

# Implementation

**Since the launch of the Special Initiative for Rebuilding and Resiliency in December 2012, scores of City employees across a variety of agencies have invested thousands of hours in the development of A Stronger, More Resilient New York.** But in many ways, the hard work really begins with the publication of this report. Only a focused, energetic, and sustained implementation effort can ensure that the strategies and initiatives outlined in this document are translated into specific actions that achieve the goal of increasing the resiliency of New York's buildings, infrastructure, and communities.

The 2007 PlaNYC report *A Greener, Greater New York* set similarly ambitious goals to improve the city's sustainability. The report noted, "This agenda will require tremendous effort: on the part of City officials and State legislators; by community leaders and our delegation in Washington; from the State government and from every New Yorker. It will not be easy, and it will not be free. But the payoff is real, and big; and the perils of inaction are far greater than the costs of action."

This statement is as true today as it was in 2007. Fortunately, the City's approach to PlaNYC provides a model for how to translate plans into results.

For example, in 2010, the international nonprofit ICLEI-Local Governments for Sustainability said, "Since the release of [PlaNYC], the City has made great strides towards implementing the plan—passing groundbreaking green buildings legislation, creating miles of bike lanes, opening acres of open space, cleaning the air, and reducing greenhouse gas emissions. PlaNYC is a success because it is not just a plan; it is an action-oriented agenda that provided the City with a framework for implementing bold changes." The organization went on to identify 10 factors contributing to PlaNYC's success.

The implementation of *A Stronger, More Resilient New York* will build on the systems and structures that have made PlaNYC a success, including four that will be particularly important in the months and years to come: assignment of clear accountability; development of regular, required reporting; identification of near-term milestones; and creation of a clear and compelling Federal agenda. (See sidebar: *Factors Contributing to PlaNYC's Success*)

## Clear Accountability

An initiative without a clear owner is destined to fail. That is why the key to successful implementation of this plan is ensuring that each and every initiative is owned by a designated agency or

office, with interagency working groups where appropriate and coordination by a single entity.

A number of topics in this report align primarily to a single responsible agency—including transportation (Department of Transportation, or NYCDOT), water and wastewater (Department of Environmental Protection, or DEP), solid waste (Department of Sanitation, or DSNY), telecommunications (Department of Information Technology and Telecommunications, or DoITT), and parks (Department of Parks & Recreation, or DPR). Each of these agencies therefore, will be responsible for driving the implementation of initiatives contained within their respective chapters. In some other chapters, only selected initiatives are aligned clearly to a single agency. This includes, for example, the land use actions within the Community Rebuilding and Resiliency Plans (Department of City Planning, or DCP) and the recommendations for City-owned hospitals within Chapter 8 (*Healthcare*) (Health and Hospitals Corporation, or HHC). With respect to the remaining initiatives (those without a natural "owner"), it will be necessary to identify an appropriate lead agency responsible for implementing each.

Even with different agencies assigned to each initiative, it is necessary to appoint a single entity as the overall steward of this plan and its implementation. That entity should be experienced in interagency coordination, informed about climate change and its impacts on New York City, and practiced in driving the

development and implementation of long-term planning efforts.

Fortunately, the Mayor's Office of Long-Term Planning and Sustainability (OLTPS) is positioned perfectly to play this role, building on its success at driving the City's sustainability efforts during the last six years. OLTPS long has focused not just on making the city greener but also on identifying and protecting New York from climate change impacts. For example, well before Sandy, OLTPS staff had coordinated with the New York City Panel on Climate Change (NPCC) to develop local climate projections for New York City; engaged with the Federal Emergency Management Agency (FEMA) on the development of new flood maps (including forward-looking maps reflecting projected sea level rise); convened the Climate Change Adaptation Task Force to assess risks to critical infrastructure; and begun coordinating with the United States Army Corps of Engineers (USACE) on a study of potential protections for New York Harbor. During Sandy, OLTPS staff worked night and day to support recovery operations related to the City's energy and other critical infrastructure. Furthermore, as leaders and members of the Special Initiative for Rebuilding and Resiliency (SIRR), OLTPS staff members have been central to the creation of this report.

OLTPS, therefore, will lead the implementation of this plan. In addition to a small core of dedicated staff, the OLTPS Director of Resiliency will coordinate the work of three critical

### Factors Contributing to PlaNYC's Success

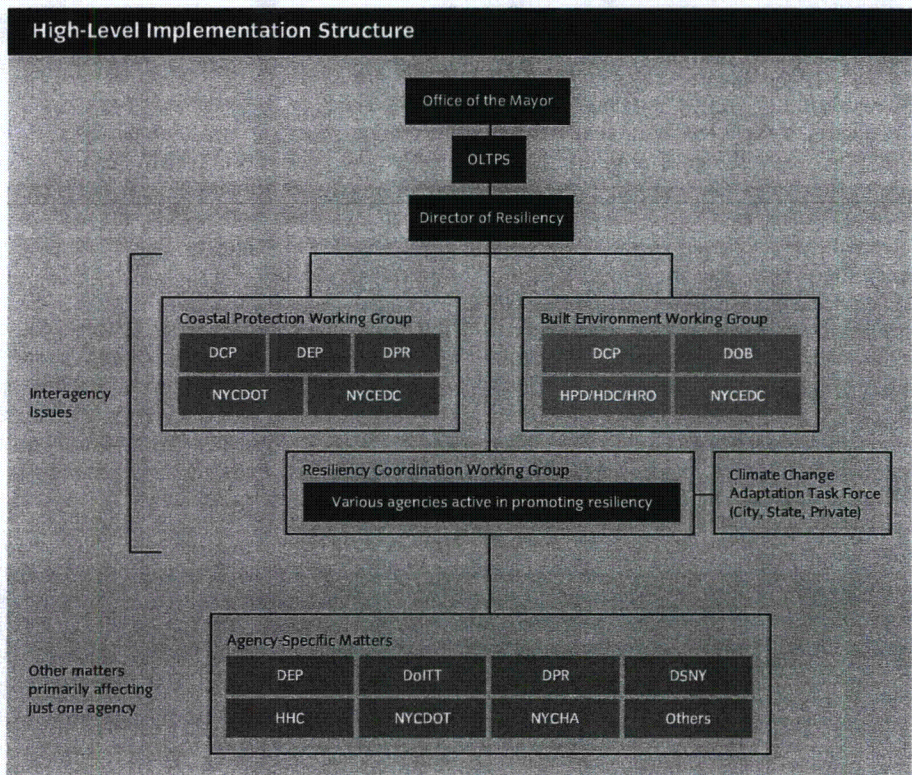
An independent organization, ICLEI-Local Governments for Sustainability, spent over a year researching and understanding the process New York City followed to develop PlaNYC, interviewing many of the key people involved. Through this research process, ICLEI identified the top 10 factors for PlaNYC's success:

1. **Strong mayoral leadership and cooperation** between the Mayor's Office and City Council.
2. A group of dedicated City agency staff performed **in-depth research and analysis**, involving extensive **coordination and collaboration** between the agencies.
3. A **methodical, transparent, and inclusive planning process**.
4. **Central management and coordination** provided by the Mayor's Office of Long-Term Planning and Sustainability.
5. An external Sustainability Advisory Board provided **best practice advice and guidance**.
6. A **comprehensive public outreach process** generated broad public support and helped to educate the general public about climate change and sustainability issues.
7. The Mayor's Office of Long-Term Planning and Sustainability **strategically released** the plan by coordinating announcements with key stakeholders.
8. The plan included an **implementation plan** with a timeline and a funded budget.
9. **Swift transition from planning to action:** the City is actively implementing all 127 initiatives.
10. **Openness for innovation** and policy-making not driven by politics or business as usual.

interagency working groups that will be established to address high-priority initiatives that cut across the typical boundaries of City government. The first of these areas is coastal protection, which will involve further risk assessment, review of technologies and equipment, coordination with the USACE, and implementation. This working group—to include DCP, DEP, DPR, NYCDOT, and the New York City Economic Development Corporation (NYCEDC)—will pursue the implementation of the initiatives in Chapter 3 (*Coastal Protection*), including securing necessary funding.

The second critical interagency working group will coordinate the implementation of buildings-related recommendations, including the various initiatives contained within Chapter 4 (*Buildings*), Chapter 5 (*Insurance*), and Chapter 8 (*Healthcare*). The intersection of the building code, mitigation measures, Federal flood insurance, and zoning requires a close working relationship among various agencies, including DCP, NYCEDC, the Department of Buildings (DOB), the Department of Housing Preservation and Development (HPD), and the Mayor's Office of Housing Recovery Operations (HRO). OLTPS will coordinate this group and collaborate with the City Council to ensure sustained progress on the initiatives outlined herein.

The third interagency working group will provide operational support and coordination for citywide long-term recovery and resiliency efforts of all types, citywide. Made up of senior leaders from the most involved agencies, this working group will ensure cross-agency cooperation for various initiatives, particularly those assigned to one agency but needing support from others. In addition, this working group will seek to prevent duplication of efforts, promoting coordination between the resiliency efforts included herein and other post-Sandy



recovery initiatives (such as implementation of the recommendations in the City's *Hurricane Sandy After Action Report*). This working group also will collaborate with the existing Climate Change Adaptation Task Force. (See chart: *High-Level Implementation Structure*)

In addition to leading these interagency working groups, OLTPS also will draw upon other lessons from its successful implementation of PlaNYC. For example, in order to solicit the continued input of third-party experts, OLTPS will consider supplementing the membership of the Sustainability Advisory Board to include expertise in resiliency and other fields needed

to ensure that the latest science, research, and community input is brought to bear to make New York City more resilient.

With the tools outlined above and the necessary additional resources, OLTPS is well positioned to oversee the implementation of this plan, even as it continues to implement the entire PlaNYC sustainability agenda.

### Required Reporting

Renowned management theorist Peter Drucker famously said, "What gets measured, gets

Select Local Laws Supporting PlaNYC	
Local Law 17 of 2008	<ul style="list-style-type: none"> <li>Establishes OLTPS in the City Charter</li> <li>Requires OLTPS to issue an updated "comprehensive, long-term sustainability plan" every four years, and an annual progress update including sustainability indicators</li> <li>Requires DCP to issue updated population projections every four years</li> </ul>
Local Law 22 of 2008	<ul style="list-style-type: none"> <li>Requires a 30 percent reduction in citywide greenhouse gas emissions by 2030 and City government emissions by 2017</li> <li>Requires annual inventory and analysis of greenhouse gas emissions</li> </ul>
Local Law 42 of 2012	<ul style="list-style-type: none"> <li>Codifies the NPCC and requires updates to climate projections at least every three years, and within one year of an Intergovernmental Panel on Climate Change update</li> <li>Codifies the Climate Change Adaptation Task Force and requires an updated risk assessment within one year of new projections</li> </ul>
Various Other Local Laws	<ul style="list-style-type: none"> <li>Includes the production of regular or one-time studies on a variety of topics, including stormwater management, recycling and composting, food distribution, and undergrounding of power lines</li> <li>Creates the Office of Environmental Remediation and a "renewable energy portal"</li> </ul>

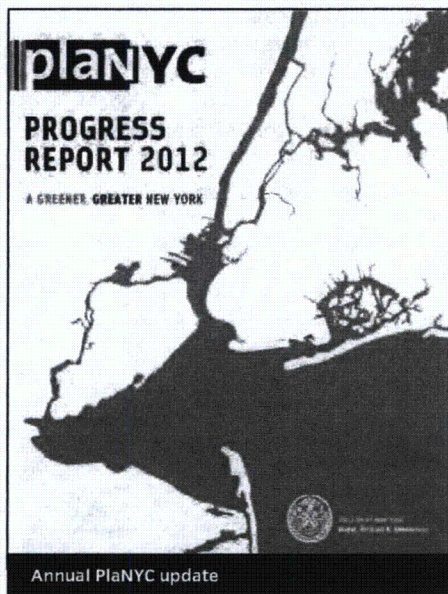
managed." The history of PlaNYC demonstrates the power of establishing clear metrics and monitoring progress against them. Since 2007, the Administration has worked closely with the City Council to adopt legislation requiring City agencies to submit regular progress reports relating to the plan. For example, Local Law 17 of 2008 requires OLTPS to issue an updated "comprehensive, long-term sustainability plan" every four years, and an annual progress update including sustainability indicators. Local Law 22 of 2008 requires a 30 percent reduction in citywide greenhouse gas emissions by 2030 and City government emissions by 2017. Critically, it also requires an annual inventory and analysis of these emissions. (See table: *Selection of Local Laws Supporting PlaNYC*)

Subsequent planning efforts, including the *Sustainable Stormwater Management Plan* (2008), the *Green Infrastructure Plan* (2010), and the *New York City Wetlands Strategy* (2012) all require reporting and periodic updates. In short, the requirement to monitor and report on the progress of sustainability initiatives has enabled observers both within and outside government to assess progress and, if necessary, advocate for change.

