport, boat landing facility, bridge or causeway to or on” any part of the barrier.¹³⁴ This program is unique and distinct from the CZMA because it does not set forth any guidelines, but rather attempts to regulate development by prohibiting federal support for programs that capitalize on coastal barriers for development.¹³⁵ Although this Act takes a hands-on approach to conservation, the CBA is a potential source of policy development for soft infrastructure because the two are topically related and could seamlessly be integrated into a double layer conservation strategy.

B. State Law Programs and Actors Governing the New York City Coast

Although the problems associated with sea level rise and climate change have a federal law component, much of the risk management and necessary planning focused around climate change requires state government responsibility.¹³⁶ Within the state of New York, there are a host of actors and regulations that have a hand in planning for the future of the coastline in New York City. State and local government control overlap, underscoring the need for cooperation within the region. This section will discuss the dizzying volume of governmental role-players and attempt to simplify the regulatory scheme that controls the New York–New Jersey Upper Bay.

1. New York Coastal Management Program

In accordance with the CZMA, the National Oceanic and Atmospheric Administration (“NOAA”) approved the New York Coastal Management Program in 1982.¹³⁷ Chiefly administered by the New York Department of State, the comprehensive plan delineates forty-four policies directed at coordinating State activities that have an impact on the Coastal

¹³³ Fletcher, *supra* note 132, at 167.

¹³⁴ *Id.*

¹³⁵ See UPTON, *supra* note 110, at 15. The at-risk coastal barriers for New York are clustered around Long Island. See John H. Chaffee Coastal Barrier Resources System: *New York–Long Island*, U.S. FISH & WILDLIFE SERV., http://www.fws.gov/habitatconservation/State_Locator_Maps/Small_NY_Long_Island.pdf (last visited Feb. 1, 2012).

¹³⁶ See JOHN R. NOLON & PATRICIA E. SALKIN, CLIMATE CHANGE AND SUSTAINABLE DEVELOPMENT LAW IN A NUTSHELL 395 (West 2010).

¹³⁷ *Ocean and Coastal Management in New York*, NAT'L OCEANIC & ATMOSPHERIC ADMIN., <http://coastalmanagement.noaa.gov/mystate/ny.html> (last visited Feb. 1, 2012).

Area.¹³⁸ Further, the plan incorporates local government action by creating incentives for municipalities to create Local Waterfront Revitalization Plans (“LWRPs”).¹³⁹

Ultimately, the coastal management program was designed to rest on the preexisting state environmental legislation.¹⁴⁰ However, the New York State legislature encountered holes that required further legislation, leading to passage of the Waterfront Revitalization and Coastal Resources Act and the Coastal Erosion Hazard Areas Act.¹⁴¹ Although the program covers a wide range of coastal-related issues, the relevant portions include a description of general program management, an assessment of localized flood and erosion hazards, and the laundry list of policies outlined to coordinate the coastline development.¹⁴²

The program management section utilizes a “network” approach to implementation of the program, organizing existing programs into a comprehensive scheme and ensuring compliance with the consistency provision of the Waterfront Revitalization and Coastal Resources Act.¹⁴³ The program also reserves roles for several agencies in implementing and coordinating the plan, including: the Coastal Management Agency; the Department of Environmental Conservation; the Office of Parks, Recreation, and Historic Preservation; the Departments of Transportation and Commerce; Business Permits, Energy, and General Services; the Port Authority of New York–New Jersey; and the Power Authority of the State of New York.¹⁴⁴ The Department of State, as noted above, is the primary administrator of the plan and is empowered to apply for federal CZMA funding and enter into agreements with other state, regional, county, and

¹³⁸ See NAT’L OCEANIC AND ATMOSPHERIC ADMIN & N.Y. DEP’T OF STATE, NEW YORK STATE COASTAL MANAGEMENT PROGRAM AND FINAL ENVIRONMENTAL IMPACT STATEMENT § I, at 1–2 (2010).

¹³⁹ *Id.* § I, at 2; see Salkin, *supra* note 115, at 216 (highlighting New York’s LWRP encouragement).

¹⁴⁰ NEW YORK COASTAL MANAGEMENT PROGRAM AND FINAL ENVIRONMENTAL IMPACT STATEMENT, *supra* note 138, § II-1.

¹⁴¹ *Id.*; see Salkin, *supra* note 115, at 213–14 (stating that a “main problem” the WRCA tried to address was the lack of required coordination among agencies).

¹⁴² NEW YORK COASTAL MANAGEMENT PROGRAM AND FINAL ENVIRONMENTAL IMPACT STATEMENT, *supra* note 138, § II-4, at 1–14, § II-5, at 6–14, § II-6, at 1–105 (listing the entirety of the policies although all are not particularly relevant to the scope of this Note); see Salkin, *supra* note 115, at 214–15 (highlighting some of the policies contained in the CZMP).

¹⁴³ NEW YORK COASTAL MANAGEMENT PROGRAM AND FINAL ENVIRONMENTAL IMPACT STATEMENT, *supra* note 138, § II-4, at 1–2; see Salkin, *supra* note 115, at 215.

