Hoboken's Post-Sandy Resilience

Learning from the Past, Rebuilding for the Future

Deborah Bailin

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Union of Concerned Scientists

Deborah Bailin is an analyst and ACLS Public Fellow in the Center for Science and Democracy at the Union of Concerned Scientists.

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NATIONAL HEADQUARTERS
Two Brattle Square
Cambridge, MA 02138-3780
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Chicago, IL 60602-4064
t 312.578.1750
f 312.578.1751

Summary: Hoboken, New Jersey, Turns to Science for Resilient Recovery Planning after a Battering by Extreme Weather

On October 29, 2012, Superstorm Sandy slammed into the eastern United States and caused record damage across the region. When Sandy's heavy rains and unprecedented storm surge swept across low-lying Hoboken, New Jersey, the streets—in the words of Hoboken's Mayor Dawn Zimmer—filled up with water "like a bathtub" (Zernike 2013).

Although Hoboken had experienced flooding since its earliest days, Sandy's powerful impact marked a turning point. Following this destructive storm, citizens of the "Mile Square City" across the Hudson River from Manhattan began to recognize the unique dangers sea level rise posed to their urban coastal community and, to mitigate the effects of future storms, took steps not only to rebuild but to do so more resiliently. In August 2013, Mayor Zimmer released the Hoboken Resiliency and Readiness Plan (Zimmer 2013), a plan based on the best available scientific information and aligned with recommendations issued by the federal Hurricane Sandy Rebuilding Task Force and the president's Climate Action Plan (Obama 2013).

Throughout the city's history, scientific information frequently conflicted with the interests of developers and city leaders who made a series of decisions over time that increased the city's vulnerability to flood risks. Given this history, fully implementing the mayor's plan will take sustained leadership and community commitment and perseverance in the years ahead. Today, however, strong leadership, respect for science, and evidence-based decisions are setting a precedent and making a difference in Hoboken's preparedness to meet the challenges of climate change.

1. Vulnerability of an Urban Coastal Community: History, Location, and Local Politics

1.1 Early decision-making and development

As an urban coastal community, Hoboken was no stranger to floods prior to Superstorm Sandy. Flanked to the south, north, and east by the waters of the Hudson River, Hoboken's geography has always presented unique challenges even before factoring in the increasing risks from sea level rise.

While development along the waterfront, discussed in Section 2.2, has been the source of much controversy and debate in recent years, historical patterns of development in other parts of Hoboken have contributed to the flooding problems the city now faces (Abernathy 2013). When Colonel John Stevens, a captain in George Washington's army during the Revolutionary War, settled his family in Hoboken in 1784, he chose the highest point in the area, known as Castle Point, for his estate, now the site of Stevens Institute of Technology near the waterfront to the east. He did this for a reason: Much of the land to the west of the Stevens' property was a tidal marsh. Rainfall, high tides, and storm surges routinely caused flooding in this area, cutting off the Stevens' land from Weehawken to the north and the Palisades cliffs further to the west.

Throughout Col. Stevens' lifetime, the western part of Hoboken remained a marsh. However, as Manhattan flourished, so, too, did Hoboken's potential to become a satellite community, and by the mid-1800s, town officials and developers could no longer resist the temptation to build on what they viewed as valuable real estate.

Although Hoboken's early leaders knew about existing flood risks, they eventually decided the benefits of economic development outweighed the costs of flooding, and they had the western marshlands drained to make way for roads, houses, schools, businesses, churches, and hospitals. Many structures built during this era by the Hoboken Land and Improvement Company, owned and operated by the Stevens family, remain in use in the present day and incurred significant flood damage from Sandy. Recurrent flooding of these same streets and buildings is a lasting consequence of those early decisions but is the source of greater concern today because of the worsening effects of sea level rise.

These especially low lying areas—at less than five feet above the average high tide (Climate Central 2012a)—are designated by Federal Emergency Management Administration (FEMA) revised Advisory Base Flood Elevation maps as a High Flood Risk zone (Spinello 2013). Just one step removed from the riskiest Coastal High Hazard zone along the waterfront, this area is at increasing risk of more frequent and more severe flooding. When rain, storm surge, and sea level rise cause the river to spill over its banks and inundate low-lying streets from narrow points at the south and north, the water has nowhere to go. Hence, Mayor Zimmer's "bathtub" metaphor accurately illustrates what happens when flooding occurs and water pools up in the former marshlands on the western side of town.