The City believes the same rigor that applies to its sustainability efforts should apply equally to its resiliency efforts. To that end, the Administration will work with the City Council to pass a new local law that requires OLTPS to issue an updated "comprehensive,

long-term resiliency plan" every four years, beginning in 2017, four years after the release of this plan. The local law should require that this update be developed in coordination with the City's regularly updated Hazard Mitigation Plan, which is compiled by OEM in close partnership with DCP and other City agencies based on FEMA regulations. In addition, the local law should require OLTPS to include resiliency indicators in the annual progress update already issued by the office. OLTPS will work closely with other involved City agencies to identify a list of appropriate metrics. (See table: *Selected Citywide Infrastructure and Built Environment Resiliency Metrics, Preliminary*)

Selected Citywide Infrastructure and Built Environment Resiliency Metrics, Preliminary	
Category	Metrics
Coastal Protection	<ul style="list-style-type: none"> <li>• Federal dollars secured for coastal protection projects</li> <li>• # of buildings with reduced coastal risk due to coastal protection projects</li> </ul>
Buildings	<ul style="list-style-type: none"> <li>• # of buildings implementing Core Flood Resiliency Measures</li> <li>• # of square feet of residential and non-residential buildings implementing Core Flood Resiliency Measures</li> </ul>
Insurance	<ul style="list-style-type: none"> <li>• % of residences in 100-year floodplain purchasing flood insurance</li> <li>• Average premium paid for NFIP policies</li> </ul>
Utilities	<ul style="list-style-type: none"> <li>• % of electric generation capacity in the 500-year floodplain able to remain online after a 500-year flood</li> <li>• Maximum % of peak load that could be lost due to failure of any one substation</li> <li>• % of assets at or above their loading limits during peak demand periods (e.g., during heat waves)</li> <li>• # of miles of cast iron and bare steel gas mains in the 500-year floodplain</li> <li>• % of steam generation capacity in the 500-year floodplain able to remain online after a 500-year flood</li> </ul>
Liquid Fuels	<ul style="list-style-type: none"> <li>• % of gas stations with quick-connects for generators</li> <li>• % of regional fuel terminal capacity in the 100-year floodplain hardened against a 100-year flood</li> <li>• % of regional refining capacity in the 100-year floodplain hardened against a 100-year flood</li> </ul>
Healthcare	<ul style="list-style-type: none"> <li>• % of hospital beds in 500-year floodplain meeting resiliency requirements</li> <li>• % of nursing homes and adult care beds in 100-year floodplain meeting resiliency requirements</li> </ul>
Telecommunications	<ul style="list-style-type: none"> <li>• # of critical telecommunications facilities implementing Core Flood Resiliency Measures</li> </ul>
Transportation	<ul style="list-style-type: none"> <li>• # of lane-miles reconstructed or resurfaced</li> <li>• % of New York City transportation assets adapted for climate change resiliency</li> </ul>
Parks	<ul style="list-style-type: none"> <li>• % of facilities in Sandy inundation zone upgraded for greater resiliency</li> <li>• # of trees inspected and pruned</li> <li>• # of cubic yards of beach sand nourishment</li> </ul>
Water and Wastewater	<ul style="list-style-type: none"> <li>• # of wastewater facilities or assets protected or raised above the 100-year floodplain</li> <li>• % of combined sewer area runoff managed by green infrastructure</li> <li>• # of new sewer miles built in areas with no or partial sewers</li> <li>• # of areas served by Bluebelt projects built citywide</li> <li>• % of water quality samples complying with Surface Water Treatment Rule standard for turbidity</li> </ul>
Solid Waste	<ul style="list-style-type: none"> <li>• # of DSNY facilities protected or raised above the 100-year floodplain</li> </ul>
Food Supply	<ul style="list-style-type: none"> <li>• # of grocery stores with generators or quick connects for generators</li> <li>• % of DCAS food procurement backstopped with more resilient distributors</li> </ul>



## Near-Term Milestones

In its 2010 report, ICLEI—Local Governments for Sustainability noted the importance of “swift transition from planning to action” as a factor contributing to PlanNYC’s success. Within the first year of releasing PlanNYC, the City had launched 118 of its 127 initiatives (over 90 percent). These initiatives included creating the Office of Environmental Remediation and the Brownfield Opportunity Area grants program; opening more than 100 schoolyards as playgrounds; signing legislation to require ultra-low sulfur diesel in City-owned ferries; issuing Executive Order 109 directing agencies to take steps to reduce City government’s energy consumption and CO<sub>2</sub> emissions by 30 percent from 2006 levels within 10 years; and launching the Mayor’s Carbon Challenge at 10 leading universities that committed to matching the City’s “30x17” goal (a 30 percent reduction in City government carbon emissions by 2017).

Climate change is a long-term problem, and many of the strategies and initiatives outlined in this report will evolve over a similarly long period of time. However, it is both possible and necessary to begin to make progress now. The achievement of near-term milestones can help build momentum for initiatives that take longer to implement, and generate lessons that can be applied across the entire plan.

To that end, the City has identified a series of resiliency milestones that can be achieved in 2013. These milestones include an array of concrete achievements that will result in material improvements to New York’s resiliency, including, but not limited to, the following:

- launch of housing and building recovery programs;
- launch of Neighborhood Game Changer and Resiliency Technology Competitions;
- appointment of a member of the senior leadership team of each relevant City agency as the point person for resiliency matters;
- establishment of the DoITT Planning and Resiliency Office;
- launch of the USACE comprehensive coastal protection study with active City participation;
- completion of emergency beach nourishment projects in Brooklyn and Queens by the USACE, and Staten Island by DPR;
- implementation of DCP’s Flood Resilience Text Amendment to facilitate flood-resistant new construction retrofits;
- approval of amendments to the Construction Codes to provide for resiliency improvements for new and existing buildings, including healthcare facilities;
- implementation of a resiliency incentive program for properties in the 100-year floodplain facing increased flood risk;
- launch of flood insurance-related studies with FEMA for the National Flood Insurance Program (NFIP);
- introduction of a legislative package (City, State, and Federal) to provide regulatory relief in the event of a liquid fuel emergency;
- launch of an emergency fueling equipment and generator procurement program for critical fleets; and
- submission of testimony calling for significant investment in resiliency and storm-hardening measures as part of the 2013 Con Edison rate cases for electric, gas, and steam before the New York State Public Service Commission (PSC).

These near-term milestones and others identified will demonstrate the City’s commitment to protecting its coastal neighborhoods and all New Yorkers, and will represent a significant down payment on the years of hard work to come. (See table: *Selected 2013 Resiliency Milestones*)

## Federal Agenda

Given the important role played by the Federal government in flood risk assessment, flood insurance, and coastal protection measures, a clear Federal agenda for the City to pursue (in partnership with the State and the Congressional delegation) is critical to the successful implementation of the plan outlined in this report.

The City, therefore, has developed a Federal Resiliency Agenda that it intends to bring to Washington immediately. While this list does

not reflect all of New York City’s needs from the Federal government, it does reflect a set of priorities that require immediate attention:

1. **Establish a Federal policy for using local climate projections:** Using different climate projections at the local and Federal levels will cause confusion and lead to conflicting measures for protecting against future risks. Federal policy should permit or require that, where local climate projections meet rigorous scientific standards, they should be deferred to by the Federal government within the applicable locality.
2. **Improve the national flood mapping program:** FEMA flood maps are one of the main tools for understanding coastal flood risks, but 30 years have passed since FEMA last completed a coastal flood study for New York—resulting in outdated maps that underestimate today’s coastal flood risk. In addition to more frequent updates, improvements to the program should include clearer technical guidance, increased transparency, and the incorporation of future risks such as sea level rise.
3. **Better reflect coastal protection measures in flood maps:** A primary goal of coastal protection measures is to mitigate the risks to New Yorkers that are reflected in Federal flood maps. As such, neighborhood- and site-specific improvements that provide defenses against floods should result in flood map amendments.
4. **Ensure completion of key USACE coastal protection studies with the right priorities, and secure supplemental funding for implementation:** Recent Federal legislation instructs the USACE—and provides the necessary funding—to complete a series of high-priority assessments, including, most importantly, a comprehensive New York Harbor study. These studies should prioritize an analysis of the City’s proposed coastal protection measures. In addition, the Federal government should ensure funding that will allow the recommendations of these studies to be implemented.
5. **Work with FEMA to update its requirements and best practices for flood protection to reflect the needs of a high-density urban environment:** New York City’s built environment differs significantly from coastal communities in most of the rest of the country. Upgrading FEMA guidance, practices, and policies, where warranted, can aid and encourage

adaptation in New York City and other urban contexts.

**6. Develop NFIP mitigation credits for resiliency measures:** Many buildings in urban environments have structural characteristics or site conditions that pose a challenge to elevation. Other mitigation options that reduce the risk of flood damage are available and should be encouraged through commensurate insurance premium reductions.

**7. Address NFIP affordability:** Implementation of the Biggert-Waters flood insurance reform legislation will adversely affect many property owners, especially low-income populations, and is likely to have broader impacts on home ownership affordability and neighborhood stability. The legislation called for FEMA and the National Academy of Sciences to conduct a study of methods for addressing flood insurance affordability. This study must be completed and its recommendations must be implemented as soon as possible.

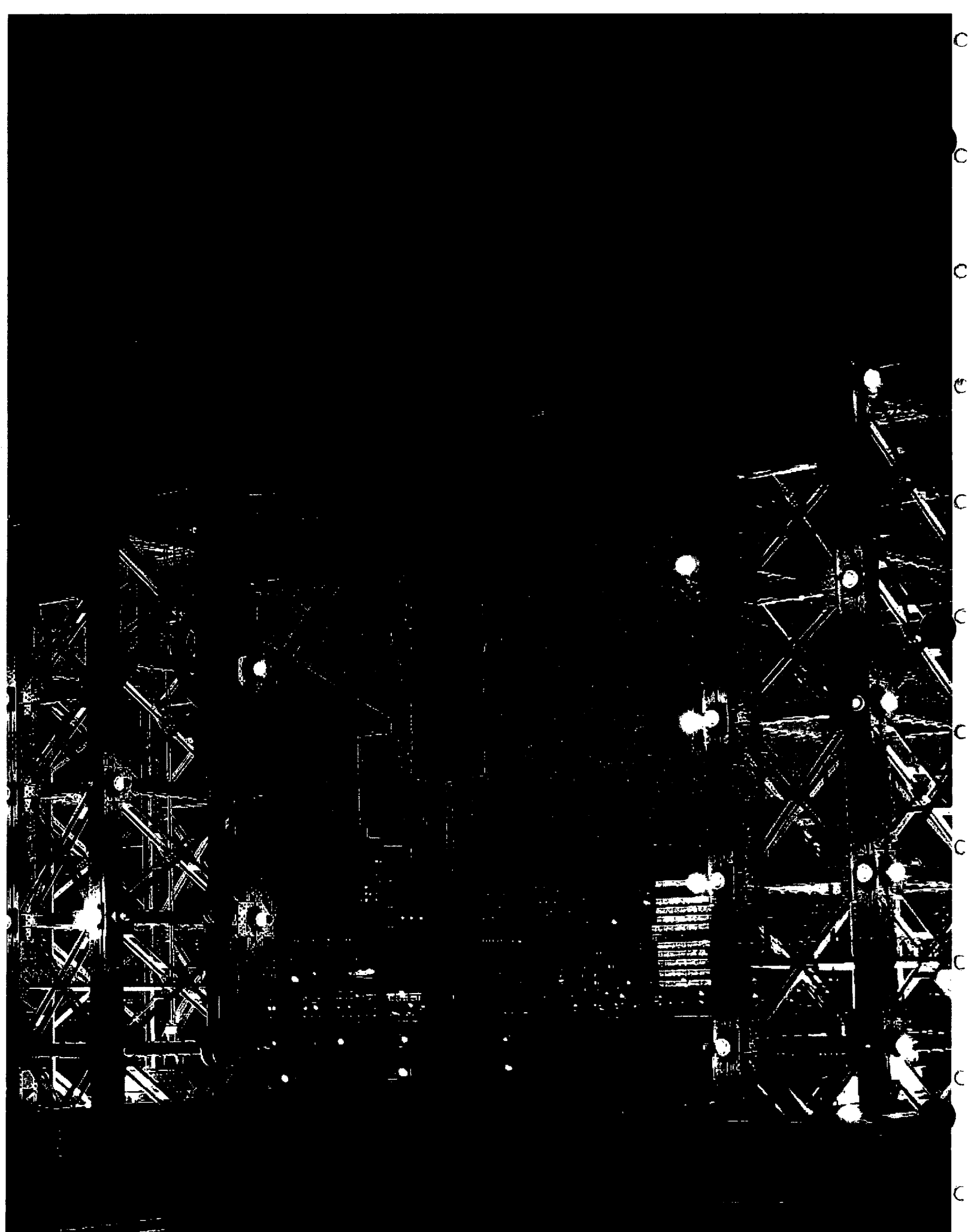
**8. Strengthen resiliency of the regional liquid fuel infrastructure:** The City lacks the regulatory power to monitor or require resiliency in much of the liquid fuels infrastructure that serves New York. The Federal government must convene stakeholders to identify ways of ensuring the resiliency of this infrastructure and preventing future supply chain breakdowns.

Selected 2013 Resiliency Milestones	
Chapter	2013 Milestone
Climate Analysis	<ul style="list-style-type: none"> <li>• Launch of interactive web platform for communicating flood-related risk information*</li> <li>• Release of NPCC climate projections for 2100, including humidity projections</li> <li>• Release of a set of metrics developed with the NPCC to measure actual climate change against predicted climate change</li> </ul>
Coastal Protection	<ul style="list-style-type: none"> <li>• Launch of USACE Harborwide coastal protection study with active City collaboration</li> <li>• Release of global competition to design integrated flood-protection systems*</li> <li>• Completion by USACE of emergency beach nourishment in the Rockaways, Coney Island, Brighton Beach and Plumb Island with active City collaboration</li> <li>• Completion by DPR of emergency beach nourishment at South Beach, New Dorp Beach, and Oakwood Beach in Staten Island</li> </ul>
Buildings	<ul style="list-style-type: none"> <li>• Approval of Construction Code amendments and zoning text amendments to provide for resiliency improvements for new and existing buildings</li> <li>• Launch of incentive program for properties in the 100-year floodplain facing increased to adopt Core Flood Resiliency Measures</li> <li>• Launch of Resiliency Technologies Competition, and Resilient Housing Design Competition*</li> <li>• Launch of sales tax abatement program for flood resiliency in industrial buildings</li> <li>• Initiation of studies related to wind risk and potential resiliency retrofit requirements*</li> </ul>
Insurance	<ul style="list-style-type: none"> <li>• Launch of mitigation credits study with FEMA</li> <li>• Launch of consumer education campaign on flood insurance*</li> </ul>
Utilities	<ul style="list-style-type: none"> <li>• Filing of comments in the Con Edison rate case, including proposals for a new approach to resiliency investment on the part of the PSC</li> <li>• Development of a generator plan with OEM, including coordination with the Federal government and with the State</li> </ul>
Liquid Fuels	<ul style="list-style-type: none"> <li>• Launch of discussions with the Federal government on liquid fuels infrastructure hardening</li> <li>• Introduction of a legislative package for liquid fuels emergency relief</li> </ul>
Healthcare	<ul style="list-style-type: none"> <li>• Amendments to Construction Code for new and existing facilities</li> <li>• Launch of resiliency incentive program for nursing homes and adult care facilities*</li> </ul>
Telecommunications	<ul style="list-style-type: none"> <li>• Establishment of the DoITT Planning and Resiliency Office*</li> <li>• Launch of WiredNYC and NYC Broadband Map programs to provide better information about building broadband access and resiliency</li> </ul>
Transportation	<ul style="list-style-type: none"> <li>• Raising of selected traffic signal controllers above flood elevations in vulnerable areas</li> <li>• Acquisition of power inverters to allow signals to operate on NYPD vehicle power during outages</li> <li>• First planning exercise for temporary measures to respond to extreme weather-related transit outage scenarios</li> <li>• Initiation of detailed planning for Select Bus Service bus rapid transit route on Woodhaven Boulevard</li> </ul>
Parks	<ul style="list-style-type: none"> <li>• Establishment of Jamaica Bay Science and Resilience Center</li> <li>• Expansion of DPR native plant seed collection</li> </ul>