¹⁴⁴ NEW YORK COASTAL MANAGEMENT PROGRAM AND FINAL ENVIRONMENTAL IMPACT STATEMENT, *supra* note 138, § II-4, at 2–4.

local agencies that could help with the success of the plan.¹⁴⁵ As the plan has been implemented, the Department of State has developed a subdivision of Coastal Resources to administer the plan, as well as coordinate other general coastal policy within the state.¹⁴⁶

Paralleling the federal CZMA, the Act's "major vehicle for promoting waterfront revitalization is through the implementation of voluntary local government waterfront revitalization programs."¹⁴⁷ New York City is in the process of adopting a new waterfront revitalization plan that will be discussed in greater detail *infra*.¹⁴⁸ More broadly, the Coastal Management Program places an emphasis on local government action, encouraging municipalities to develop and implement smaller scale plans for coastal preservation.¹⁴⁹ Although the program emphasizes local engagement, the LWRPs must undergo an approval process, ultimately seeking confirmation from the New York Department of State.¹⁵⁰

In addition to this provision, the plan also sets up a regulatory scheme to ensure the consistency of state action given the network approach to program implementation.¹⁵¹ The primary mechanism to ensure consistency is the State Environmental Quality Review Act ("SEQRA").¹⁵² This preexisting legislation was selected to help monitor coastal preservation because a review structure was already in place, requiring state agencies to file environmental impact statements if the action will have adverse environmental effects.¹⁵³ The State Department also requires all actions within the coastal area to be reported directly to the Department in a Coastal Assessment Form ("CAF").¹⁵⁴

¹⁴⁵ *Id.* § II-4, at 2.

¹⁴⁶ Division of Coastal Resources, *About Us*, N.Y. DEPT OF STATE, <http://nyswaterfronts.com/aboutus.asp> (last visited Feb. 1, 2012) (discussing the various roles of the Division of Coastal Resources, not limited to the implementation of the CZMA and the state CZMP).

¹⁴⁷ NEW YORK COASTAL MANAGEMENT PROGRAM AND FINAL ENVIRONMENTAL IMPACT STATEMENT, *supra* note 138, § II-4, at 5; see Salkin, *supra* note 115, at 215–16.

¹⁴⁸ See *infra* Part II.B.3; see generally MICHAEL R. BLOOMBERG & AMANDA M. BURDEN, THE NEW WATERFRONT REVITALIZATION PROGRAM (2002) [hereinafter THE NEW WATERFRONT REVITALIZATION PLAN].

¹⁴⁹ NEW YORK COASTAL MANAGEMENT PROGRAM AND FINAL ENVIRONMENTAL IMPACT STATEMENT, *supra* note 138, § II-4, at 11–12.

¹⁵⁰ *Id.* § II-4, at 12. Even after the plan has been approved by the Secretary of State, any later amendments to the LWRP are potentially "subject to review and approval by the Secretary." *Id.* § II-4, at 13.

¹⁵¹ See *id.* § II-4, at 5.

¹⁵² See *id.* § II-4, at 8.

¹⁵³ NEW YORK COASTAL MANAGEMENT PROGRAM AND FINAL ENVIRONMENTAL IMPACT STATEMENT, *supra* note 138, § II-4, at 8.

¹⁵⁴ *Id.*

Another pertinent portion of the plan discusses the coastal issues surrounding both flood and erosion hazards.¹⁵⁵ In attempting to address the concerns of the coastline, the program places some focus on the “‘structural’ approach,” including a discussion of the conventional hard barriers, as well as less conventional approaches, such as dune reconstruction.¹⁵⁶ Under the program, the structural approach is described as “the building of protective structures, including those which use natural materials such as sand, to defend coastal property against damage by flooding or erosion.”¹⁵⁷ This definition certainly has positive implications for the future development of soft barrier design technology. Further, the subdivision on structural response notes that conventional barriers have certain drawbacks for the ultimate preservation of beaches and shoreline.¹⁵⁸ The positive definition, coupled with a nod to the destructive nature of hard barrier infrastructure, provides a potentially hospitable environment for the implementation of soft barrier technology. However, the plan only provides a cursory discussion of the available design options, not going far enough.

The erosion section of the program also discusses the benefits of barrier islands in managing storm surge, determining that “barrier islands respond to natural forces by absorbing wave energy which, in major storms, is dissipated on the beach and over the dunes, with beach materials often being carried into the bay beaches or wetlands.”¹⁵⁹ Although the plan acknowledges that barrier islands are unique ecosystems that provide a benefit to the coastal environment, the plan is silent on using man-made archipelago islands as a solution to New York’s coastal problems.¹⁶⁰

Lastly, the program outlines forty-four policies for the management of coastal resources, creating three general categories.¹⁶¹ The first set of

¹⁵⁵ See *id.* § II-5, at 6–14.

¹⁵⁶ *Id.* § II-5, at 9–12. Although the plan does discuss both soft barriers and more environmentally friendly approaches, it highlights the high costs typically associated with each of the tactics. Ultimately, the discussion is inconclusive on what technique would best suit New York. *Id.*

¹⁵⁷ *Id.* § II-5, at 9.

¹⁵⁸ NEW YORK COASTAL MANAGEMENT PROGRAM AND FINAL ENVIRONMENTAL IMPACT STATEMENT, *supra* note 138, § II-5, at 9–10.

¹⁵⁹ *Id.* § II-5, at 7; see Salkin, *supra* note 115, at 215 (noting that barrier island protection is one of the policies included).

¹⁶⁰ See NEW YORK COASTAL MANAGEMENT PROGRAM AND FINAL ENVIRONMENTAL IMPACT STATEMENT, *supra* note 138, § II-5, at 7.

¹⁶¹ See *id.* § II-6 (discussing generally the implementation of the program and associated coastal policies); see Salkin, *supra* note 115, at 214–15 (discussing more of the specific policies at length).

policies are designed to “promote the use of coastal resources.”¹⁶² The second group aims to restrict the general principle of the first group, delineating policies to ensure the ongoing preservation of fragile resources.¹⁶³ Lastly, the third group focuses on specific activities that pose more of a threat to coastal resources.¹⁶⁴ Despite the policies’ wide-ranging scope, they take a more defensive approach to controlling erosion and flooding.¹⁶⁵ Rather than emphasize these approaches and try to avoid the likely consequences, the State Department should be more proactive in implementing technology that accommodates the problem of rising sea-levels.