1.2 Politics vs. science on the waterfront

Hoboken's former marshlands are not the only cause of the city's vulnerability. During the 1990s, the city underwent another major wave of development, this time along the waterfront. As in the mid-1800s, local decision makers prioritized short-term economic benefits over potential future costs.

A key difference, however, between these two periods of development has been the lack of resilience on the waterfront, despite the availability of better information about coastal risks. Whereas the buildings and roads on Hoboken's western side have survived over a century of flood exposure, waterfront structures hardly more than a decade old have already began to deteriorate.

During the 1990s, old docks and marinas no longer in use were turned into parks, walkways, and roads, but developers and politicians ignored the warnings of scientists and engineers about the risks of building on top of existing, aging structures, as well as risks from the coastal environment (Perez-Pena 2011). As a consequence, the city experienced significant losses in this area well before Superstorm Sandy. A section of the new Sinatra Park, for example, collapsed into the river in 2009 (Hack 2013). As the

latest in a series of collapses (City of Hoboken 2010a), it resulted from corrosion and from mollusks boring into 100-year-old wood support beams. Repair will cost the city millions of dollars on top of the millions it spent to develop the park initially. Although engineers had alerted policy makers to this and other problems as early as 1995 (City of Hoboken 2010b), local politicians have repeatedly favored short-term interests of developers over long-term, science-based community resilience (City of Hoboken 2010b). Mayor Zimmer's predecessor, Peter J. Cammarano III went to prison on corruption charges related to the unsustainable waterfront development shortly after taking office (Perez-Pena 2010).

Following Sandy, state lawmakers were considering allowing even more risky and unsustainable development to commence. Opposed by Mayor Zimmer but driven by developers' interests in new commercial construction on Hoboken's piers, the New Jersey legislature passed bills A-3933/S-3680 in 2013 (Hine 2013a). In August, Governor Chris Christie vetoed the legislation, which would have permitted hotels, retail establishments, and multi-unit residential structures to be built on Hoboken's piers, a FEMA-designated Coastal High Hazard Zone.

Governor Christie's veto indicates a move towards more science-informed waterfront policy. During a storm like Sandy, the waterfront development proposed in the bills—structures built literally on top of the river—would have been especially vulnerable to breaking waves and high water resulting from a combination of high tides, storm surge, and sea level rise. Building in a Coastal High Hazard Zone would have put not only property but lives at risk—residents, hotel guests, workers, and first responders—and jeopardized Hoboken's status to participate in the National Flood Insurance Program (NFIP).

1.3 The need for local and regional collaboration

Hoboken's transportation infrastructure and proximity to Manhattan, where many residents work, are additional factors Mayor Zimmer and other policy makers have considered in addressing vulnerability and planning for Hoboken's post-Sandy recovery and resilience. Regional interdependencies underscore the need for cooperation and collaboration in developing resilient infrastructure.

Regional transportation infrastructure has long been a key element of Hoboken's ability to prosper as a community. During the city's early years, Col. Stevens made significant personal and financial investments in advancing the transportation technology that would later help the city become the regional commuter center it is today. As one of the first Americans to patent a steam engine, Stevens devised some of the first steam-powered ferries that carried passengers across the Hudson to and from Manhattan in the 1800s. He was also instrumental in developing early railroad technology and was the first American to design and build a steam locomotive (Alexander 1993).

These innovations were cutting edge for their time, but nearly two hundred years later, transportation technology has advanced far beyond those first steam engines. As technology has advanced, so has the public's reliance on it. Today, Port Authority Trans-Hudson (PATH) trains carry thousands of commuters under the Hudson River to and from Manhattan every day. Following Sandy, Hoboken Terminal—built in 1907 and utilized by PATH rapid transit and New Jersey Transit commuter trains—was shut down and service not fully restored for several months due to flooding and its impact on aging and inadequate infrastructure (Hack 2012). While ferries remained an option as repairs were being completed region-wide to tunnels, stations, trains, and control systems, they proved too costly and time-consuming to provide a realistic long-term option for twenty-first century commuters. The regional transportation disruptions caused a slowdown in Hoboken's economy that further hurt local businesses, which were themselves struggling to recover from storm damage (Rivera 2012).