**Selected 2013 Resiliency Milestones (Continued)**

Chapter	2013 Milestone
Water and Wastewater	<ul style="list-style-type: none"> <li>• Adoption of infrastructure guidelines for new wastewater facilities that include storm surge and sea level rise</li> <li>• Completion of detailed facility risk assessment and adaptation study, and release of final report</li> <li>• Start of construction of the Catskill and Delaware interconnection, completion of Ultraviolet Disinfection Facility, and revision of EPA filtration waiver</li> </ul>
Solid Waste	<ul style="list-style-type: none"> <li>• Completion of detailed facility risk assessment</li> </ul>
Food Supply	<ul style="list-style-type: none"> <li>• Launch of comprehensive food distribution study to identify supply chain vulnerabilities*</li> </ul>
All Communities	<ul style="list-style-type: none"> <li>• Launch of Business Recovery and Resiliency programs</li> <li>• Launch of Neighborhood Game Changer contest</li> </ul>
Brooklyn-Queens Waterfront	<ul style="list-style-type: none"> <li>• Launch of pilot summer weekend ferry service expansion from Manhattan to Red Hook</li> <li>• Completion of enhancements to Mill Street and the BQE underpass to improve the connection between Red Hook and the rest of Brooklyn</li> <li>• Announcement of Brooklyn Bridge Park designation for John Street site, including elevated building and coastal edges</li> </ul>
East and South Shores of Staten Island	<ul style="list-style-type: none"> <li>• Issuance of RFEI for new concessions and services at City-controlled beachfront</li> <li>• Launch of detailed land use studies to encourage retrofits of existing buildings and construction of new resilient buildings in severely impacted East Shore communities*</li> <li>• Launch of the first capital project for the Mid-Island Bluebelt in Midland Beach</li> <li>• Launch of Great Kills Harbor comprehensive revitalization study to increase resiliency and draw additional investments*</li> <li>• Implementation of roadway and sewer capital projects along Hylan Boulevard, especially in vulnerable South Shore areas</li> </ul>
South Queens	<ul style="list-style-type: none"> <li>• Launch of Beach 116th Street commercial revitalization study to develop detailed redevelopment plan*</li> <li>• Launch of Far Rockaway commercial revitalization study to develop detailed redevelopment plan*</li> <li>• Launch of detailed land use studies to encourage retrofits of existing buildings and construction of new resilient buildings in Hamilton Beach and Broad Channel*</li> <li>• Start of pilot summer extension of weekday ferry and expansion of weekend ferry from Manhattan to the Rockaways</li> </ul>
Southern Brooklyn	<ul style="list-style-type: none"> <li>• Start of construction on a new iconic rollercoaster in Coney Island's amusement area</li> <li>• Launch of detailed land use studies to encourage retrofits of existing buildings and construction of new resilient buildings in Gerritsen Beach*</li> <li>• Completion of emergency repairs to bulkhead/floodwall along the Belt Parkway</li> <li>• Continuation of construction of the first phase of area drainage improvements in Coney Island</li> </ul>
Southern Manhattan	<ul style="list-style-type: none"> <li>• Launch of incentive program targeting new and renewing tenants in the 100-year floodplain*</li> <li>• Launch of Take the HELM competition for Sandy-impacted areas*</li> <li>• Start of streetscape and safety improvements on Water Street</li> <li>• Launch of initiative to encourage comprehensive upgrades of ground floors and adjacent Privately Owned Public Spaces along Water Street</li> </ul>
Implementation	<ul style="list-style-type: none"> <li>• Passage of local law outlining resiliency requirements for OLTPS</li> <li>• Appointment of Citywide Director of Resiliency at OLTPS</li> <li>• Issuance of executive order requiring agencies to appoint a resiliency point person and to build new facilities to most recent available 100-year floodplain plus appropriate freeboard, or equivalent standard</li> </ul>
Funding	<ul style="list-style-type: none"> <li>• Inclusion of resiliency funding in City capital budget</li> </ul>

\* Subject to available funding





# Appendix: Initiatives

Initiative	Lead City Agency	Milestones for Completion, Assuming Funding		10-Year Capital / Study Cost (Preliminary Estimate, in \$ Millions, Nominal)	Funding Source
		By End of 2014	By End of 2020		

**Strengthen the quality of available climate analysis**

CLIMATE ANALYSIS	1	Work with FEMA to improve the flood-mapping process	OLTPS	Implement technical and process improvements	--	N/A	N/A
	2	Work with FEMA to improve the communication of current flood risks	OLTPS	Launch a new interactive tool	--	N/A	N/A
	3	Call on the State and Federal governments to coordinate with the City on local climate change projections	OLTPS	Obtain Federal agreement to rely on NPCC	--	N/A	N/A
	4	Continue to refine local climate change projections to inform decision-making	OLTPS	Issue expanded NPCC projections; release evaluation metric for climate change	--	N/A	N/A
	5	Explore improved approaches for mapping future flood risks, incorporating sea level rise	OLTPS	Develop revised future flood maps	--	N/A	N/A
	6	Launch a pilot program to identify and test strategies for protecting vulnerable neighborhoods from extreme heat health impacts	OLTPS	Launch pilot program	Complete pilot and seek to expand it	<1	CDBG

**Increase coastal edge elevations**

COASTAL PROTECTION	1	Continue to work with the USACE to complete emergency beach nourishment in Coney Island	DPR	Complete beach nourishment projects	--	40-60	USACE
	2	Continue to work with the USACE to complete emergency beach nourishment on the Rockaway Peninsula	DPR	Complete beach nourishment projects	--	100-125	USACE
	3	Complete short-term beach nourishment, dune construction, and shoreline protection on Staten Island	DPR	Complete beach nourishment and related projects	--	10-20	FEMA
	4	Install armor stone shoreline protection (revetments) in Coney Island	OLTPS	Begin design	Complete project	20-40	CDBG
	5	Install armor stone shoreline protection (revetments) on Staten Island	OLTPS	Begin design	Complete project	20-40	CDBG
	6	Raise bulkheads in low-lying neighborhoods across the city to minimize inland tidal flooding	OLTPS	Launch study of low-lying neighborhoods; begin selected implementation	Complete initial work; pursue additional work subject to study results	80-100	CDBG
	7	Complete emergency bulkhead repairs adjacent to the Belt Parkway in Southern Brooklyn	DPR	Complete bulkhead repairs	--	1-10	FEMA
	8	Complete bulkhead repairs and roadway drainage improvements adjacent to Beach Channel Drive on the Rockaway Peninsula	NYCEDC	Complete bulkhead repairs and related drainage improvements	--	20-40	City
	9	Continue to work with the USACE to complete emergency floodgate repairs at Oakwood Beach, Staten Island	OLTPS	Complete floodgate repairs	--	1-10	USACE
	10	Complete tide gate repair study at Flushing Meadows Corona Park, Queens	DPR	Study tide gate repairs	Subject to study results	1-5	City

Note: As used herein, TBD means that a specific source has not yet been secured for the identified use; potential sources are described in Chapter 19 (Funding)

Initiative	Lead City Agency	Milestones for Completion, Assuming Funding		10-Year Capital / Study Cost (Preliminary Estimate, in \$ Millions, Nominal)	Funding Source
		By End of 2014	By End of 2020		

Minimize upland wave zones

COASTAL PROTECTION

11	Continue to work with the USACE to complete existing studies of the Rockaway Peninsula and implement coastal protection projects	DPR	Begin study of flood risk reduction projects; complete identified short-term dune improvements	Subject to study results	100-125	USACE
12	Call on and work with the USACE to study and install primary and secondary dune systems in vulnerable Rockaway Peninsula neighborhoods (such as Breezy Point)	OLTPS/DPR	Begin study	Subject to study results	40-60	TBD
13	Call on and work with the USACE to study and install offshore breakwaters adjacent to and south of Great Kills Harbor	OLTPS	Begin study	Subject to study results	200-250	TBD
14	Call on and work with the USACE to study and install wetlands for wave attenuation in Howard Beach and to study further flood protection improvements within Jamaica Bay	DPR	Begin study	Subject to study results	250-300	TBD
15	Call on and work with the USACE to study and install living shorelines for wave attenuation in Tottenville	DPR	Begin study	Subject to study results	60-80	TBD
16	Continue to work with the USACE to complete its Plumb Beach breakwater and beach nourishment project in Southern Brooklyn	DPR	Complete construction	--	1-10	USACE
17	Complete living shorelines and floating breakwaters for wave attenuation in Brant Point, Queens	DEP	Complete construction	--	1-10	City
18	Continue to work with the USACE to complete its Sea Gate project in Southern Brooklyn	DPR	Complete construction	--	20-40	USACE

Protect against storm surge

COASTAL PROTECTION

19	Install an integrated flood protection system in Hunts Point	OLTPS	Begin design	Complete construction	150-175	TBD
20	Install an integrated flood protection system in East Harlem	OLTPS	Begin design	Complete construction	175-200	TBD
21	Install an integrated flood protection system in Lower Manhattan, including the Lower East Side	OLTPS	Begin design	Complete construction	300-350	TBD
22	Install an integrated flood protection system at Hospital Row	OLTPS	Launch competition; begin design	Complete construction	60-80	CDBG
23	Install an integrated flood protection system in Red Hook	OLTPS	Begin design	Complete construction	175-200	TBD
24	Continue to work with the USACE to complete existing studies on Staten Island and implement coastal protection projects	DPR	Complete study	Subject to study results	400-450	USACE/TBD
25	Continue to work with Con Edison to protect the Farragut substation	OLTPS	File comments on rate case	Subject to rate case outcome	40-60	Ratepayers
26	Call on and work with the USACE to study and install local storm surge barriers at Newtown Creek	OLTPS	Begin study	Subject to study results	950-1000	TBD

Initiative	Lead City Agency	Milestones for Completion, Assuming Funding		10-Year Capital / Study Cost (Preliminary Estimate, in \$ Millions, Nominal)	Funding Source
		By End of 2014	By End of 2020		

**Improve coastal design and governance**

COASTAL PROTECTION	27	Continue to work with the USACE to complete its comprehensive flood protection study of New York Harbor	OLTPS	Complete draft study, recommending projects ready for authorization by Congress	Subject to study results	10-20	USACE
	28	Implement the WAVES Action Agenda	DCP	Complete scheduled projects	--	N/A	N/A
	29	Implement citywide waterfront inspections to better manage the City's waterfront and coastal assets	NYCEDC	Implement program	--	1-10	TBD
	30	Study design guidelines for waterfront and coastal assets to better mitigate the effects of flooding	DPR	Complete study	Subject to study results	N/A	N/A
	31	Evaluate soft infrastructure as flood protection and study innovative coastal protection techniques	OLTPS	Partner with the planned Jamaica Bay Science and Resilience Center and others to begin studies	--	1-10	TBD
	32	Evaluate the city's vulnerability to drainage pipe flooding and identify appropriate solutions to minimize those risks	OLTPS	Complete study as part of other coastal protection projects	Subject to study results	10-20	TBD
	33	Evaluate strategies to fund wetland restoration and explore the feasibility of wetland mitigation banking structures	NYCEDC	Complete study of mitigation banking	Subject to study results	10-20	TBD
	34	Work with agency partners to improve the in-water permitting process	NYCEDC	Launch website	--	<1	ESDC
	35	Enhance waterfront construction oversight by strengthening the City's waterfront permit and dockmaster units	SBS	Explore options to enhance waterfront permitting and dockmaster function	--	N/A	N/A
	36	Identify a lead entity for overseeing the collaboration on the USACE comprehensive study and for overseeing the implementation of coastal flood protection projects	OLTPS	Identify lead entity	--	N/A	N/A
37	Call on and work with the USACE and FEMA to collaborate more closely on flood protection project standards	OLTPS	Identify risk reduction standards	--	N/A	N/A	

**Strengthen new and substantially rebuilt structures to meet the highest resiliency standards moving forward**

BUILDINGS	1	Improve regulations for flood resiliency of new and substantially improved buildings in the 100-year floodplain	OLTPS	Adopt changes to Construction Codes and zoning	Complete analysis of additional freeboard	N/A	N/A
	2	Rebuild and repair housing units destroyed and substantially damaged by Sandy	HRO	Disburse funds to rebuild and repair 500 buildings	Disburse funds to rebuild and repair 100% of eligible buildings	950-1000	CDBG (Partial)/ TBD
	3	Study and implement zoning changes to encourage retrofits of existing buildings and construction of new resilient buildings in the 100-year floodplain	DCP	Begin studies for 5-10 neighborhoods and citywide strategies	Complete all studies and implement zoning changes per study findings	20-40	CDBG (Partial)/ TBD
	4	Launch a competition to encourage development of new, cost-effective housing types to replace vulnerable stock	HPD	Launch and award Phase I of competition and launch Phase II	Complete Phase II RFP for Phase I winners and complete resilient designs	10-20	TBD
	5	Work with New York State to identify eligible communities for the New York Smart Home Buyout Program	HRO	Identify all projects and complete transactions	--	150-175	CDBG (NYS)
	6	Amend the Building Code and complete studies to improve wind resiliency for new and substantially improved buildings	OLTPS	Implement initial Building Code changes	Complete wind studies	1-10	TBD

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Initiative	Lead City Agency	Milestones for Completion, Assuming Funding		10-Year Capital / Study Cost (Preliminary Estimate, in \$ Millions, Nominal)	Funding Source
		By End of 2014	By End of 2020		