2. New York City’s Comprehensive Waterfront Plan¹⁶⁶

As discussed previously, New York City’s Comprehensive Waterfront Plan was recently revised in March 2011.¹⁶⁷ The plan assesses and analyzes several policy and design options.¹⁶⁸ Under these recommendations, the City again provides broad policy goals aimed at addressing the climate change dilemma, including conducting “a citywide strategic planning process for climate resilience” and a proactive exploration of options to protect the coastline.¹⁶⁹ Additionally, the plan highlights the need to coordinate any action with the current Waterfront Revitalization Plan (“WRP”), indicating that the WRP is the preeminent coastal planning tool.¹⁷⁰

3. New York City’s “New Waterfront Revitalization Program”

New York City is currently operating under the New Waterfront Revitalization Plan, last updated in 2002.¹⁷¹ The City’s LWRP is the third

¹⁶² NEW YORK COASTAL MANAGEMENT PROGRAM AND FINAL ENVIRONMENTAL IMPACT STATEMENT, *supra* note 138, § II-6, at 1.

¹⁶³ *Id.* § II-6, at 2.

¹⁶⁴ *Id.*

¹⁶⁵ *Id.* § II-6, at 34, 42 (highlighting policies that are backward-looking rather than proactive).

¹⁶⁶ *See supra* Part I.C.2 (discussing Vision 2020 program).

¹⁶⁷ *See* VISION 2020: NEW YORK CITY COMPREHENSIVE WATERFRONT PLAN, *supra* note 75; *see also* Sussman et al., *supra* note 7, at 70–71 (noting that the Department of City Planning is the acting body on comprehensive waterfront plan reform and should look to use adaptation strategies in this plan and the City LWRP).

¹⁶⁸ *See generally* VISION 2020: NEW YORK CITY COMPREHENSIVE WATERFRONT PLAN, *supra* note 75, at 105–13.

¹⁶⁹ *Id.* at 112. The plan explains that the exploration of sea level protection could include both levees and “soft edges.” *Id.* at 110–12.

¹⁷⁰ *Id.* at 8 (cataloging past achievements for New York City waterfront planning, including the relevance of the WRP).

¹⁷¹ THE NEW WATERFRONT REVITALIZATION PLAN, *supra* note 148.

level in coastal legislation, promulgated in accordance with the New York State Coastal Management Program.¹⁷² Generally, “the plan[] assess[es] local conditions and propose[s] short- and long-term strategies to guide land use change, planning and coordination, and public investment for each of the waterfront functional areas.”¹⁷³ The plan also works in conjunction with a range of zoning statutes enacted in 1993, integrating the goals and policies of the City’s waterfront plan.¹⁷⁴ In addition to the waterfront zoning provisions, the plan incorporates another layer of City planning, coordinating local programs provided for in the City Charter with the City’s LWRP.¹⁷⁵ Ultimately, the plan requires that “[w]hen a proposed project is located within the coastal zone and it requires a local, state, or federal discretionary action, a determination of the project’s consistency with the policies and intent of the WRP must be made before the project can move forward.”¹⁷⁶

Further, the plan, much like the State Department’s Coastal Management Program, outlines a list of ten policies designed to improve the City’s coastline and protect vital resources.¹⁷⁷ The most pertinent policy aims to “[m]inimize loss of life, structures and natural resources caused by flooding and erosion.”¹⁷⁸ This policy, like much of the other policies outlined in the federal and state plans, provides little detail. Rather, the goal is very broad and purpose-oriented, offering little guidance for practical flood prevention. In the description of the policy, the plan generally endorses natural, instead of structural, approaches for flood protection.¹⁷⁹

C. *Reconciling Federal, State, and Local Programs*

As demonstrated by the discussion of the applicable federal, state, and local programs governing coastal management, attempting to alter coastal policy can be an arduous task. Any proposed plan for an at-risk coastal zone must jump through several bureaucratic hoops to ensure that the fragile coastal area is not harmed.¹⁸⁰ While the plans do not necessarily

¹⁷² *Id.* at 3 (noting that it “is authorized under the State’s Coastal Management Program, which, in turn, stems from federal coastal zone legislation”).

¹⁷³ *Id.* at 6.

¹⁷⁴ *See id.*

¹⁷⁵ *Id.* These plans are known as 197-a plans. *Id.*

¹⁷⁶ N.Y.C. Dep’t of City Planning, *Waterfront Revitalization Program*, NYC.GOV, <http://www.nyc.gov/html/dcp/html/wrp/wrp.shtml> (last visited Feb. 1, 2012).

¹⁷⁷ THE NEW WATERFRONT REVITALIZATION PLAN, *supra* note 148, at 8.

¹⁷⁸ *Id.* at 20.

¹⁷⁹ *Id.* at 21.