Early local leaders and innovators could not have foreseen how flood risks to transportation infrastructure in the Hoboken they knew would be affected in the future by sea level rise or how population growth and reliance on a more complex infrastructure would add to the community's vulnerability. Today, Hoboken's citizens and leaders have access to better information about how flooding could affect their community in the future. However, resilient recovery and redevelopment plans for Hoboken Terminal require cooperation between the NJ Transit Corporation and the City of Hoboken.

Since NJ Transit owns Hoboken Terminal, it plays an important role in the decision-making process. A NJ Transit redevelopment plan for Hoboken Terminal proposed prior to Superstorm Sandy was revised post-Sandy to include better flood mitigation features, including a flood wall (Hoboken Terminal & Rail Yard Redevelopment 2013a). However, this plan, which would include commercial and residential components and bring considerable revenue to the transit company, still remains controversial for advocates of sustainable waterfront development (DeChiaro 2013). Alternative plans by the city (City of Hoboken 2013) and by Dutch finalists in the Rebuild By Design Competition (Hine 2013b), an initiative of the Hurricane Sandy Rebuilding

Task Force, are viable contenders, but conflicts between local and regional interests, as well as public and private ones, must be resolved before any redevelopment activities can commence.

1.4 Community vulnerability to extreme weather events and lack of pre-Sandy preparedness

Sea level rise now exacerbates the city's longstanding problems with flooding by creating a higher launching pad for water to enter the city from high tides and storm surge. In a report on risks to New Jersey from sea level rise, Climate Central identified five feet above the local high tide line as a flood level of particular note because "the chances for floods topping 5 feet by midcentury are significant throughout the region under all sea-level-rise scenarios" (Strauss et al 2013).

Unlike more sparsely populated, beachfront communities along the Jersey Shore that also sustained significant damage from Sandy, Hoboken has a dense population and a high concentration of buildings and infrastructure, exposing more people and more property to flood risks. Among all New Jersey cities, Hoboken ranks at the top for the largest population exposed to flood risk. That is because 53 percent of the low-lying city's population of 50,000 residents lives below five feet above the local high tide line. Besides housing, much of the city's vital infrastructure is also at significant risk because it also lies below the five foot mark. One hundred percent of Hoboken's fire and EMS stations, hospitals, libraries, community centers, rail and ferry stations, sewage plants, and major hazardous waste sites are all located below five feet. Fifty-seven percent of its houses of worship, 57 percent of roads, and 50 percent of its schools are also below five feet (Climate Central 2012b).

Although exposure to flood risk is a concern for all Hoboken residents, residents of color disproportionately live in lower-lying areas. Hoboken's population is significantly less diverse than New Jersey's is overall; 82 percent of its residents are white compared to 68 percent for the state (U.S. Census 2013). However, the city's populations of color in general and African Americans in particular face disproportionately elevated risks. Compared to 52 percent of the city's white residents living below the five foot mark, 57 percent of its total residents of color and 62 percent of its African American residents are living in these especially low-lying areas (Climate Central 2012b).

In addition to risk exposure based on the physical location of housing and infrastructure, Hoboken's entire population—91 percent of all residents, 95 percent of whites, and 82 percent of residents of color—face a medium amount of social vulnerability on a social vulnerability index that determines low, average, medium, and high levels of vulnerability (Climate Central 2012b). This level of moderate vulnerability is disproportionate to the amount of low and average levels experienced by the rest of New Jersey residents (Climate Central 2012b). Social vulnerability is important to consider in assessing a community's risk exposure from extreme weather events because it takes into account socioeconomic factors including income, education, age, family structure, language barriers, type of housing, and access to a vehicle. These factors influence a community's ability to prepare for, respond to, and recover from floods and other natural disasters (Strauss *et al* 2013).

Notwithstanding past decisions to drain the tidal marsh and build on the waterfront, city leaders have long been aware of Hoboken's vulnerability to flooding. However, although city leaders had been discussing storm preparedness for years before Sandy, addressing flooding was seen as the correction of a longstanding problem rather than part of a long-term resilience strategy. Not until Sandy did the kind of flooding possible from sea level rise become a significant part of their planning, despite the routine, if less severe, flooding that has frequently occurred when ordinary storms coincided with high tides (storm tides).