**Retrofit as many buildings as possible so that they will be significantly more resilient than they are today**

BUILDINGS	7	Encourage existing buildings in the 100-year floodplain to adopt flood resiliency measures through an incentive program and targeted requirements	NYCEDC	Implement code changes and launch incentive program	Complete Core Flood Resiliency Measures on >100M square feet	1150-1200	CDBG (Partial)/ TBD
	8	Establish Community Design Centers to assist property owners in developing design solutions for reconstruction and retrofitting, and connect them to available City programs	HRO	Launch centers in targeted neighborhoods	--	N/A	NA
	9	Retrofit public housing units damaged by Sandy and increase future resiliency	NYCHA	Install backup generators in vulnerable buildings; launch planning efforts for undamaged but vulnerable buildings	Complete repairs and resiliency retrofits in 40% of vulnerable buildings	700-750	CDBG (Partial)/ TBD
	10	Launch sales tax abatement program for flood resiliency in industrial buildings	NYCIDA	Launch program	--	1-10	City
	11	Launch a competition to increase flood resiliency in building systems	NYCEDC	Launch competition and select winners	--	40-60	CDBG
	12	Clarify regulations relating to the retrofit of landmarked structures in the 100-year floodplain	LPC	Issue written guidance	--	N/A	N/A
	13	Amend the Building Code to improve wind resiliency for existing buildings and complete studies of potential retrofits	OLTPS	Implement initial Building Code changes	Complete wind studies	1-10	TBD
	14	Amend the Construction Codes and develop best practices to protect against utility service interruptions	OLTPS	Implement changes to Construction Codes	Develop best practices	1-10	TBD

**Support community and economic recovery in impacted areas**

ECONOMIC RECOVERY	1	Launch Business Recovery and Resiliency Programs	NYCEDC	Launch program and begin disbursing funds	Complete investments	150-175	CDBG
	2	Launch Neighborhood Game Changer Competition	NYCEDC	Issue RFP and select winning proposals	Complete investments	80-100	CDBG
	3	Launch Neighborhood Retail Recovery Program	NYCEDC	Launch Business Incentive Rate for retail and approve applications	--	1-10	Utilities/ City
	4	Support local merchants in improving and promoting local commercial corridors	SBS	Provide technical assistance and funding	Continue support	N/A	N/A
	5	Continue to support the FRESH program to increase the number of full-line grocers in underserved neighborhoods	NYCEDC	Pursue FRESH programs in Sandy-impacted neighborhoods	Continue FRESH program	N/A	City
	6	Reassess commercial properties citywide to reflect post-Sandy market values	DOF	Establish new market values and lower property taxes	--	80-100	City

**Target affordability solutions to low-income policyholders**

1	Support Federal efforts to address affordability issues related to reform of the NFIP	OLTPS	Complete affordability study	Subject to study findings	N/A	N/A
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**Define resiliency standards for existing buildings**

FINANCE	2	Develop FEMA-endorsed flood protection standards and certifications for existing urban buildings	OLTPS	Complete development of building standards and FEMA review	--	N/A	N/A
	3	Call on FEMA to recognize mixed-use buildings as a distinct building category	OLTPS	Create a mixed-use building category within the NFIP	Obtain flood-proofing certifications	N/A	N/A

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<b>Incorporate resiliency standards in insurance underwriting</b>							
INSURANCE	4	Call on FEMA to develop mitigation credits for resiliency measures	OLTPS	Complete study of mitigation options and risk reduction	Subject to study findings	<1	TBD
	5	Study approaches for New York City to join FEMA's Community Rating System program	OLTPS	Complete study of City's ability to be admitted to CRS program and cost-benefit analysis	Subject to study findings	<1	TBD
<b>Expand pricing options for policyholders</b>							
	6	Call on FEMA to allow residential policyholders to select higher deductibles	OLTPS	Complete evaluation of higher deductible options	Obtain FEMA approval to allow higher deductibles for residential policies	N/A	N/A
<b>Improve awareness and education about insurance</b>							
INSURANCE	7	Support the goals of the NYS 2100 Commission to protect New York State, consumers, and businesses	OLTPS	Support State efforts	--	N/A	N/A
	8	Call on New York State to improve policyholder awareness at the point of sale or renewal	OLTPS	Support State efforts to improve policyholder awareness	--	N/A	N/A
	9	Launch a consumer education campaign on flood insurance	DCA	Complete citywide campaign	--	<1	TBD
	10	Launch an engagement campaign targeting insurers	OLTPS	Establish regular meetings with leading insurers	--	N/A	N/A
<b>Redesign the regulatory framework to support resiliency</b>							
UTILITIES	1	Work with utilities and regulators to develop a cost-effective system upgrade plan to address climate risks	OLTPS	Incorporate cost-benefit analysis tool into regulatory framework	--	N/A	N/A
	2	Work with utilities and regulators to reflect climate risks in system design and equipment standards	OLTPS	Submit comments to 2014 NYISO Reliability Needs Assessment	--	N/A	N/A
	3	Work with utilities and regulators to establish performance metrics for climate risk response	OLTPS	Complete Con Edison rate case proceeding	--	N/A	N/A
<b>Harden existing infrastructure to withstand climate events</b>							
UTILITIES	4	Work with power suppliers and regulators to harden key power generators against flooding	OLTPS	Launch effort with stakeholders	--	N/A	N/A
	5	Work with utilities and the PSC to harden key electric transmission and distribution infrastructure against flooding	OLTPS	Complete Con Edison rate case proceeding	--	Subject to 2013 rate case decision	Ratepayers
	6	Work with utilities and the PSC to harden vulnerable overhead lines against winds	OLTPS	Complete Con Edison rate case proceeding and Local Law 13 study	--	Subject to 2013 rate case decision	Ratepayers
	7	Work with utilities, regulators, and gas pipeline operators to harden the natural gas system against flooding	OLTPS	Complete Con Edison rate case proceeding	--	Subject to 2013 rate case decision	Ratepayers
	8	Work with steam plant operators and the PSC to harden steam plants against flooding	OLTPS	Complete Con Edison rate case proceeding	--	Subject to 2013 rate case decision	Ratepayers

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Initiative	Lead City Agency	Milestones for Completion, Assuming Funding		10-Year Capital / Study Cost (Preliminary Estimate, in \$ Millions, Nominal)	Funding Source
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**Reconfigure utility networks to be redundant and resilient**

UTILITIES	9	Work with industry partners, New York State, and regulators to strengthen New York City's power supply	OLTPS	Continue ongoing power supply efforts	--	N/A	N/A
	10	Require more in-city plants to be able to restart quickly in the event of blackout	OLTPS	Continue ongoing efforts	--	N/A	N/A
	11	Work with Con Edison and the PSC to develop a long-term resiliency plan for the electric distribution system	OLTPS	Complete Con Edison rate case proceeding	--	N/A	N/A
	12	Work with utilities and regulators to minimize electric outages in areas not directly affected by climate impacts	OLTPS	Complete Con Edison rate case proceeding	--	Subject to 2013 rate case decision	Ratepayers
	13	Work with utilities and regulators to implement smart grid technology to assess system conditions in real time	OLTPS	Complete Con Edison rate case proceeding	--	Subject to 2013 rate case decision	Ratepayers
	14	Work with utilities and regulators to speed up service restoration for critical customers via system configuration	OLTPS	Complete Con Edison rate case proceeding	--	Subject to 2013 rate case decision	Ratepayers
	15	Work with utilities and regulators to speed up service restoration via pre-connections for mobile substations	OLTPS	Complete Con Edison rate case proceeding	--	Subject to 2013 rate case decision	Ratepayers
	16	Work with pipeline operators to expand and diversify natural gas supply	OLTPS	Continue ongoing efforts	--	N/A	N/A
	17	Work with utilities and regulators to strengthen the in-city gas transmission and distribution system	OLTPS	Complete Con Edison rate case proceeding	--	Subject to 2013 rate case decision	Ratepayers
	18	Launch energy infrastructure resiliency competition	NYCEDC	Select winners of competition	--	N/A	N/A

**Reduce energy demand**

UTILITIES	19	Work with utilities and regulators to expand citywide demand response programs	OLTPS	Complete Con Edison rate case	Implement 50 MW of DR capacity at municipal buildings	Subject to 2013 rate case decision	Ratepayers
	20	Work with government and private sector partners to expand the energy efficiency of buildings	OLTPS	Launch Green Light New York Center	--	N/A	N/A

**Diversify customer options in case of utility outage**

UTILITIES	21	Work with public and private partners to scale up distributed generation (DG) and micro-grids	OLTPS	Launch micro-grid feasibility study	Installation of at least 55 MW of distributed generation in municipal buildings	N/A	N/A
	22	Incorporate resiliency into the design of City electric vehicle initiatives and pilot storage technologies	OLTPS	Continue ongoing efforts; implement and pilot at Brooklyn Army Terminal	--	N/A	N/A
	23	Improve backup generation for critical customers	OEM	Expand City emergency generator fleet by 20 to 30 units	--	N/A	N/A

Initiative	Lead City Agency	Milestones for Completion, Assuming Funding		10-Year Capital / Study Cost (Preliminary Estimate, in \$ Millions, Nominal)	Funding Source		
		By End of 2014	By End of 2020				
<b>Seek to harden the liquid fuels supply infrastructure</b>							
LIQUID FUELS	1	Call on the Federal government to convene a regional working group to develop a fuel infrastructure hardening strategy	OLTPS	Develop regional strategy	--	N/A	N/A
	2	Develop a reporting framework for fuel infrastructure operators to support post-emergency restoration	OLTPS	Ensure development of IT systems and information reporting framework	--	N/A	N/A
	3	Work with Buckeye and New York State to safely build pipeline booster stations in New York City to increase supply and withstand extreme weather events	OLTPS	Ensure booster stations to withstand climate change impacts	--	N/A	N/A
	4	Work with New York State to provide incentives for the hardening of gas stations to withstand extreme weather events	OLTPS	Assist in launching incentive program	--	N/A	N/A
	5	Ensure that a subset of gas stations and terminals have access to backup generators in case of widespread power outages	OEM	Ensure creation of a generator pool and pre-event positioning plan	--	N/A	N/A
<b>Enhance the ability of the supply chain to respond to disruptions</b>							
LIQUID FUELS	6	Explore the creation of a transportation fuel reserve to temporarily supply the private market during disruptions	OLTPS	Evaluate feasibility and cost	--	N/A	N/A
	7	Call on New York State to modify price gouging laws and allow flexibility of gas station supply contracts to increase fuel availability during disruptions	OLTPS	Secure passage of legislation	--	N/A	N/A
	8	Develop a package of City, State, and Federal regulatory actions to address liquid fuel shortages during emergencies	OEWDCAS	Complete rationing plan and package of regulatory waivers	--	N/A	N/A
<b>Improve the City's ability to fuel first responders and private critical fleets</b>							
	9	Harden municipal fueling stations and enhance mobile fueling capability to support both City government and critical fleets	DCAS	Procure equipment	Put flood protection standards in place	20-40	City
<b>Ensure critical providers' operability through redundancy and the prevention of physical damage</b>							
HEALTHCARE	1	Improve design and construction of new hospitals	OLTPS	Amend Construction Codes		N/A	N/A
	2	Require the retrofitting of existing hospitals in the 500-year floodplain	OLTPS	Amend Construction Codes	Confirm 100% compliance or plan to reach compliance by 2030	700-750	FEMA/VA/State/ (Partial) TBD
	3	Support the Health and Hospital's Corporation effort to protect public hospital emergency departments (EDs) from flooding	HHC	Determine strategies and identify funding for each at-risk ED	Begin construction planning	N/A	N/A
	4	Improve the design and construction of new nursing homes and adult care facilities	OLTPS	Amend Construction Codes	--	N/A	N/A
	5	Require the retrofitting of existing nursing homes in the 100-year floodplain	OLTPS	Amend Construction Codes	Confirm 100% compliance or plan to reach compliance by 2030	80-100	FEMA (Partial) TBD
	6	Require the retrofitting of existing adult care facilities in the 100-year floodplain	OLTPS	Amend Construction Codes	Confirm 100% compliance or plan to reach compliance by 2030	1-10	FEMA
	7	Support nursing homes and adult care facilities with mitigation grants and loans	DOHMH	Develop and launch program	Disburse funds to ~60% of providers	40-60	TBD
	8	Increase the air conditioning capacity of nursing homes and adult care facilities	NYCEDC	Develop and launch program	Disburse funds to ~60% of providers	1-10	TBD

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Reduce barriers to care during and after emergencies

HEALTHCARE	9	Harden primary care and mental health clinics	DOHMH	Develop and launch program	Disburse funds and complete mitigation projects	1-10	TBD
	10	Improve pharmacies' power resiliency	DOHMH	Implement regulatory changes	--	N/A	N/A
	11	Encourage telecommunications resiliency	DOHMH	Develop and distribute best practice guide	--	N/A	N/A
	12	Encourage electronic health record-keeping	DOHMH	Incorporate resiliency into EHR programs and conduct outreach	--	N/A	N/A

Improve the ability of communities to prepare for and respond to disasters

COMMUNITY PREPAREDNESS	1	Launch pilot program to identify and address gaps in community capacity	OEM	Complete pilot assessment	Develop and implement plan to address gaps	<1	TBD
	2	Continue and Expand OEM's Community Emergency Response Teams	OEM	Expand programs	--	<1	TBD
	3	Expand the Worker Connect information technology tool to serve as an Emergency Services Portal	Office of Deputy Mayor for Health and Human Services	Create new emergency services portal and strengthen functionality of Worker Connect	--	1-10	TBD
	4	Explore the creation of a new online Emergency Notification Contact System	HPD	Begin to create voluntary database	Launch fully functional database	1-10	TBD

Increase accountability to promote resiliency

TELECOMMUNICATIONS	1	Establish an office within DoITT to focus on telecommunications regulation and resiliency planning	DoITT	Establish and operationalize new office	--	N/A	N/A
	2	Establish new resiliency requirements for providers using scheduled renewals of the City's franchise agreements	DoITT	Establish framework of new resiliency requirements	Execute new franchise agreements including resiliency requirements	N/A	N/A

Enable rapid recovery after extreme weather events

3	Request business continuity plans from current City franchisees as permitted under existing franchise agreements	DoITT	Establish regular meetings with cell providers; develop criteria for hardening cell sites	Harden selected cell sites	N/A	N/A
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Harden facilities to reduce weather-related impacts