¹⁸⁰ Bruce Kuhse, *The Federal Consistency Requirements of the Coastal Zone Management Act of 1972: It’s Time to Repeal This Fundamentally Flawed Legislation*, 6 OCEAN &

conflict in terms, they do provide an increasingly complicated structure to develop effective program design. First, under the CZMA, Congress created a regulatory scheme that delegated power to the states to create coastal management programs, providing guidance through statutory guidelines.¹⁸¹ The CZMA's goal is not necessarily to preempt the states' coastal planning, but rather to provide incentives for effective coastal management.¹⁸² In complying with the CZMA, New York has created a state Coastal Management Program, further regulating the coastal zone through policy enactments.¹⁸³ Within this plan, New York approached the dilemma of coastal management much like the federal government by further delegating coastline planning and conservation to local governments.¹⁸⁴

Consistency is another concern for each level of regulation. Each plan highlights a mechanism for coordinating previously dissonant agencies.¹⁸⁵ However, in implementing an effective and streamlined plan, a wide range of actors may ultimately prevent any comprehensive plan for the coastline from moving forward. In order for any plan to succeed, a large amount of governmental collaboration must take place.¹⁸⁶

In addition to the coastal zone management plans, the other federal regulations addressed in this Note, including the SLA, cede power to the states.¹⁸⁷ Further, the CBRA could be viewed as protection-focused, and may serve as another hurdle to soft infrastructure development if the plan incorporates the soft infrastructure design scheme with multi-use development.¹⁸⁸

Overall, the largest barrier to application of soft infrastructure in New York City is the bureaucratic maze of regulation and government actors. Part III will analyze ways to both incentivize soft infrastructure

COASTAL L.J. 77, 86–87 (2001) (quoting *Am. Petroleum Inst. v. Knech*, 456 F. Supp. 889 (C.D. Cal. 1978), *aff'd* 609 F.2d 1306 (9th Cir. 1979)) (highlighting the federal courts' negative opinion of the CZMA and the huge problems created by the large number of both federal and state bureaucracies).

¹⁸¹ See *supra* notes 117–24 and accompanying text (discussing the requirements of the various state CZMPs).

¹⁸² See Salkin, *supra* note 115, at 210.

¹⁸³ See *supra* Part II.B.3.

¹⁸⁴ See NEW YORK COASTAL MANAGEMENT PROGRAM AND FINAL ENVIRONMENTAL IMPACT STATEMENT, *supra* note 138, § II-4, at 1–2.

¹⁸⁵ See *supra* notes 123–24, 152–58 and accompanying text.

¹⁸⁶ See NEW YORK COASTAL MANAGEMENT PROGRAM AND FINAL ENVIRONMENTAL IMPACT STATEMENT, *supra* note 138, § II-4, at 2–4 (highlighting the roles of the multiple agencies in the management process).

¹⁸⁷ WELLES ET AL., *supra* note 95, at 6.

¹⁸⁸ See *supra* notes 132–35 and accompanying text.

implementation on the national level and simplify the governmental barriers to success on the state and local level.

III. IMPLEMENTING NEW TECHNOLOGIES ON THE WATER: UTILIZING AND CHANGING THE POLICIES TO MAKE TECHNOLOGY A REALITY

As new design technology becomes available, the law should serve as a source of encouragement rather than a barrier to implementation. The current law governing coastal management is convoluted, involving a multitude of actors and policies.¹⁸⁹ Perhaps the most daunting element of utilizing cutting edge design is not the actual construction, but complying with intricate sets of regulations. In order to ease the path to successful implementation, the law should both incentivize implementation of soft infrastructure and simplify the current regulatory scheme with which plans must comply. This section will first evaluate the City's attempt to simplify the current local regulation complicating the New York legal environment. Second, this section will propose changes to federal regulation, including the CZMA and the CBRA which will ease development of soft infrastructure. Finally, this section will broaden the scope of this Note to apply the suggested changes to other coastal cities throughout the nation.

A. *Streamlining Local Governmental Actors*

New York City, the nation's largest city,¹⁹⁰ has many stakeholders invested in protecting the City's coastline. Reconciling the goals and plans of the multitude of party actors is difficult, yet it is essential to the ultimate preservation of the City. First, the state CZMP acknowledges an overwhelming number of governmental actors with a stake in coastline management and development, noting the roles of the Departments of State and Environmental Conservation, among others.¹⁹¹ Second, much like at the state level, the City also has recognized a number of interested role-players, including the broader PlaNYC initiative, the Vision 2020 project, and the newly conceptualized WAVES program.¹⁹²

The current state CZMP reconciles the large number of governmental actors by laying the framework for a networking approach to coastal management, attempting to coordinate a large number of government

¹⁸⁹ See Kuhse, *supra* note 180, at 87.

¹⁹⁰ Glaeser, *supra* note 49, at 7.

¹⁹¹ See *supra* Part II.B.1; see also Kuhse, *supra* note 180, at 87 (highlighting that criticism of the CZMA included problems between a large number of actors).

¹⁹² See *supra* Part I.C.1–2.

agencies through the use of consistency reporting.¹⁹³ While the New York CZMP does eventually create a framework of regulation, it does so in a piecemeal fashion.¹⁹⁴ By failing to have a single agency charged with ensuring compliance with the CZMP, the New York network approach creates a tangled framework that limits the plan's effectiveness.¹⁹⁵ Further, the state program emphasizes the importance of LWRPs, allowing state-wide policy determinations to be fairly vague.¹⁹⁶ As a result, the major problem associated with the planning mechanism in place is that it encourages entities to metaphorically "pass the buck" by developing plans of broad policy goals without developing any concrete mechanisms for actually handling the problem of sea level rise.¹⁹⁷ For example, New York's WAVES initiative creates yet another agency relying on delegated power, ultimately charged with creating an explicit action agenda.¹⁹⁸

Rather than utilize a program that relies on the consistency and collaboration of a wide range of actors, New York should reevaluate the CZMP and implement a plan that is comprehensive on its face. Although it is a somewhat radical idea given the longevity of the plan in place, creating a state-wide legislative mandate with enforceable goals, including

¹⁹³ See NEW YORK COASTAL MANAGEMENT PROGRAM AND FINAL ENVIRONMENTAL IMPACT STATEMENT, *supra* note 138, § II-4, at 1–2, 8 (discussing that rather than adopt comprehensive legislation, New York's CZMP elected to utilize a network approach for coordinating and implementing the goals of the plan); see also Rusty Russell, *Coastal Wind Energy Generation: Conflict and Capacity*, 31 B.C. ENVTL. AFF. L. REV. 221, 240–41 (2004) (explaining that the network approach unites a large number of state and local agencies). Russell argues that the complexity, as well as other regulatory problems of the networked plan in Massachusetts, serve as a hindrance to offshore wind projects. *Id.* at 242–44.