Following the brutal 2005 season in the Gulf of Mexico (Hurricanes Katrina, Rita, and Wilma), Hoboken officials began raising questions about what would happen if a storm like Katrina were to hit the tri-state area (Jennemann 2005). At the time, Hoboken lacked an official whose fulltime responsibility it was to lead the city's emergency management team. A police captain and zoning officer had been sharing this role in addition to their regular responsibilities. In the wake of the 2005 destructive storm season, the Hoboken City Council created a new Office of Emergency Preparedness to "be a proactive entity charged with preparing for a whole array of different disasters." A Community Emergency Response Team was also formed, along with the appointment of a citizen liaison to the city's Office of Community Preparedness.

Emergency management—communications, community engagement, disaster response—seemed a more immediate and overriding concern than dealing with the possibility of extreme flooding. Flood mitigation also became an elevated concern after the 2005 hurricane season but, as it had always been, was discussed largely as a chronic rather than an urgent problem without consideration of the added risks from sea level rise.

An analysis of routine flooding on the southwestern side of town had been completed in 2002 by the North Hudson Sewage Authority (NHSA 2002). The analysis developed models showing that flooding could be expected to occur during 3-month,

1-year, 2-year, and 5-year storms because much of the area in question (part of the former tidal marsh) was at or below two feet above the average high tide. The NHSA analysis cited the limited capacity of combined sewage and stormwater drains as a problem and recommended installation of a set of four "wet weather" pumps to handle overflow caused by storm tides.

Pumps as a solution to Hoboken's flooding problem were discussed subsequently at various times throughout the years leading up to Superstorm Sandy. By 2007, however, installation of the first pump was still awaiting final approval by the state's Department of Environmental Protection (Hoboken411 2007). Hoboken's Mayor at the time, David Roberts, along with NHSA Executive Director Fred Pocci, both supported installing the pumps and had been pushing for DEP approval. Mayor Roberts stated they would once and for all "solve the heavy stormwater flooding problem in the City of Hoboken" (Roberts 2007).

During the NHSA press conference announcing plans for the pumps where Mayor Roberts made this statement, no one mentioned sea level rise, the likelihood that it would exacerbate the existing flooding problem, or whether the pumps would be enough to address higher average high tides and storm tides in the future (Roberts 2007). The press conference took place in October 2007 when the scientific community already had a ninety-five percent consensus that climate change was occurring, that humans were responsible, and that sea level rise would be a significant consequence affecting coastal communities (UCS 2013).

Five years later in 2012, a year after Hurricane Irene and just a few months before Sandy, only one of the four recommended pumps had been installed. Mayor Zimmer's team was moving ahead with the pump plans—but slowly. Zimmer cautioned that "Pumps are expensive" and it would be important to gather data from 25 underground flood monitoring sensors installed throughout the city in 2011 to determine if the other three pumps recommended by the NHSA analysis would be necessary or "if there are other cost effective solutions that can be done that would be more sustainable in the long term" (LaMarca 2012). City spokesperson Juan Melli noted that the sensors had already provided data suggesting that at least two of the three other pumps would be unnecessary.

Although Zimmer was taking an evidence-based approach to making decisions about the pumps, the delays and concerns with costs underscore how flooding prior to Sandy was viewed by the community as a chronic but stable rather than urgent and worsening problem. Big-picture evidence about future flood risk exacerbated by climate change was not a major factor in pre-Sandy decision making.

2. Sandy's Impact: A Turning Point

Scientists accurately predicted that when Sandy came ashore it would have devastating consequences. The storm, a vast post-tropical cyclone expected to make a direct hit on a densely populated region, was so unprecedented that forecasters and the media had to invent new language to describe it: "superstorm" and "frankenstorm." Although weather forecasters received some criticism for communications shortcomings, Louis Uccellini, director of the National Weather Service, emphasized the accuracy of predictions and the important role scientific information had played in saving lives: "there were evacuations in areas that if they weren't evacuated … there would have been many more lives lost" (Freedman 2013).