TELECOMMUNICATIONS	4	Develop flood protection standards for placement of telecommunications equipment in buildings	OLTPS	Implement programs	Put flood protection standards in place	N/A	N/A
	5	Use the DoITT franchise agreements to ensure hardening of all critical facilities	DoITT	Audit all critical facilities and provide guidance for hardening	Establish requirements for facilities and equipment	N/A	N/A
	6	Work with cell providers to encourage hardening of cell sites	DoITT	Establish regular meetings with cell providers; develop criteria for hardening cell sites	Harden selected cell sites	N/A	N/A

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<b>Create redundancy to reduce risk of outages</b>							
TELECOMMUNICATIONS	7	Study options to increase conduit infrastructure redundancy and resiliency	DoITT	Launch study	Subject to study findings	N/A	N/A
	8	Continue implementation of ConnectNYC Fiber Access to create broadband redundancy	NYCEDC	Complete second round of applications and begin installing fiber connections	Complete fiber installations	N/A	N/A
	9	Add telecommunications provider quality and resiliency to the WiredNYC and NYC Broadband Map ratings	NYCEDC	Launch updated maps	Make available information about telecommunications resiliency	N/A	N/A
<b>Protect assets to maintain system operations</b>							
TRANSPORTATION	1	Reconstruct and resurface key streets damaged by Sandy	NYCDOT	Begin reconstruction and resurfacing	Complete resurfacing and majority of reconstruction	450-500	FHWA / FEMA
	2	Integrate climate resiliency features into future capital projects	NYCDOT	Ongoing	Ongoing	175-200	FHWA (Partial)/ City
	3	Elevate traffic signals and provide backup electrical power	NYCDOT	Begin effort	Complete implementation	1-10	FEMA
	4	Protect NYCDOT tunnels in Lower Manhattan from flooding	NYCDOT	Launch design	Complete implementation	20-40	TBD
	5	Install watertight barriers to protect movable bridge machinery	NYCDOT	Launch design	Complete implementation	1-10	TBD
	6	Protect Staten Island Ferry and private ferry terminals from climate change-related threats	NYCDOT	Design underway	Complete implementation	10-20	FTA (Partial)/ TBD
	7	Integrate resiliency into planning and project development	NYCDOT	Begin effort	Ongoing	N/A	N/A
	8	Call on non-City agencies to implement strategies to address climate change threats	OLTPS	Engage with non-City agencies	Ongoing	N/A	N/A
<b>Prepare the transportation system to restore service after extreme climate events</b>							
TRANSPORTATION	9	Plan for temporary transit services in the event of subway system suspensions	NYCDOT	Complete initial planning	Continue to update as necessary	1-10	FTA (Partial)/ TBD
	10	Identify critical transportation network elements and improve transportation responses to major events through regular resiliency planning exercises	NYCDOT	Complete initial planning, including multiple planning exercises and one live drill	Continue to update as necessary	<1	City
	11	Develop standard plans for implementing High-Occupancy Vehicle (HOV) requirements	NYCDOT	Complete plan	Continue to update as necessary	<1	City
	12	Plan for and install new pedestrian and bicycle facilities to improve connectivity to key transportation hubs	NYCDOT	Develop plan for improvements; begin implementation of most critical components	Implement first plan on improvements; pursue ongoing development of additional facilities	10-20	TBD
	13	Construct new ferry landings to support private ferry services	NYCEDC	Identify locations and launch design	Complete new ferry landings	20-40	FTA
	14	Deploy the Staten Island Ferry's Austen Class vessels on the East River Ferry and during transportation disruptions	NYCDOT	Complete operational plans for various types of deployment	Continue to update as necessary	<1	FTA
	15	Improve at all levels communications about the restoration of transportation services	NYCDOT	Put communications plan in place	Continue to update as necessary	N/A	N/A

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**Implement new and expanded services to increase system flexibility and redundancy**

TRANSPORTATION	16	Expand the city's Select Bus Service network	NYCDOT	Implement four SBS routes	Implement four additional Phase II SBS routes	80-100	FTA (Partial)/ TBD
	17	Expand the network of bus priority strategies on arterial highways	NYCDOT	Initiate planning for first highway priority corridor	Implement first highway priority corridor and launch planning and design for two additional corridors	40-60	FTA (Partial)/ TBD
	18	Expand ferry services in locations citywide	NYCEDC	Complete Citywide Ferry Study	Implement additional viable ferry services as per study and through RFEIs	<1	City

**Adapt parks and expand green infrastructure to shield adjacent communities from the impacts of extreme weather events**

PARKS	1	Restore city beaches	DPR	Engage community and begin design options	Subject to study results	250-500	Federal/City/TBD
	2	Harden or otherwise modify shoreline parks and adjacent roadways to protect adjacent community (See Coastal Protection Initiative 30)	DPR	Complete preliminary design investigation for pilot	Complete improvements	20-40 (Pilot)	Federal/TBD
	3	Reinforce or redesign bulkheads in coastal parks (See Coastal Protection Initiative 6; see Coastal Protection Initiative 29)	DPR	Inspect damaged bulkheads on parkland and develop plan	Subject to development of plan	40-60 (Pilot)	Federal/TBD
	4	Expand the City's greenstreets plan, including for Jamaica Bay	DPR	Expand program to area around Jamaica Bay	Expand program to 14 new neighborhoods	60-80	Federal/TBD

**Retrofit or harden park facilities to withstand the impacts of climate change**

PARKS	5	Fortify marinas and piers	DPR	Complete preliminary design investigation	Complete improvements	5-20 (Pilot)	Federal/City/TBD
	6	Relocate or increase the resiliency of playgrounds and athletic fields	DPR	Complete preliminary design investigation	Complete improvements	125-150	Federal/City/TBD
	7	Protect mechanical systems at major park facilities and buildings	DPR	Complete preliminary design investigation	Complete improvements	60-80 (Pilot)	Federal/City/TBD
	8	Move or protect critical operations centers	DPR	Begin to construct protective measures	Complete protective measures	80-100	Federal/City/TBD

**Protect wetlands, other natural areas, and the urban forest**

PARKS	9	Work with the Federal government to transform Jamaica Bay	DPR	Continue to advance partnership and launch transformation	Implement transformation	N/A	N/A
	10	Increase the health and resiliency of natural areas, including Tibbetts Brook	DPR	Launch projects in Alley Creek and Bronx River watersheds and tidal wetlands in Staten Island, Bronx, and Queens	- -	20-40 (Pilot)	Federal/TBD
	11	Improve the health and resiliency of the city's urban forest	DPR	Hire and train 10 foresters	Increase pruning operations and expand tree beds	N/A	N/A
	12	Increase growth of local plant material for restoration work	DPR	Launch improvements to Greenbelt Native Plants Center	Expand operations	10-20	Federal/City/TBD

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**Develop tools for comprehensive climate adaptation planning and design**

PARKS	13	Establish a center for resiliency and restoration efforts in the Jamaica Bay-Rockaway Parks	DPR	Launch initial operations of center	--	1-20	Federal/City/TBD
	14	Quantify the benefits of the city's ecosystems and green infrastructure	DPR	Commission studies on the impact of the city's green infrastructure program	Subject to study findings	N/A	N/A
	15	Create climate adaptation plans for all parks in the 100-year floodplain	DPR	Map and catalogue vulnerable sites	Develop and maintain updated climate adaptation plans	N/A	N/A
	16	Map the city's overhead utilities and street trees	DPR	Launch mapping effort	Complete map	N/A	N/A

**Protect sites with hazardous substances and encourage brownfield redevelopment**

ENVIRONMENTAL PROTECTION AND REMEDIATION	1	Identify cost-effective measures to safeguard exposed substances in the 100-year floodplain	DCP	Complete Open Industrial Uses study	Subject to study findings	N/A	N/A
	2	Develop a catalogue of best practices for storing enclosed hazardous substances in the 100-year floodplain	OLTPS	Begin process of developing best practices	Complete catalogue	N/A	N/A
	3	Accelerate brownfield cleanup in the 100-year floodplain to prevent release of pollutants	OER	Launch expansion of existing Brownfield Incentive Grant program	Subject to funding, complete cleanup of 150 tax lots in floodplain	1-10	Federal/City
	4	Explore strengthened cleanup standards on industrial waterfront brownfields	OER	Examine existing soil cleanup standards and evaluate how to strengthen protections	Subject to study findings	N/A	N/A
	5	Launch brownfield climate change resiliency audits and improve storm preparedness	OER	Begin audits of brownfield cleanup and publish report findings	Subject to study findings	<1	TBD
	6	Launch full operations of the NYC Clean Soil Bank	OER	Launch NYC Clean Soil Bank	Reuse 600,000 tons of soil	N/A	N/A
	7	Perform update of SPEED, the City's online environmental research engine	OER	Complete update to SPEED database	Continue periodic updates	<1	TBD

**Protect wastewater treatment facilities from storm surge**

WATER AND WASTEWATER	1	Adopt a wastewater facility design standard for storm surge and sea level rise	DEP	Adopt new design guidelines	--	N/A	N/A
	2	Harden pumping stations	DEP	Incorporate resiliency measures in repairs and capital projects	Incorporate resiliency measures in repairs and capital projects	125-150	TBD
	3	Harden wastewater treatment plants	DEP	Incorporate resiliency measures in repairs and capital projects	Incorporate resiliency measures in repairs and capital projects	700-750	TBD
	4	Explore alternatives for the Rockaway Wastewater Treatment Plant	DEP	Initiate feasibility study	Subject to study findings	1-10	City
	5	Develop cogeneration facilities at North River Wastewater Treatment Plant	DEP	Substantially complete design of cogeneration facilities	--	200-250	City
	6	Explore opportunities to expand cogeneration and other energy measures	DEP	Initiate feasibility study	Subject to study findings	N/A	N/A
	7	Encourage regional resiliency planning	DEP	Share results of DEP's detailed wastewater risk and adaptation analysis	--	N/A	N/A

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Initiative	Lead City Agency	Milestones for Completion, Assuming Funding		10-Year Capital / Study Cost (Preliminary Estimate, in \$ Millions, Nominal)	Funding Source
		By End of 2014	By End of 2020		

**Improve and expand drainage infrastructure**

WATER AND WASTEWATER	8	Reduce combined sewer overflows with Green Infrastructure	DEP	Complete four long-term control plans	Capture runoff in 4% of impervious areas and complete all long-term control plans	700-750	City
	9	Reduce combined sewer overflows with high-level storm sewers citywide	DEP	Begin or continue construction of 4 high-level storm sewer capital projects	Substantially complete 10 high-level storm sewer capital projects	350-400	City
	10	Continue to implement and accelerate investments in Bluebelts across the city	DEP	Continue build out of South Richmond Bluebelt and begin construction of Mid-Island Bluebelt	Substantially complete South Richmond Bluebelt and advance projects in Mid-Island and Twin Ponds, Queens	500-550	City (Partial)/ TBD
	11	Build out stormwater sewers in areas of Queens with limited drainage systems	DEP	Begin or continue construction of three storm sewer build-out capital projects	Substantially complete 15 storm sewer build-out capital projects	125-150	City
	12	Periodically review rainfall trends and implications for stormwater infrastructure	DEP	Create process to reassess precipitation data	Complete at least one data reassessment	N/A	N/A

**Promote redundancy and flexibility to ensure constant supply of high-quality water**

WATER AND WASTEWATER	13	Repair the leak in the Delaware Aqueduct	DEP	Continue construction of bypass tunnel	Implement water augmentation and conservation measures in preparation for temporary shutdown of aqueduct	1050-1400	City
	14	Improve interconnection between the Catskill and Delaware aqueducts and maximize capacity to deliver water from the Catskill/Delaware system	DEP	Begin construction of interconnection	Complete construction of interconnection and design of Catskill Pressurization	550-600	City
	15	Continue the Watershed Protection Program to maintain drinking water quality	DEP	Incorporate updates to Long-Term Watershed Protection Program	--	250-300	City

**Identify and harden critical food distribution assets**

FOOD SUPPLY	1	Study the food distribution system to identify other prospective vulnerabilities	OLTPS	Launch study	Subject to study findings	1-10	TBD
	2	Expand upon prior energy studies, to explore options for cost-effective, continuous power for the Hunts Point Food Distribution Center	NYCEDC	Expand current study	Subject to study findings	N/A	N/A

Initiative	Lead City Agency	Milestones for Completion, Assuming Funding		10-Year Capital / Study Cost (Preliminary Estimate, in \$ Millions, Nominal)	Funding Source		
		By End of 2014	By End of 2020				
<b>Improve the resiliency of consumer access</b>							
<b>FOOD SUPPLY</b>	3	Call on New York State to issue preparedness guidelines to retailers in anticipation of extreme weather events	OLTPS	Disseminate State-issued preparedness guidelines	--	N/A	N/A
	4	Call on the State legislature to pass City-sponsored legislation mandating electric generators for food retailers	OEM	Advance legislation	Secure passage	N/A	N/A
	5	Continue to support the FRESH program to increase the number of full-line grocers in underserved neighborhoods	NYCEDC	Continue to advance program	--	N/A	N/A
	6	Expand DCAS food procurement pilots towards contracts with larger, more resilient distributors that have active New York operations	DCAS	Begin expansion of suppliers	--	N/A	N/A
	7	Implement preparedness measures for continued availability of SNAP benefits for vulnerable consumers following large-scale power outages	HRA	Prepare waiver for immediate submission if necessary	--	N/A	N/A
<b>Protect solid waste facilities and disposal networks</b>							
<b>SOLID WASTE</b>	1	Harden critical City-owned facilities	DSNY	Incorporate resiliency measures in repairs and capital projects	Incorporate resiliency measures in repairs and capital projects	20-40	TBD
	2	Work with third-party owners to protect critical assets and networks	DSNY	Develop an inventory of critical system vulnerabilities and catalogue known risks	Develop contingency plans and implement resiliency measures	N/A	N/A
<b>Coastal Protection</b>							
<b>BROOKLYN-QUEENS WATERFRONT</b>	1	Work with the Port Authority to continue a study of innovative coastal protection measures using clean dredge material in Southwest Brooklyn	NYCEDC	Complete study and launch pilot measures	Subject to study findings	N/A	N/A
	2	Call on and work with the USACE to develop an implementation plan and preliminary designs for a local storm surge barrier along the Gowanus Canal	OLTPS	Complete preliminary feasibility study and design and launch USACE study	Subject to study findings	1-10	TBD
	3	Implement strategies to protect Brooklyn Bridge Park and DUMBO	Brooklyn Bridge Park Corporation/OLTPS	Begin construction of the John St. section of the park; designate developer for John St. lower site; complete study of DUMBO resiliency measures	Subject to DUMBO study findings	10-20	Brooklyn Bridge Park Corp./TBD
	4	Support private investments that reduce flood risk along Newtown Creek	NYCEDC	Advertise support to businesses; provide technical assistance	Continue to provide technical assistance	N/A	N/A
	5	Create an implementation plan for comprehensive flood-protection improvements on public and private property along the Williamsburg, Greenpoint, and Long Island City coastlines	OLTPS	Commence study	Subject to study findings	<1	TBD
<b>Buildings</b>							
	6	Implement planned upgrades to vulnerable City-owned, industrial properties	NYCEDC/BNYDC	Commence property upgrades and substantially complete	Complete additional property upgrades	80-100	FEMA/Insurance Proceeds