¹⁹⁴ See generally NEW YORK COASTAL MANAGEMENT PROGRAM AND FINAL ENVIRONMENTAL IMPACT STATEMENT, *supra* note 138, § II-4, at 1–14.

¹⁹⁵ See *supra* note 186 and accompanying text.

¹⁹⁶ See NEW YORK COASTAL MANAGEMENT PROGRAM AND FINAL ENVIRONMENTAL IMPACT STATEMENT, *supra* note 138, § II-4, at 11–12; see Russell, *supra* note 193, at 236 (stating that CZMPs can function like a "black box"—it can generate decisions, while failing to enunciate the clear principles and performance standards that many believe are a necessary prerequisite to coherent coastal-zone management over the long term").

¹⁹⁷ For example, New York State used the CZMP as a forum to develop a list of policies and encourage localities to create a LWRP. In turn, the City of New York used its New Waterfront Revitalization Program as yet another opportunity to develop policies rather than concrete plans of action. See NEW YORK COASTAL MANAGEMENT PROGRAM AND FINAL ENVIRONMENTAL IMPACT STATEMENT, *supra* note 138, § II-6, at 1–3; see also THE NEW WATERFRONT REVITALIZATION PLAN, *supra* note 148, at 11–24; J.B. Ruhl, *Farms, Their Environmental Harms, and Environmental Law*, 27 ECOLOGY L.Q. 263, 303–04 (2000) (noting a similar problem in the delegation of power to the state when dealing with farms and non-point source pollution); Russell, *supra* note 193, at 240 (noting that the CZMPs rarely offer specific guidance but, rather, further develop principles listed in the CZMA).

¹⁹⁸ See *supra* Part I.C.2.

accommodation of climate change, would streamline the planning process. The state should create a CZMP with specified goals and plans and appoint only one state agency and one local agency in each area to specifically draft plans and coordinate given LWRPs. At the state level, New York should utilize the current subdepartment of Ocean and Coastal Resources within the Department of State. The Department of City Planning is the best agency to take control on the municipality level because it is currently involved in much of the planning taking place in New York City.¹⁹⁹

These specified agencies would be responsible for amending and enforcing the LWRP, eliminating any other agency actors. The local agency appointed, potentially the Department of City Planning, for example, would be responsible not only for creating policy goals, but also for developing a strict action plan to address sea level rise. The selected agency would also be responsible for streamlining and reconciling the given plans in place, eliminating the overlap of programs such as WAVES, Vision 2020, and the general LWRP.

In creating such a program, New York would maintain its consistency reporting plan for current state agencies that must review their actions to ensure that they do not conflict with the requirements of the CZMP.²⁰⁰ However, the state should decide to house the entirety of the CZMP administration in the Department of State, eliminating regulatory crossover and bureaucratic confusion. Another benefit of restricting the CZMP enforcement to the Division of Coastal Resources is that such an approach provides a clear path for localities to get answers and approvals.

Ultimately, New York should eliminate the “network” approach and create comprehensive CZMP legislation. Further, the State should empower specific actors to handle the entirety of coastal zone management in order to eliminate the multiplicity of planning that exists currently.

B. Federal Approaches to Implementation

1. Amending the Scope of the CZMA

Congress has amended the scope of the CZMA to include a congressional finding of the potential impacts of global warming, noting that

¹⁹⁹ See *supra* Part I.C.2 (discussing the Vision 2020 Program orchestrated by the Department of City Planning).

²⁰⁰ See NEW YORK COASTAL MANAGEMENT PROGRAM AND FINAL ENVIRONMENTAL IMPACT STATEMENT, *supra* note 138, § II-4, at 8 (discussing New York’s management plan’s reliance on the State Environmental Quality Review Process for maintaining consistency as required by the Waterfront Revitalization and Coastal Resources Act).

“[b]ecause global warming may result in a substantial sea level rise with serious adverse effects in the coastal zone, coastal states must anticipate and plan for such an occurrence.”²⁰¹ Further, the general policy goals of the Act have been altered to encourage the Secretary of Commerce to facilitate state research and planning for sea level rise as he or she sees fit.²⁰² Both of these policy pronouncements reflect a general shift towards a focus on climate change and coastal vulnerability. However, each of these amendments fails to make the concrete changes necessary to encourage adaptation to manage rising sea levels. An amendment aimed at more guidance in sea level rise planning James G. Titus advocated for, but the general policy he set forth was, while helpful, relatively vague, as it called for NOAA to set a number of guidelines for states to use in dealing with sea level rise issues but provided limited details for a constructive plan.²⁰³

Although amending the general policy of the CZMA is a progressive and vital step towards adapting to sea level rise, the proposed amendment does not go far enough in pushing states to grapple with climate change issues directly. Congress should go further and require states to alter their CZMPs to demonstrate how they have specifically allotted for changes in sea level rise.

The foundational principle of the CZMA is to encourage states to effectively manage their coastal zones through the implementation of CZMPs in exchange for federal funding.²⁰⁴ As a means of developing sound programs, the Act sets forth a list of different requirements for the CZMP with which the state must comply in order to receive the promised funding.²⁰⁵ Currently, the CZMA lists required program elements necessary for secretarial approval but lacks any mention of specific planning for sea level rise.²⁰⁶ In response to this new threat, Congress should amend Section 1455(d)(2)²⁰⁷ to require states to complete a risk assessment of climate change effects on the coastline and propose state plans

²⁰¹ 16 U.S.C. § 1451(l) (2006).