Sandy, however, demonstrated that robust scientific infrastructure to enable accurate predictions and good communications alone cannot prevent major losses from occurring if communities are unprepared to respond to the level of threats posed. Threats communities must prepare for include both short-term, immediate dangers to lives and property caused by individual weather events and the long-term potential to increase these dangers prompted by climate change.

In Hoboken, city officials strongly urged people to evacuate, sending out press releases, tweeting, and distributing fliers in both English and Spanish (Kirkham 2012). Yet some Hoboken residents either did not receive or ignored the city's warnings and remained to shelter in place. Some may have been recalling what many had perceived as overhyped evacuation orders preceding Hurricane Irene the previous year, but Hoboken's disproportionate amount of social vulnerability (discussed in Section 1.4) suggests many may have simply been unprepared to evacuate. Lack of a vehicle, lack of financial resources, unwillingness to leave property behind, health concerns and disabilities, family structure, and other barriers likely contributed to the large number of Hoboken residents who stayed in the city, placing themselves and their families at high risk. During Sandy's peak storm tides, an estimated 20,000 Hoboken residents who stayed in town were completely surrounded by water (Blake et al 2013), and an estimated 22,829 Public Service Electric and Gas Company (PSEG) account holders in Hoboken lost electricity for some duration, many still without power a week later (City of Hoboken 2012a).

At the community level, the damage to Hoboken was massive in large part because effective, science-based resilience measures had never been established. As a result, Hoboken damages were estimated at well above $100 million to private property (City of Hoboken 2012b), including over 1700 homes, $100s of millions to the transit system (Zimmer 2013), and $10 million to city property (City of Hoboken 2012b), including three out of four fire stations, the community center, public works garage, volunteer ambulance corps, and municipal parks and recreational facilities.

Businesses also suffered. While Washington Street, location of numerous restaurants, bars, and shops, did not flood, over 200 businesses elsewhere did (Zimmer 2012). During the ensuing weeks and months, many flooded businesses struggled to stay open, some relocating to alternate sites while repairs took place but others forced to close. More than a month after the storm, many local businesses were reporting up to a 60 percent drop in revenue (Zimmer 2012). Even businesses not directly affected by flooding, like those on Washington Street, experienced significant decreases in revenue due to transportation disruptions. The closure of the PATH station made it difficult for Hoboken residents to get to work in Manhattan, but it also prevented many Manhattanites from coming to Hoboken to enjoy its lively night life, known for being less expensive than Manhattan's.

An added challenge for both residents and business owners was the difficulty of accessing financial support to aid in recovery efforts. In her December 2012 testimony to the U.S. Senate Committee on Small Business and Entrepreneurship, Mayor Zimmer described "an insurance gauntlet" Hoboken faced "because the National Flood Insurance Program is not designed to meet the needs of the built urban environment" (City of Hoboken 2012b). Many residences and businesses in Hoboken are located on so-called "garden-style" levels of multi-story older buildings one or two steps below street level. Property owners in flood zones like Hoboken are required to purchase flood insurance for garden-level units as a mortgage contingency, but this insurance provides very little coverage because these properties are considered basements. Only things like boilers and electrical control panels are covered.

Many flooded property owners in Hoboken thus found themselves high and dry when it came to financial recovery and resilience. Flood insurance policies they had been paying into for years were supporting large payouts for vacation homes on the beachfront but failed to cover losses for primary residences and small businesses in garden-level urban units. Growing exposure to flood risk and inadequate insurance tools for managing that risk in Hoboken, as in many other coastal communities, are making it harder for residents in these communities to rebound after major storms (Cleetus 2013).

In her testimony, Mayor Zimmer stressed the importance of policy structures that support both infrastructure and financial recovery and resilience. She suggested to members of Congress "that rather than denying people coverage, businesses and residents should be given incentives to invest in taking the necessary steps to reduce the impact of flooding."

After Sandy, installing the remaining three "wet weather" pumps—an action the city had been stalling over for the past decade—became a priority. The pumps are now featured as a key component of flood mitigation in Mayor Zimmer's multipronged resilience plan (Zimmer 2013b), discussed in Section 4.2. Both the City of Hoboken and the NHSA have applied for grants and loans totaling $29 million to support construction of the pumps.