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Initiative	Lead City Agency	Milestones for Completion, Assuming Funding		10-Year Capital / Study Cost (Preliminary Estimate, in \$ Millions, Nominal)	Funding Source
		By End of 2014	By End of 2020		

**Critical Infrastructure**

BROOKLYN-QUEENS	7	Improve connections between Red Hook and the rest of Brooklyn	NYCDOT	Complete enhancements to Mill Street connection and BQE underpass	--	<1	City
	8	Call for the MTA to explore Red Hook-Lower Manhattan bus connections	NYCEDC	Complete assessment	Subject to findings from assessment	N/A	N/A
	9	Implement expanded free summer weekend ferry service from Manhattan to Red Hook in 2013	NYCEDC	Complete summer 2013 service and evaluate results	Extend service if justified	<1	City

**Community and Economic Recovery**

BROOKLYN-QUEENS	10	Create and implement a revitalization strategy for targeted retail and community spaces within Red Hook Houses	NYCEDC/ NYCHA	Complete assessment	Subject to results of assessment	1-10	TBD
	11	Implement planned and ongoing investments by the City and private partners	Varies	Complete first phase of Bush Terminal Park	Complete residential buildings for parcels A and B at Hunters Point South development	Varies	Varies

**Coastal Protection**

SOUTHERN BROOKLYN	1	Call on and work with the USACE to study additional Sea Gate oceanfront protections	OLTPS	Launch study	Subject to plan findings	N/A	N/A
	2	Continue to work with the USACE to study strengthening the Coney Island/Brighton Beach nourishment	OLTPS	Launch study	Subject to plan findings	N/A	N/A
	3	Call on and work with the USACE to study Manhattan Beach oceanfront protections	OLTPS	Launch study	Subject to plan findings	N/A	N/A
	4	Call on and work with the USACE to study mitigating inundation risks through Rockaway Inlet, exploring a surge barrier and alternative measures	OLTPS	Launch study	Subject to plan findings	N/A	N/A
	5	Develop an implementation plan and preliminary designs for new Coney Island Creek wetlands and tidal barrier	OLTPS	Complete preliminary feasibility study and design and identify next steps	Subject to study findings	1-10	TBD

**Buildings**

	6	Study additional resiliency initiatives for ground-floor housing within NYCHA buildings	NYCHA	Complete outreach process and study	Subject to study findings	<1	TBD
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Initiative	Lead City Agency	Milestones for Completion, Assuming Funding		10-Year Capital / Study Cost (Preliminary Estimate, in \$ Millions, Nominal)	Funding Source
		By End of 2014	By End of 2020		

**Critical Infrastructure**

SOUTHERN BROOKLYN	7	Support CUNY launch of study and pilot of new technologies for high-rise buildings	OLTPS	CUNY to identify site and launch study and pilot	Subject to study findings	N/A	N/A
	8	Study options to ensure resiliency of private cogeneration facilities in the area	OLTPS	Launch study	Subject to study findings	N/A	N/A
	9	Construct new Coney Island Hospital outpatient clinic to replace the destroyed Ida G. Israel facility	HHC	Open interim facility	Construct and make operational a permanent facility	10-20	FEMA (Partial)/ TBD
	10	Call for the USACE to develop an implementation plan for the reinforcement of existing Belt Parkway edge protections	OLTPS	Complete study	Implementation subject to study findings	N/A	N/A
	11	Restore recreational infrastructure along Southern Brooklyn beaches	DPR	Complete restoration of infrastructure and facilities	--	See Parks Initiative 1	See Parks Initiative 1
	12	Complete planned drainage improvements in Coney Island to mitigate flooding	DEP	Commence first phases of construction and advance design for future phases	Complete construction	125-150	City
	13	Provide technical assistance to support Sea Gate in repairing Sandy-damaged infrastructure	OLTPS/DDC	Work with Sea Gate Association to study private infrastructure and prepare scope for repairs	Subject to study findings	N/A	N/A

**Community and Economic Recovery**

SOUTHERN BROOKLYN	14	Work with Brooklyn Chamber of Commerce to assist in organizing Sheepshead Bay businesses	SBS	Assist local merchant organizing efforts	Subject to local merchant organizing and planning	N/A	N/A
	15	Support area recovery through the rebuilding and expansion of the entertainment district	NYCEDC/DCA	Complete phase 5 of amusement area expansion with new roller coaster; commence Aquarium expansion	Complete Aquarium expansion	175-200	FEMA/City
	16	Study opportunities along Coney Island Creek to generate economic activity and facilitate resiliency investments	NYCEDC	Complete study of economic development opportunities	Subject to study findings	<1	TBD
	17	Implement planned and ongoing investments by the City and private partners	Varies	Complete Calvert Vaux Park fields; West 8th Street Access Project; Coney Island Commons and YMCA	Implement Coney Island Comprehensive Plan	Varies	Varies

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Initiative	Lead City Agency	Milestones for Completion, Assuming Funding		10-Year Capital / Study Cost (Preliminary Estimate, in \$ Millions, Nominal)	Funding Source
		By End of 2014	By End of 2020		

**Coastal Protection**

SOUTHERN MANHATTAN	1	Create an implementation plan and design for an integrated flood protection system for remaining Southern Manhattan areas	OLTPS	Commence competition and design study	Subject to study findings and funding availability	1-10	TBD
	2	Conduct a study for a multi-purpose levee along Lower Manhattan's eastern edge to address coastal flooding and create economic development opportunities	NYCEDC	Complete initial feasibility study	Subject to study findings	1-10	TBD

**Critical Infrastructure**

	3	Construct physical enhancements to Water Street	NYCEDC/ NYCDOT	Complete temporary improvements and design permanent improvements	Complete permanent improvements	10-20	LMDC/ City
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**Community and Economic Recovery**

SOUTHERN MANHATTAN	4	Implement temporary programming of Water Street privately owned public spaces (POPS)	DCP/NYCEDC	Approve zoning changes, select programming partner, and commence programming	--	N/A	N/A
	5	Launch a program to enable permanent improvements to Water Street privately owned public spaces (POPS)	DCP	Create design criteria and solicit design proposals; facilitate land use approvals	Enact permanent regulatory changes to facilitate improvements, as necessary	N/A	N/A
	6	Implement planned and ongoing investments in the South Street Seaport	NYCEDC	Complete resiliency improvements to Schermerhorn Row and Museum Block	--	<1	City
	7	Use the Job Creation & Retention Program to attract and retain businesses in Sandy-impacted areas of Lower Manhattan	NYCEDC	Extend and create a new program to make awards to new and renewing tenants	Make awards to new and renewing tenants	10-20	CDBG (ESDC)
	8	Expand Take the HELM program (Hire and Expand in Lower Manhattan)	NYCEDC	Expand competition and make awards to businesses new to Lower Manhattan in the 100-year floodplain	--	1-10	TBD
	9	Implement planned and ongoing investments by the City and private partners	Varies	Complete East River Waterfront, EcoPark, Pier 42 Waterfront Park, Battery Park Playspace, Peck Slip Park, Asser Levy Park, Hudson River Park, The High Line, Peck Slip reconstruction, Battery Maritime Building, Pier A renovation, 9/11 Museum	Complete Hudson Yards South Tower, Peck Slip School	Varies	Varies

Initiative	Lead City Agency	Milestones for Completion, Assuming Funding		10-Year Capital / Study Cost (Preliminary Estimate, in \$ Millions, Nominal)	Funding Source
		By End of 2014	By End of 2020		

**Coastal Protection**

1	Call on and work with the USACE to study the construction of a floodgate at Mill Creek	OLTPS	Commence study	Subject to study findings	N/A	N/A
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**Critical Infrastructure**

EAST AND SOUTH SHORES STATEN ISLAND	2	Assist Staten Island University Hospital (SIUH) in applying for hazard mitigation funding	OEM	Provide technical support to SIUH	--	N/A	N/A
	3	Implement and expedite roadway and sewer capital projects along Hylan Boulevard, especially in vulnerable South Shore areas	NYCDOT/DEP	Commence sewer enhancement and paving projects; complete intersection improvements	Complete sewer enhancement and paving projects	40-60	City
	4	Call on and work with the MTA to create an implementation plan for the relocation of Richmond Valley SIR station to Page Avenue	NYCEDC	Commence relocation feasibility study	Subject to study findings	<1	TBD
	5	Study potential new ferry routes serving Staten Island and issue a Request for Expressions of Interest (RFEI) to gauge market interest	NYCEDC/ NYCDOT	Commence Comprehensive Citywide Ferry Study	Subject to study findings	See Transportation Initiative 18 for Ferry Study	See Transportation Initiative 18
	6	Secure available Federal funding to implement the Community Wildfire Protection Plan for fire-prone areas on the East Shore	DPR	Apply for relevant funding	Subject to funding	<1	TBD
	7	Launch the first capital project for the Mid-Island Bluebelt in Midland Beach	DEP	Finalize Environmental Impact Statement; obtain all necessary permits; begin property acquisition	Complete capital project located in the New Creek West Branch	1-10	City
	8	Explore expansion of the City's mitigation banking pilot as a funding mechanism to facilitate the construction of the Mid-Island and South Shore Bluebelts	NYCEDC/DEP	Develop pilot mitigation banking structure	Subject to implementation structure	<1	TBD

**Community and Economic Recovery**

EAST AND SOUTH SHORES STATEN ISLAND	9	Issue a Request for Expressions of Interest (RFEI) for new concessions and services at City-controlled beaches in the East Shore	NYCEDC/DPR	Issue RFEI; activities subject to RFEI response	Subject to RFEI response	<1	TBD
	10	Create a comprehensive revitalization plan for Great Kills Harbor to increase resiliency and to draw additional investment	NYCEDC	Complete plan	Subject to plan recommendations	<1	TBD
	11	Create a strategic plan for public recreational land, including the beachfront recreation areas and open space	NYCEDC	Complete plan	Subject to plan recommendations	<1	TBD
	12	Implement planned and ongoing investments by the City and private partners	Varies	Complete Ocean Breeze track and field athletic complex; select respondent for Brielle Avenue municipal site	Complete first phase of Charleston Mixed-Use Development, New Stapleton Waterfront development and former Coast Guard Site development; complete St. George waterfront redevelopment	Varies	Varies

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Initiative	Lead City Agency	Milestones for Completion, Assuming Funding		10-Year Capital / Study Cost (Preliminary Estimate, in \$ Millions, Nominal)	Funding Source
		By End of 2014	By End of 2020		

### Coastal Protection

SOUTH QUEENS	1	Call for USACE to develop an implementation plan to mitigate inundation risks through Rockaway Inlet, exploring a surge barrier and alternative measures	OLTPS	Launch study	Subject to study findings	N/A	N/A
	2	Develop an implementation plan to address frequent tidal inundation in Broad Channel and Hamilton Beach, incorporating international best practices	NYCEDC/OLTPS	Complete study	Subject to study findings	1-10	TBD
	3	Complete short-term dune improvements on the Rockaway Peninsula	OLTPS	Complete dune improvements	--	See Coastal Protection Initiative 3 for dune implementation cost	See Coastal Protection Initiative 3

### Buildings

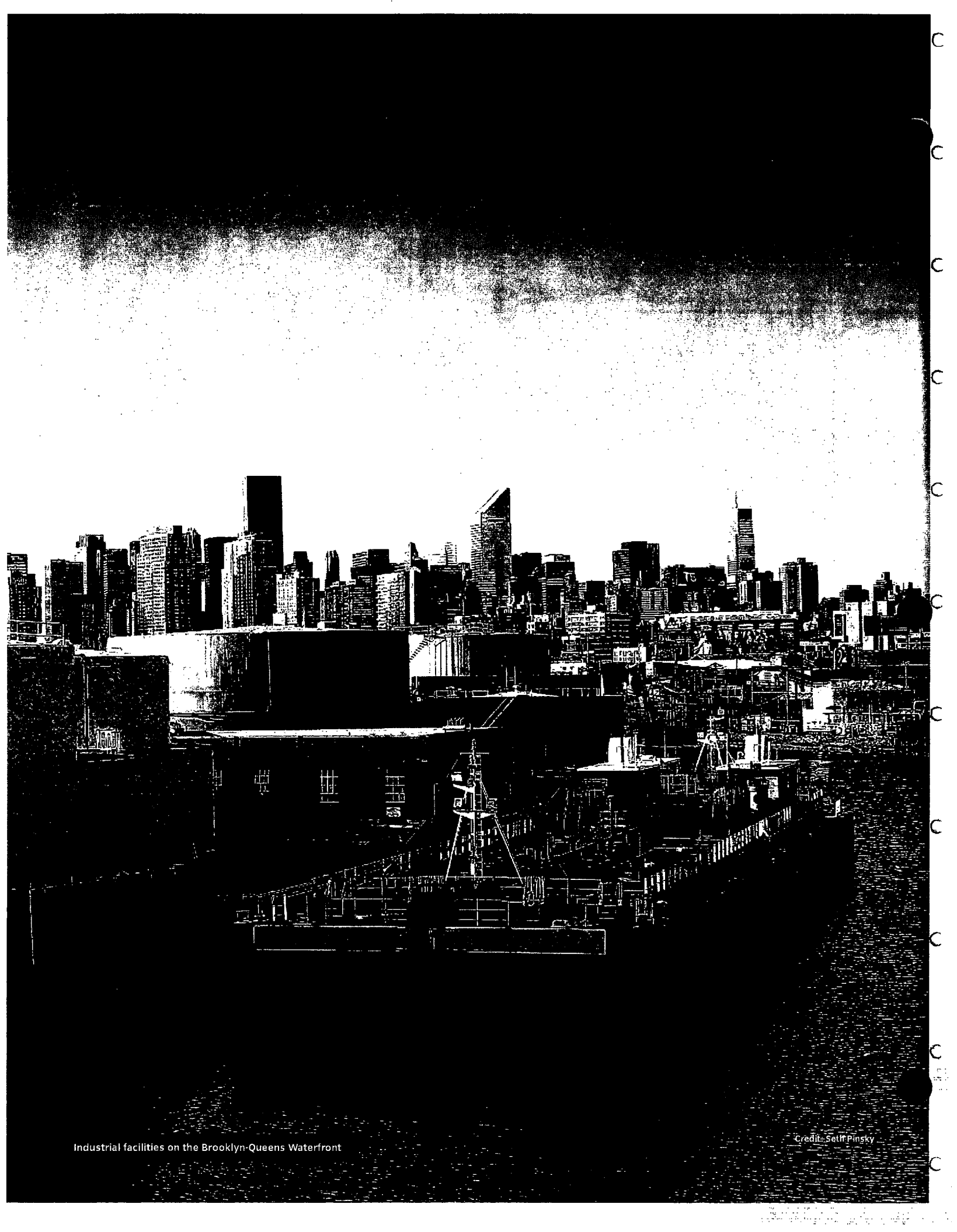
	4	Complete design competition to enhance resiliency of planned Arverne East Project	HPD	Complete competition and announce winning submission	Subject to competition outcome	N/A	Private
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### Critical Infrastructure