²⁰² See 16 U.S.C. § 1452(2) (2006).

²⁰³ See James G. Titus, *Does the U.S. Government Realize That the Sea Is Rising? How to Restructure Federal Programs so That Wetlands and Beaches Survive*, 30 GOLDEN GATE U. L. REV. 717, 769 (2000); see 16 U.S.C. §§ 1451(l), 1452(2) (2006) (where Titus proposes to add his amendments).

²⁰⁴ See *supra* notes 112–16 and accompanying text.

²⁰⁵ See *supra* notes 112–21 and accompanying text.

²⁰⁶ 16 U.S.C. § 1455(d)(2) (2006) (setting forth the requisite program elements of a CZMP for ultimate approval by NOAA).

²⁰⁷ *Id.*

to accommodate for sea level rise.²⁰⁸ Titus recommended that the CZMA require states to address their “vision” for their respective wetlands.²⁰⁹ Here, the proposals to make his suggestion more specific include not only wetlands planning but planning for the entirety of the coastal zone affected by rising currents. This specific amendment would potentially cure some of his uneasiness.

Such an amendment could ultimately have a positive impact by encouraging states to make definitive plans to address the problem instead of making lofty and amorphous policy goals.²¹⁰ Rather than leaving the states to draft further vague policy statements about how they will address sea level rise, Congress must jump-start the planning process before catastrophic predictions become realities. As demonstrated by the number of actors operating in any one given coastal zone,²¹¹ Congress needs to mandate that a prerequisite for receiving federal money is to develop a sea level rise risk assessment identifying specific vulnerable areas. Congress should also require that states present a concrete action plan consisting of proposed projects for the identified areas along with an explanation of how the proposed plans will help accommodate rising water levels. By attaching these requirements to the federal money that states with approved plans already receive, Congress can stop the cycle of infinite delegation in its tracks.²¹²

When amending the CZMA, Congress should emphasize that state plans must directly address sea level rise adaptation, placing sea level rise

²⁰⁸ See Russell, *supra* note 193, at 256–57 (arguing a similar policy suggestion for wind energy, altering the CZMA to require the states to respond specifically to offshore wind development). Proposed changes would be best situated at 16 U.S.C. §1455(d)(2)(A)–(I) (2006). A similar bill was introduced in the House amending the CZMA to include a new section at the end of the Act devoted to “coastal climate adaptation planning.” H.R. 5453, 110th Cong. (2008). However, the CZMA remains unchanged and the proposed legislation was ultimately tabled, stopping action with subcommittee hearings in February of 2008. See Library of Cong., *Bill Summary & Status: H.R. 5343*, <http://thomas.loc.gov/cgi-bin/bdquery/z?d110:HR05453:@@X#> (last visited Feb. 1, 2012).

²⁰⁹ Titus, *supra* note 203, at 769.

²¹⁰ See Patrick J. Gibbons, *Too Much of a Good Thing? Federal Supremacy & the Devolution of Regulatory Power: The Case of the Coastal Zone Management Act*, 48 NAVAL L. REV. 84, 96 (2001) (noting that early criticisms of the Act included its vague policy determinations); Kuhse, *supra* note 180, at 82 (highlighting some of the vagueness of the language of the original CZMA); Russell, *supra* note 193, at 240 (noting that CZMPs are often vague on specific guidelines).

²¹¹ See *supra* Part II.

²¹² See generally Gibbons, *supra* note 210, at 96 (stating that early on, environmentalists would have been in favor of a stronger federal role).

mitigation as a secondary goal. This focus on adaptation is vital to furthering realistic and effective planning for climate change. As many commentators have noted, climate change is a global problem.²¹³ Rather than focus on solving the monumental problem of global warming, the CZMA should be utilized as a means to facilitate coastal land use planning and conservation through specific policy enactments, such as the amendment proposal set forth in this Note.

This proposed change would have an impact on not only New York, but also all other coastal states faced with increasing problems of sea level rise.²¹⁴ By compelling states to assess the vulnerability of their coasts and requiring them to develop some form of a sea level rise adaptation plan, Congress, along with NOAA, can ensure that the government's approach to climate change shifts from reactionary to proactive. A simple change such as this could be a positive step towards creating a national climate change policy that attempts to both mitigate the causes of global warming as well as address the onset effects of the problem.

Even though this proposal does not make soft infrastructure the primary focus of the amendment, a change of this nature brings the implementation of soft infrastructure one step closer to reality. Hopefully, by forcing states to evaluate the consequences of sea level rise, they will encounter technology and design proposals like those set forth in *Palisade Bay* and choose to implement them in their own communities. Additionally, a successful plan for implementation in New York City, coupled with the execution of this proposal, could highlight the success of the soft infrastructure approach as states are increasingly pressured to adopt plans, possibly inspiring other states to adopt similar models.

2. CZMA Section 309: Coastal Zone Enhancement Grants— A Direct Route to Soft Infrastructure?

Perhaps one avenue to expedite the implementation of soft barrier infrastructure plans is to utilize the funding valve created in Section 309

²¹³ Cf. Robert N. Stavins, *Policy Instruments for Climate Change: How Can National Governments Address a Global Problem?*, 1997 U. CHI. LEGAL F. 293 (discussing national policies in response to a global climate change problem); *Climate Change*, U.S. ENVTL. PROT. AGENCY, <http://www.epa.gov/climatechange/> (last visited Feb. 1, 2012).