To address flooding in a post-Sandy Hoboken, the pumps will play one part in a much broader resilience strategy. The flooding produced by Sandy's record 14 foot storm tide was unlike anything the city had seen in the past. Unlike city leaders before them, Mayor Zimmer and her team recognized that sea level rise had the potential to dramatically affect an already bad situation and that a multi-pronged plan of action was needed. As Michael Bruno, dean of Hoboken's Stevens Institute's Schaefer School of Engineering and Science, commented, "You can't pump against the entire Atlantic Ocean" (Stevens Institute 2013).

3. Leadership in Government and Respect for Science: Aligning Federal and Local Resilience Policy

3.1 Science-based initiatives at the federal level supporting community preparedness

In the weeks and months following Sandy, a series of federal policy actions were launched that supported the development of Mayor Zimmer's Hoboken Resiliency and Readiness Plan. These science-based initiatives laid the foundation for the coordination across all levels of government essential to a resilient recovery and ensured that the effects of climate change, including projections for sea level rise, would be taken into account in rebuilding and resiliency efforts.

The first initiative was an executive order issued on December 7, 2012, establishing the Hurricane Sandy Rebuilding Task Force (Obama 2012). The Task Force, comprised of federal agency leaders and members of the Obama Administration, was given the responsibility of coordinating rebuilding efforts in order to protect economic vitality, public health and safety, natural resources, and infrastructure. A Task Force Advisory Group comprised of state, local, and tribal leaders was also established to provide input and assistance. Mayor Zimmer was appointed as a member of the Task Force Advisory Group (HUD 2013).

Another federal action that fully considers the scientific evidence and will be important for Hoboken's recovery was President Obama's Climate Action Plan. Released in June 2013, the president's plan lays out a national strategy for preparing for climate change. It stresses addressing impacts, like coastal flooding, that are too late to avoid, even as policy makers strive to mitigate potential further impacts. In alignment with objectives of the Hurricane Sandy Rebuilding Task Force, the plan emphasizes using science to build stronger, safer communities and infrastructure, as communities also strive to protect natural resources and local economies (Obama 2013).

Key provisions in the president's plan especially relevant to Hoboken include supporting communities as they prepare for climate change impacts, rebuilding and learning from Sandy, identifying and addressing vulnerabilities in key sectors like energy and transportation, directing agencies to support climate resilient investment, promoting insurance reform, preparing for future floods, and launching an online toolkit that centralizes access to government information to help communities obtain data and services and learn about best practices. The president's plan also mandates that the Hurricane Sandy Rebuilding Task Force deliver a strategy "to be implemented in Sandy-affected regions and establishing precedents that can be followed elsewhere" (Obama 2013).

In August 2013, the same month Mayor Zimmer announced Hoboken's plan, the Task Force released its findings, seven goals supported by a set of 69 recommendations that outline how federal funds to be invested in recovery should align with local rebuilding objectives, cut red tape in getting assistance to those directly affected, coordinate efforts among federal, state, and local governments, and ensure that rebuilding takes place to promote both the region's resilience in the face of major storms and the region's sustainability—that is, the long-term viability of communities in the face of a changing climate.

3.2Aligning local policy with federal recommendations: Hoboken's Resiliency and Readiness Plan

Mayor Zimmer's resilience plan for Hoboken addresses nine critical components: energy resiliency, shoreline protection, flood mitigation, stormwater management, critical facilities and infrastructure, emergency notification, public information, resilient building codes, and a local resiliency task force (City of Hoboken 2013b). These components of a resilient recovery align with federal Task Force goals and many of the 69 supporting recommendations. Below are highlights of Hoboken's plan and a description of how they align with science-based federal policy.

Extended loss of electricity during and after Sandy caused major disruptions in Hoboken and impeded recovery efforts. To promote energy resiliency, Hoboken is now coordinating with experts from federal (U.S. Department of Energy and Sandia National Laboratory) and state (New Jersey Board of Public Utilities) agencies to design a "microgrid." In order to provide

uninterrupted power service during storms, the microgrid would use Energy Surety Design Methodology, an innovative, reliable, and sustainable technology that links together distributed energy resources, including backup generators (Sandia 2012).