SOUTH QUEENS	5	Build a new multi-specialty ambulatory surgical center on the Rockaway Peninsula	NYCEDC	With private developer, complete center and make operational	--	N/A	Private
	6	Expand ferry service to the Rockaway Peninsula	NYCEDC	Construct flexible ferry infrastructure; commence comprehensive Citywide Ferry Study	Subject to study findings	10-20 See Transportation Initiative 18 for Ferry Study	Federal (Partial) TBD

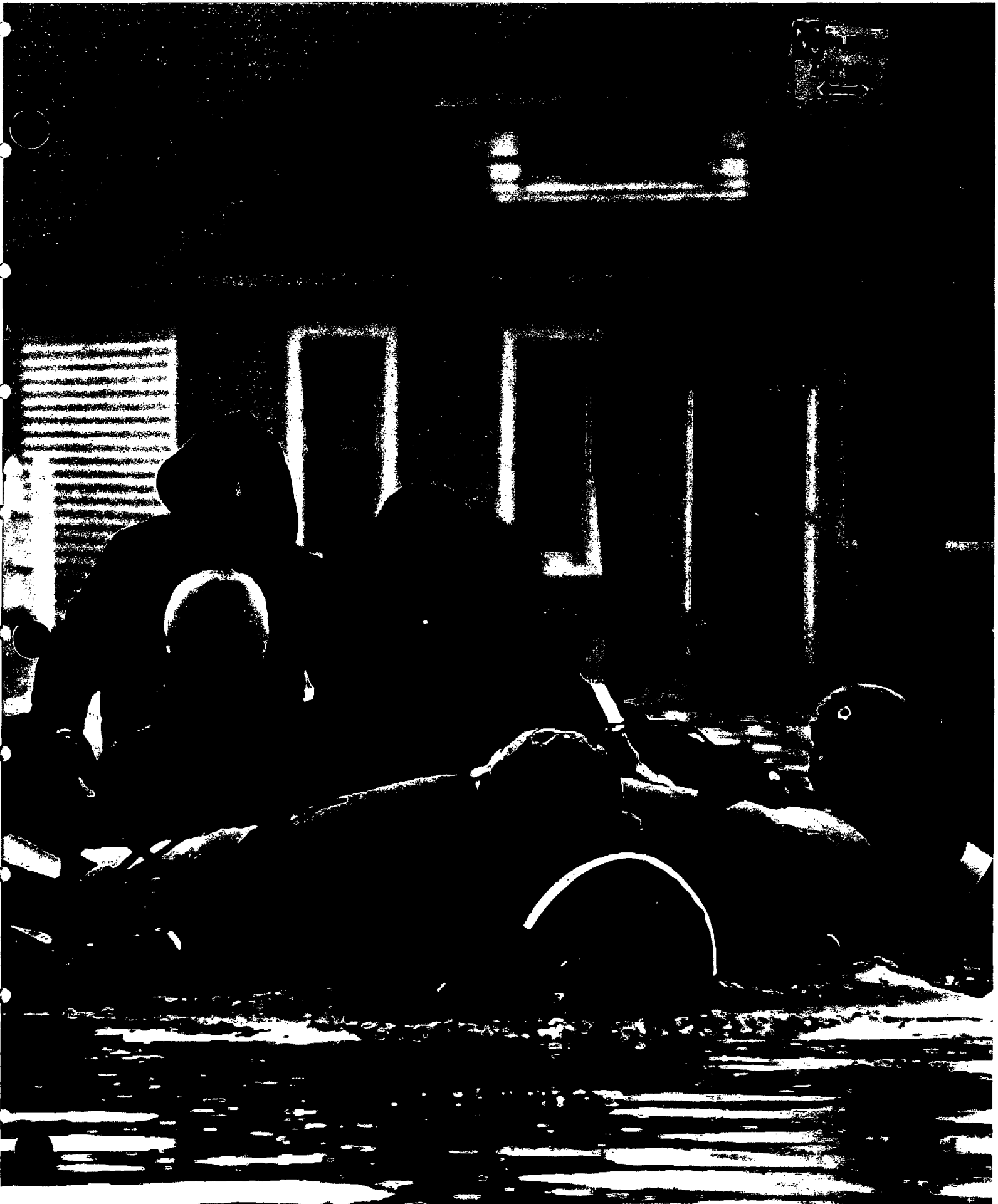
### Community and Economic Recovery

SOUTH QUEENS	7	Get New Yorkers "Back to the Beach" for summer 2013	DPR	Complete summer 2013 beach programs; complete near-term restoration of the boardwalk	--	See Parks Initiative 1 for boardwalk restoration cost	See Parks Initiative 1
	8	Explore opportunities for long-term activation of the beachfront	DPR/NYCEDC	Continue to address substantially damaged areas of boardwalk; explore options for new beachfront destinations issue; RFEI for cultural programming partners	Subject to exploration of options	10 See Parks Initiative 1 for boardwalk restoration	See Parks Initiative 1
	9	Develop a revitalization strategy for the Beach 108th Street corridor	NYCEDC/DCP	Complete strategy	Subject to strategy recommendations	<1	TBD
	10	Develop a comprehensive commercial revitalization plan for Beach 116th Street	NYCEDC/DCP	Complete plan	Subject to plan recommendations	<1	TBD
	11	Develop a commercial revitalization strategy for Far Rockaway, potentially involving repositioning of City- and MTA-controlled sites	NYCEDC	Complete plan; issue RFP for NYC/DOT/MTA controlled sites; complete Beach 20th Street plaza	Subject to strategy recommendations and RFP response	<1	TBD
	12	Launch a satellite Workforce1 Career Center in Far Rockaway	SBS	Complete and open Center	--	<1	TBD
	13	Implement planned and ongoing investments by the City and private partners	Varies	Launch Jamaica Bay/Rockaway Restoration Corps; complete Beach 73rd Street YMCA	Complete Jamaica Bay Green Infrastructure Plan, Rockaway Institute for a Sustainable Environment	Varies	Varies



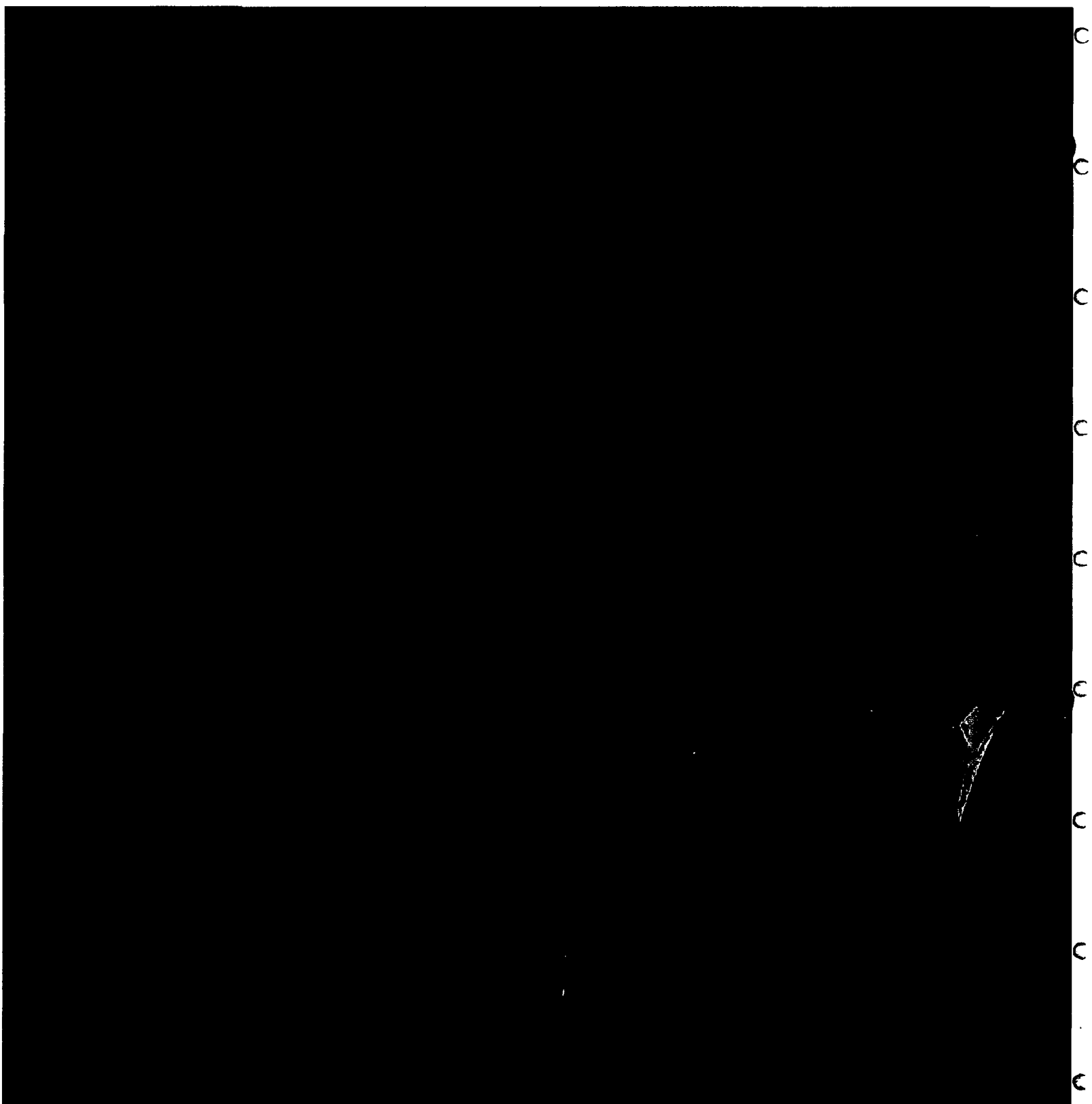
Industrial facilities on the Brooklyn-Queens Waterfront

Credit: Setif Pinsky



Staten Island residents rescued during Sandy

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Mayor Michael R. Bloomberg announcing *A Greener, Greater New York* in 2007

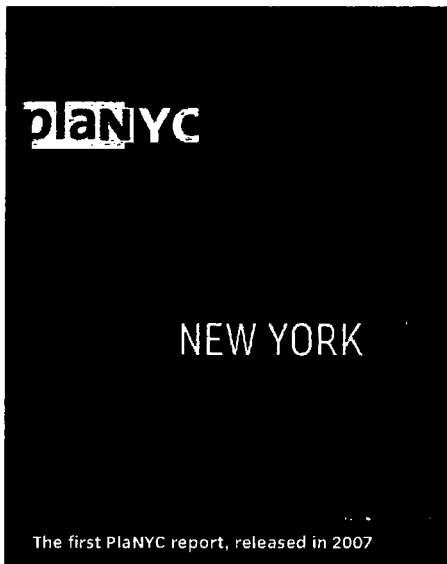
storm on the city's buildings, infrastructure, and people; assessing the risks the city faces from climate change in the medium term (2020s) and long term (2050s); and outlining ambitious, comprehensive, but achievable strategies for increasing resiliency citywide. The Mayor also asked SIRR to develop proposals for rebuilding the areas hardest hit

by Sandy—the Brooklyn-Queens Waterfront, the East and South Shores of Staten Island, South Queens, Southern Brooklyn, and Southern Manhattan—to help them to emerge safer, stronger, and better than before.

The result of this effort—and the latest incarnation of PlaNYC—is *A Stronger, More*

*Resilient New York*. Let others endlessly debate the causes (or even the existence) of climate change. New York City has chosen, once again, to act—by continuing to reduce its contribution to climate change and, at the same time, taking decisive and comprehensive steps to prepare and adapt.

# Preface



**When Michael R. Bloomberg launched PlaNYC back in 2007, combating climate change was not on the agenda of most municipal governments.** Although scientists had shown that human activities were increasing the concentration of greenhouse gases in the earth's atmosphere—and those gases were raising temperatures and sea levels—many people still questioned the very idea of climate change. Besides, what could a single city do about such a global problem?

However, Mayor Bloomberg recognized that this global problem was also a local one. Sea levels around the city already had risen more than a foot during the previous century. Higher sea levels meant coastal storms were more likely to cause flooding, and as a waterfront city with low-lying areas, New York was especially vulnerable to the storms that climate change was expected to bring. Mayor Bloomberg also knew that because of New York City's prominence in the world, it was positioned to take a leadership role on these pressing matters.

The result was PlaNYC, Mayor Bloomberg's pioneering effort to accommodate a growing population, enhance the quality of life for all New Yorkers—and address climate change. A 2007 report entitled *A Greener, Greater New York* laid out PlaNYC's ambitious goals. These included reducing the city's greenhouse gas emissions by more than 30 percent by 2030, and 126 other initiatives that City agencies would undertake to reach these goals, including the establishment of a new Mayor's Office of Long-Term Planning and Sustainability (OLTPS) to lead the effort.