²¹⁴ See generally JAMES G. TITUS ET AL., COASTAL SENSITIVITY TO SEA-LEVEL RISE: A FOCUS ON THE MID-ATLANTIC REGION (2009), available at http://www.epa.gov/climatechange/effects/coastal/pdfs/SAP_4-1_SynthesisandAssessmentProduct.pdf (reporting on the status of sea level rise).

of the CZMA.²¹⁵ Added as an amendment to the Act in 1990, the program provides federal grants to states that provide for changes in the state CZMP that promote singular, or multiple, coastal zone enhancement objectives.²¹⁶ Particularly relevant here is the policy objective of “[p]reventing or significantly reducing threats to life and destruction of property by . . . managing the effects of potential sea level rise.”²¹⁷ With this as an enumerated goal, this provision is particularly attractive because it does not require the state applying for the grant to match any of the allotted funding.²¹⁸

This provision may be particularly helpful in gaining support for soft infrastructure since it provides an avenue for unmatched federal funding,²¹⁹ increasing New York’s ability to fully address the sea level rise issue without thinning out the allocation of coastal resources already being used by the state. In order to comply with this regulation, the state would likely need to incorporate the City’s specific soft infrastructure plan into New York State’s Coastal Management Program, a process that could involve slow institutional actors and a long amendment process, including ultimate approval by NOAA.²²⁰

As the statute currently reads, however, it appears that coastal zone enhancement grants apply only to those revisions to state management plans, a large hurdle for applying the grant to a project directed at a very specific locale such as the soft infrastructure design discussed herein.²²¹ Congress should create a financial incentive to specific programs by expanding the coastal zone enhancement grants to apply to specifically developed local or state initiatives. Presently, coastal zone enhancement grants are provided when the state amends their CZMP to accommodate broad

²¹⁵ See 16 U.S.C. § 1456b(f) (2006).

²¹⁶ *Id.*; see also LINDA MALONE, ENVIRONMENTAL REGULATION OF LAND USE § 2:29 (2010); Donald C. Baur et al., *Putting “Protection” Into Marine Protected Areas*, 28 VT. L. REV. 497, 512–13 (2004); Joseph Romero, *Uncharted Waters: The Expansion of State Regulatory Authority Over Federal Activities and Migratory Resources Under the Coastal Zone Management Act*, 56 NAVAL L. REV. 137, 143 (2008).

²¹⁷ 16 U.S.C. § 1456b(a)(2) (2006).

²¹⁸ See MALONE, *supra* note 216, § 2:29.

²¹⁹ *Id.*

²²⁰ Division of Coastal Resources, *Public Notices*, N.Y. DEP’T OF STATE, <http://www.nyswaterfronts.com/publicnotices.asp> (last visited Feb. 1, 2012); see also NEW YORK STATE COASTAL MANAGEMENT PROGRAM AND FINAL ENVIRONMENTAL IMPACT STATEMENT, *supra* note 138, § II-4, at 12–13 (noting that amendments to LWRPs are also subject to review by the Secretary of State).

²²¹ MALONE, *supra* note 216 (missing any mention of grants for local programs).

objectives of the Coastal Zone Enhancements,²²² potentially allowing considerable room for grant application when changes are added. In addition to the current usage of the grants, Congress should create a narrow program for grant application through the CZMA to allow localities to apply for funding and approval for specific programs directly from the federal government. As an alternative to the multilayered approval process for amendments to LWRP and CZMP,²²³ allowing states and localities to go straight to NOAA could enable more urgent programs to have a more favorable chance at implementation. In terms of specifically implementing soft infrastructure design, Congress should create a funding consideration that rewards designs utilizing soft infrastructure, providing that communities who approach sea level rise issues with back-to-nature methods, such as barrier island construction and the construction of new wetlands, are provided a better chance at receiving funding.

One potential counterargument is that by allowing for direct federal grant approval for specific initiatives, the proposed action would undermine the wisdom of the various planning and consistency provisions of the Act. However, this proposal could be successful if the grant system suggested here was narrowly constructed, presenting some sort of barrier for all localities to submitting any program. In essence, the grant system would require that municipalities, states, and the federal government continue to work together to create consistent and comprehensive planning. Another way to narrow the scope is to limit grants to innovative programs, such as soft infrastructure.

3. Broadening the Scope of the Coastal Barrier Resources Act

One of the enumerated goals of the *Palisade Bay* project is to help reduce the impact of sea level rise through the use of man-made barrier islands that will help reduce the total wave impact on the shore.²²⁴ A way to specifically facilitate archipelago design strategy is to incorporate an acceptance of such practices on a federal level, encouraging coastal states to follow suit. The CBRA serves as a potential piece of legislation to accommodate such a goal, noting that “coastal barriers serve as natural storm protective buffers.”²²⁵

²²² See *id.* § 2:29.

²²³ See *supra* note 220 and accompanying text.

²²⁴ NORDENSON ET AL., *supra* note 1, at 112.

²²⁵ 16 U.S.C. § 3501(a)(3) (2006).

Although the CBRA currently focuses on purely conservational approaches to protecting barrier islands, including a mapping and classification system for protected barriers, in addition to a ban on federal spending in high risk areas, the Act could be expanded to permit the usage of federal funding and resources to bolster coastal barriers through soft infrastructure design.²²⁶ Congress should look to the design features for creating clusters of archipelago islands in *Palisade Bay*²²⁷ and create a plan for the federal construction of island clusters as a defense to sea level rise and increased severe weather.

The largest hurdle to this proposal's success is likely the SLA. The SLA cedes ownership of the coastal waters to the states, extending outward three nautical miles.²²⁸ This presents a problem because it limits the application of such an amendment. However, the SLA does maintain federal control over federally held lands, providing some areas for the application of this proposal.²²⁹ Even though it would have limited scope, the proposal could serve as an example and policy model for states.