The microgrid would be used to power designated "critical community facilities" to include police and fire stations, hospitals, NHSA sewage treatment plants, and flood pumps, as well as residences with high "at-risk" populations such as seniors. The microgrid, which would be the first non-military application of the technology (Marcacci 2013), aligns with Task Force recommendations to coordinate federal, state, and local efforts ensuring energy resilient investments in Sandy recovery projects and to encourage innovation and cooperation to improve the electric grid.

Incorporating future risk assessment, such as sea level rise, into rebuilding efforts, and encouraging green infrastructure are also among Task Force recommendations. The Task Force urges considering green infrastructure investments in all Sandy recovery projects, seeking opportunities for green infrastructure innovations, and advancing the broad integration of green infrastructure into communities. Green initiatives are likewise another key feature of the Hoboken plan and are explicitly stated to be aimed at mitigating "the effects of climate change and extreme storm events."

In particular, Hoboken's plan emphasizes green approaches to managing the increasing impact of stormwater. Stormwater management strategies in the Hoboken plan include the purchase of land in a Coastal High Hazard area that "will be used for parks and open space with stormwater retention facilities incorporated into the design to reduce stormwater runoff." The city has applied for a $60 million federal Hazard Mitigation grant to develop this project. Hoboken has already received over half a million dollars from Re.InvestInitative.org, a public/private partnership, to support technical assistance in the design of green infrastructure and another $110,000 to begin developing rain gardens, another sustainable approach to stormwater runoff that can help prevent overflow of the city's combined sewage and stormwater drainage system.

Among its recommendations for developing state and local capacity to plan for and implement resilient rebuilding, the Task Force specifically cites supporting New Jersey partnerships and trans-jurisdictional collaboration—important elements in Hoboken's plan. Along with the pumps, discussed in Section 3, Hoboken's plan contains measures for flood mitigation that necessitate multilateral collaboration. Among these are building sea walls and flood barriers along the waterfront, for which the city has applied to the State of New Jersey for $33 million. To support resilient protection of the waterfront surrounding Hoboken Terminal, city leaders have been working with officials from the governor's office, NJ Transit, FEMA, and the Army Corps of Engineers. Among the city's requests are that plans for the redevelopment of Hoboken Terminal include "hardening" or elimination altogether of the Long Slip Canal alongside the rail station, one of the major channels through which water from Sandy's storm surge entered the city (Hine 2012).

Other aspects of the Hoboken plan in line with federal recommendations address strengthening homes, raising public awareness about local hazards and preparedness plans, working with FEMA and the NJ DEP to reconcile city zoning codes with state and federal regulations, and developing solar-powered mobile message boards to quickly deploy information during emergencies. Additionally, Mayor's Zimmer's plan establishes a local Resiliency Task Force that will "develop ideas, policies, projects and programs to advance community recovery and resiliency and to oversee the implementation of those projects which are ultimately approved and funded." This local task force engages the community in actions that support resilience and encourages Hoboken residents to see themselves as stakeholders in the city's future.

4. The Long Road Ahead

Hoboken's recovery efforts and plans for resilience are not without caveats. Given the city's long history of seeking short-term solutions and ignoring scientific evidence in favor of unsustainable development practices, it would be premature to conclude that the mayor's post-Sandy resiliency and rebuilding plan will succeed in the years to come. The worst effects from sea level rise are not projected to occur for several more decades. For implementation of the plan to be effective, subsequent city leaders will need to sustain the efforts Mayor Zimmer and her team have begun. Political will in the city will be needed to resist a continuing push from overzealous waterfront developers. And policy makers at the state and federal levels will need to continue to support local preparedness and resilience efforts in communities like Hoboken.

Caveats aside, a year and counting after Superstorm Sandy, Hoboken is better prepared to respond to sea level rise in terms of local planning, leadership, community engagement, multilevel government policy coordination, and action. In Mayor Zimmer, Hoboken residents have a leader they can count on to take science-informed steps to protect their community from sea level rise threats that have already begun to change the magnitude of the city's longstanding flooding problem. Mayor Zimmer's proactive approach to science-based policy following Superstorm Sandy serves as a model for other leaders in coastal communities throughout the country, as they, too, contend with rising threats from climate change.

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