C. *Extrapolating to Other Coastal Cities*

The sea level rise quandary that New York City faces is not unique. Many coastal cities are faced with the same dilemma of rising waters and potential flooding.²³⁰ Although this Note focuses exclusively on the impacts of sea level rise in New York City, many other coastal cities, including Washington, D.C., Miami, and New Orleans, could all benefit from the implementation of soft barrier infrastructure. For example, New Orleans has already struggled with the effectiveness of conventional infrastructure as demonstrated by the mass levee malfunction during Hurricane Katrina.²³¹

²²⁶ 16 U.S.C. §§ 3503–04 (2006); *see also supra* Part II.A.3 (discussing the scope of the CBRA).

²²⁷ NORDENSON ET AL., *supra* note 1, at 112.

²²⁸ *See supra* Part II.A.1; *see also* WELLES ET AL., *supra* note 95, at 6.

²²⁹ WELLES ET AL., *supra* note 95, at 7.

²³⁰ Boston, New Orleans, Washington, D.C., and Miami are all vulnerable to sea level rise as a result of climate change. *See* Christine Dell'Amore, *New York, Boston "Directly in Path" of Sea Level Rise*, NAT'L GEOGRAPHIC (May 28, 2009), <http://news.nationalgeographic.com/news/2009/05/090528-greenland-melt.html>; Suzanne Goldberg, *Rising Sea Level to Submerge Louisiana Coastline by 2100, Study Warns*, GUARDIAN, (June 29, 2009, 7:33 AM), <http://www.guardian.co.uk/environment/2009/jun/29/rising-sea-level-new-orleans>; Deborah Zabarenko, *Rising Seas Threaten 180 US Cities by 2100—Study*, REUTERS (Feb. 17, 2011, 4:32 AM), <http://www.reuters.com/article/2011/02/17/uk-climate-usa-cities-idUSLNE71G00R20110217>.

²³¹ Alan Levin, *Corps: Levees' Design Caused Deadly Failure*, USA TODAY (June 1, 2006, 10:30 PM), http://www.usatoday.com/news/nation/2006-06-01-levees_x.htm.

When applying the principles set forth here to coastal cities, it is clear that the federal regulations discussed also are relevant. The proposed changes to the CZMA and the CBRA would not only encourage the implementation of soft infrastructure in New York City, but also in other cities confronted with grave climate change predictions. For example, Section 309 grants,²³² if expanded to direct federal funding for specific initiatives, could allow these cities to develop a sea level rise program with greater ease given the financial support coupled with federal approval under the CZMA. Further, coastal states would be more actively encouraged to truly assess their state's preparedness if the CZMA was amended to include sea level rise adaptation plans into the broader CZMP approval process.

The streamlining of state agencies and programming on the other hand is extremely state specific, depending on how the state has elected to administer the CZMA.²³³ For example, Boston, like New York, has elected to utilize a "network" approach to the implementation of their CZMP, allowing the suggestions provided in this Note to be particularly applicable.²³⁴ Ultimately, the structure of a state's CZMP implementation will determine the relevance of the streamlining approach presented here.

CONCLUSION

In the coming years, New York City faces adverse impacts of climate change and sea level rise, placing a great deal of resources at risk.²³⁵ Although the City has taken steps to address climate change through programs such as PlaNYC,²³⁶ the City is not adequately prepared to manage the volume of projected sea level rise. As a means to accommodate the rising waters, New York City should adopt soft infrastructure techniques. These techniques consist of using man-made barrier islands, piers and slips, and constructed wetlands as a way to reduce wave intensity and disperse water at the shore.²³⁷

Currently, New York is governed by a host of laws and controlled by a multitude of actors. The New York City coastal zone is governed

²³² See *supra* notes 215–19.

²³³ See *supra* note 110 and accompanying text.

²³⁴ MASS. OFFICE OF COASTAL ZONE MGMT., POLICY GUIDE 101 (2011), available at http://www.mass.gov/czm/plan/docs/czm_policy_guide_october2011.pdf; see also Russell, *supra* note 193, at 242–46 (explaining that the network approach in Massachusetts presents a barrier for the implementation of offshore wind energy).

²³⁵ See *supra* Part I.B.

²³⁶ See *supra* Part I.C.1.

²³⁷ NORDENSON ET AL., *supra* note 1, at 98.

by the CZMA and New York State Coastal Management Program more generally.²³⁸ In addition, New York City addresses waterfront issues directly through the Vision 2020 project, the New Waterfront Revitalization Program, and the WAVES initiative.²³⁹ Given this large number of overlapping and broad policy regulations, creating a concrete plan is not a straightforward process.

In order to implement such crucial technology, both state and federal governments should take active steps to encourage the application of soft infrastructure. First, New York should base the application of the State Coastal Management Program within the Division of Ocean Resources, and further delegate the application of New York City programs exclusively to the Department of City Planning. Further, the state should abandon the network approach and create comprehensive legislation to administer all coastal management. Additionally, Congress should amend the CZMA to include climate change risk assessment and planning as a requirement of all state coastal zone plans. Congress should also create an individualized funding grant for specific local initiatives to ensure that worthwhile programs do not get stalled by bureaucratic hurdles. Finally, Congress should amend the CBRA to provide for the construction of man-made barrier islands in federally controlled waters.

Although the scope of this Note relates specifically to New York City, many other coastal cities face similar problems.²⁴⁰ The recommendations directed towards federal legislation will also help incentivize the use of soft infrastructure in other coastal regions, ultimately relying on New York as an example. Taken all together, the proposed modifications will hopefully turn soft infrastructure design into a reality.

²³⁸ See *supra* Part II.A.2–B.2.

²³⁹ See *supra* Part II.B.2–3.

²⁴⁰ See *supra* Part III.C.