As part of PlaNYC, the Bloomberg Administration sought to understand New York's climate risks. For example, it established the New York City Panel on Climate Change (NPCC), a body of leading climate and social scientists charged with making climate projections for the city—the first group of its kind in the country. OLTPS began working with the Federal Emergency Management Agency to help produce updated Federal flood maps that would provide more

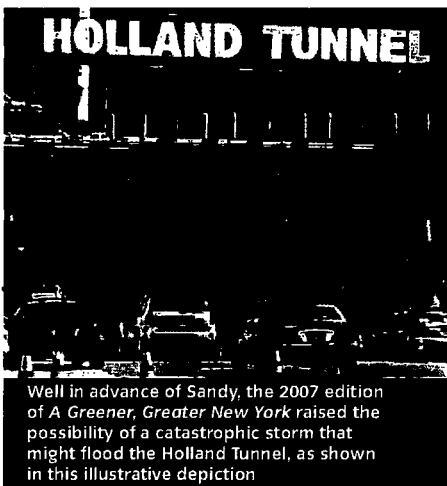
accurate information about New York's risks from coastal storms. In 2011, the City updated *A Greener, Greater New York*, with new initiatives that placed an even greater emphasis on climate resiliency in response to changes in weather that already were taking place.

In ways good and bad, PlaNYC was prescient: Six years on, New York's population is growing rapidly, as is the demand for housing and City services. But PlaNYC also hypothesized storm surges that could overtop the Battery and flood critical infrastructure like the Holland Tunnel. Sandy did that and, tragically for many New Yorkers, much more.

By the time Sandy was forming in distant waters, progress on PlaNYC's resiliency efforts had advanced substantially. Greenhouse gas emissions in New York City were down 16 percent. The City was updating its Building Code to make new buildings more flood-resistant. The Department of Environmental Protection and the Department of Parks & Recreation were restoring and enhancing wetlands. These and many other efforts to prepare our city for a future with climate change were well underway.

On October 29, Sandy hit the city with a force that made two things devastatingly clear. First, New York City had been right to invest in protections against extreme weather. Our resiliency investments performed well during Sandy: recently restored wetlands helped to soak up floodwaters like sponges; new, elevated buildings in inundated areas emerged with significantly less damage; much of the sewer system continued to operate and was restored almost completely within five days of the storm. But Sandy's magnitude, its effects on so many parts of the city, and the threat of ever greater risks from climate change also taught a second lesson: we needed to redouble our efforts.

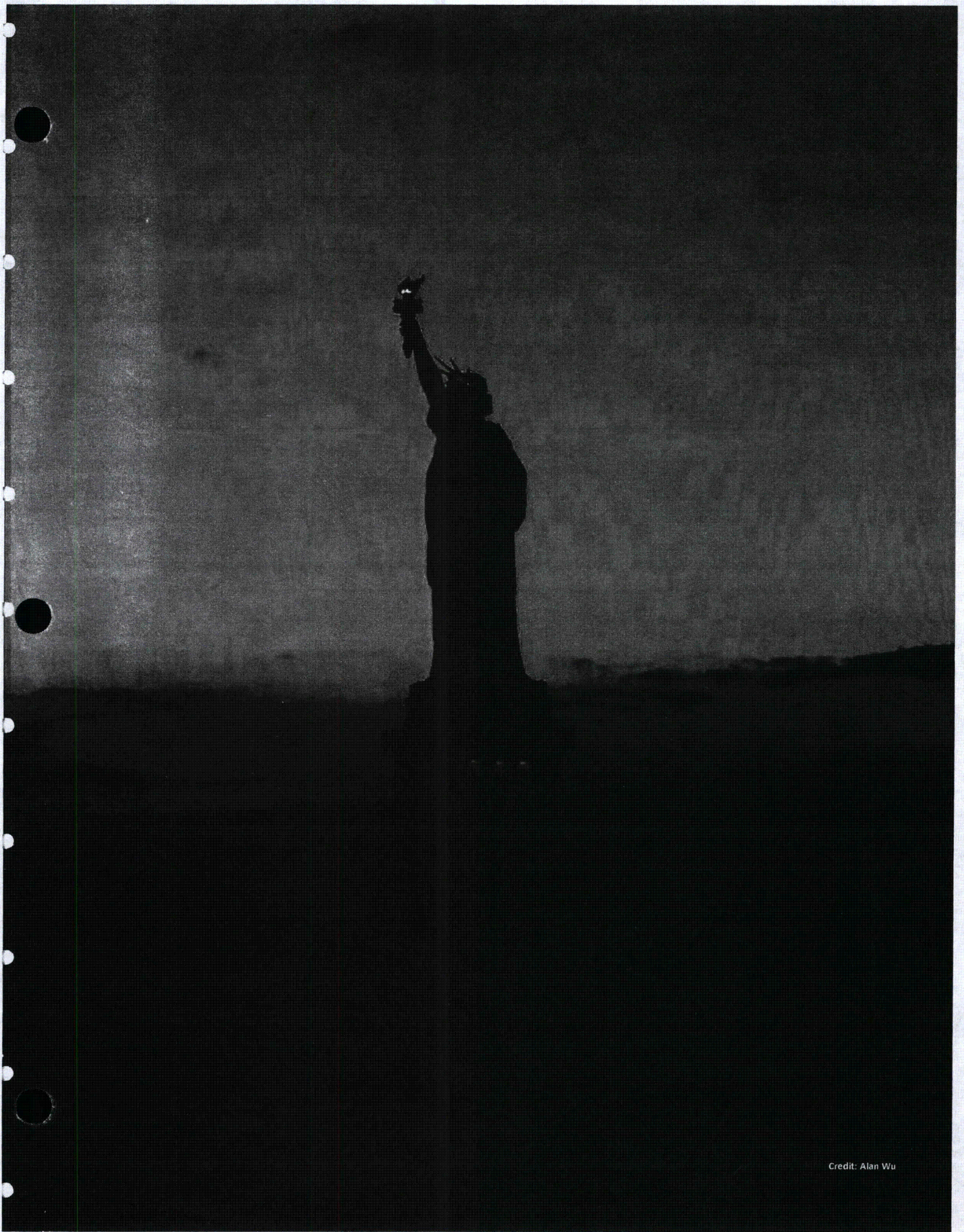
For this reason, even as the City organized unprecedented relief operations following Sandy, Mayor Bloomberg convened the Special Initiative for Rebuilding and Resiliency (SIRR) and charged it with analyzing the impacts of the



# A STRONGER, MORE RESILIENT NEW YORK

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will be absorbed by expanded green infrastructure, or diverted into new high-level sewers. Meanwhile, power, liquid fuels, telecommunications, transportation, water and wastewater, healthcare, and other networks will operate largely without interruption, or will return to service quickly when preventative shutdowns or localized interruptions occur.

Of course, if this plan is implemented, New York City will not be “climate-change proof”—an impossible goal—but it will be far safer and more resilient than it is today. While no one can say with certainty exactly how much safer, the climate analysis in Chapter 2 shows that the investments recommended in this plan certainly will be worthwhile. Lives will be saved and many catastrophic losses avoided. For example, while Sandy caused about \$19 billion in losses for our city, rising sea levels and ocean temperatures mean that by the 2050s, a storm like Sandy could cause an estimated \$90 billion in losses (in current dollars)—almost five times as much.

However, if the first phase of coastal protection measures and major power and building protections recommended in this plan are taken into account, the economic outlook changes dramatically. Pursuing just these measures could reduce expected losses in the 2050s by up to 25 percent, or more than \$22 billion. Implementing all of the measures in this plan would result in an even larger reduction, and smart investments by State-led transportation authorities and others could reduce losses further still.

This economic analysis only quantifies the value of losses avoided due to future coastal storms. Our plan will also help avoid losses as a result of other extreme weather events, such as the heavy downpours and heat waves that can cause damage and threaten public health, and which are predicted to grow in intensity as the climate changes.

Over time, implementation of this plan would address many of the risks that a coastal city like New York faces. By hardening our coastline, by making our building stock stronger, by creating a more durable power network and better stormwater infrastructure, and so much more, we can be better prepared for anything the future holds.

We are a coastal city—and we cannot, and will not, abandon our waterfront. Instead, we must build a stronger, more resilient city—and this plan puts us on a path to do just that. It will not be easy, and it will take time; but as New Yorkers we are more than up to the task.



Michael R. Bloomberg  
Mayor

## Foreword from the Mayor

June 11, 2013



CITY OF NEW YORK

Hurricane Sandy was the worst natural disaster ever to hit New York City. Forty-three New Yorkers lost their lives, many more lost homes or businesses, and entire communities were sent reeling by the storm's devastating impact.

Seven months later, we still have a lot of work to do to help the hardest-hit communities get back on their feet—but there's no question we've come a long way. During tough times, our city always pulls together, and our post-Sandy recovery has been an unprecedented team effort. Thousands of City workers and NYC Service volunteers have put in countless hours cleaning and rebuilding neighborhoods and helping families impacted by the storm, and our Administration has launched innovative new programs to expedite that work. We've also received tremendous help from partners in Federal and State government, from local community leaders, and from nonprofit groups. Private citizens and corporations, from both here in the five boroughs and across the world, have donated nearly \$60 million to the Mayor's Fund to Advance New York City in support of hurricane relief and recovery. Together, we are doing everything possible to help communities rebound and rebuild for the long term.

As our recovery from Sandy continues, we must also look to the future—and prepare for it. The long-term sustainability plan we launched in 2007—PlaNYC—included forward-looking resiliency initiatives that provided important protections during Sandy. But the storm set the bar higher—and as the possibility of more severe weather increases with climate change, we must rise to the occasion.

In December 2012, we announced the formation of the Special Initiative for Rebuilding and Resiliency and charged it with producing a plan to provide additional protection for New York's infrastructure, buildings, and communities from the impacts of climate change. *A Stronger, More Resilient New York*—a roadmap for producing a truly sustainable 21st century New York—is the result of that effort.

It is impossible to know what the future holds for New York. But if this plan is brought to life in the years and decades ahead, a major storm that hits New York will find a much stronger, better protected city.

In our vision of a stronger, more resilient city, many vulnerable neighborhoods will sit behind an array of coastal defenses. Waves rushing toward the coastline will, in some places, be weakened by offshore breakwaters or wetlands, while waves that do reach the shore will find more nourished beaches and dunes that will shield inland communities. In other areas, permanent and temporary floodwalls will hold back rising waters, and storm surge will meet raised and reinforced bulkheads, tide gates, and other coastal protections.

Water that makes its way inland will find hardened and, in some cases, elevated homes, making it more difficult to knock buildings off their foundations or knock out mechanical and electrical systems. And it



**This report is dedicated to the 43 New Yorkers** who lost their lives during Sandy, and to the loved ones they left behind. It is also offered in recognition of those whose homes, businesses, and communities were damaged during the storm and who are working to rebuild. The City stands in solidarity with all of them as it makes plans to strengthen New York so that future climate events do not have the same devastating effects.



# Appendix: Glossary

<b>100-year floodplain</b>	The geographical area with a 1 percent or greater chance of flooding in any given year
<b>500-year floodplain</b>	The geographical area with a 0.2 percent chance of flooding in any given year
<b>ABFE</b>	Advisory Base Flood Elevation
<b>BFE</b>	Base Flood Elevation
<b>BID</b>	Business Improvement District
<b>BMP</b>	Best Management Practices
<b>BNYDC</b>	Brooklyn Navy Yard Development Corporation
<b>BPC</b>	Battery Park City
<b>BRT</b>	Bus Rapid Transit
<b>BRTF</b>	Building Resiliency Task Force
<b>BSA</b>	Board of Standards and Appeals
<b>CDBG</b>	Community Development Block Grant
<b>CEO</b>	NYC Center for Economic Opportunity
<b>CERT</b>	Community Emergency Response Teams
<b>CRS</b>	Community Rating System
<b>CSO</b>	Combined Sewer Overflows
<b>DCAS</b>	Department of Citywide Administrative Services
<b>DCP</b>	NYC Department of City Planning
<b>DEP</b>	NYC Department of Environmental Protection
<b>DFE</b>	Design Flood Elevation
<b>DMAT</b>	Disaster Medical Assistance Teams
<b>DOB</b>	NYC Department of Buildings
<b>DOC</b>	NYC Department of Corrections
<b>DOE</b>	NYC Department of Education
<b>DOHMH</b>	NYC Department of Health and Mental Hygiene
<b>DoITT</b>	NYC Department of Information Technology and Telecommunications
<b>DPR</b>	NYC Department of Parks & Recreation
<b>DSNY</b>	NYC Department of Sanitation
<b>DYFJ</b>	NYC Division of Youth and Family Justice
<b>EBT</b>	Electronic Benefits Transfer
<b>ED</b>	Emergency department

<b>EHR</b>	Electronic health records
<b>ESDC</b>	Empire State Development Corporation
<b>FCC</b>	Federal Communications Commission
<b>FDC</b>	Food Distribution Center
<b>FDNY</b>	Fire Department of New York
<b>FEMA</b>	Federal Emergency Management Agency
<b>FHWA</b>	Federal Highway Administration
<b>FIRM</b>	Flood Insurance Rate Map
<b>FRESH</b>	Food Retail Expansion to Support Health
<b>FTA</b>	Federal Transit Administration
<b>GDP</b>	Gross Domestic Product
<b>HEC</b>	Healthcare Evacuation Center
<b>HHC</b>	NYC Health and Hospitals Corporation
<b>HMGF</b>	Hazard Mitigation Grant Program
<b>HOV</b>	High Occupancy Vehicle
<b>HPD</b>	NYC Department of Housing Preservation and Development
<b>HRA</b>	NYC Human Resources Administration
<b>HRO</b>	NYC Mayor's Office of Housing Recovery Operations
<b>HVAC</b>	Heating, ventilation, and air conditioning
<b>IDA</b>	NYC Industrial Development Agency
<b>IRT</b>	Interborough Rapid Transit
<b>JCRP</b>	Job Creation and Retention Program
<b>LES</b>	Lower East Side
<b>LiDAR</b>	Light Detection and Ranging
<b>LiMWA</b>	Limit of Moderate Wave Action
<b>LIPA</b>	Long Island Power Authority
<b>LIRR</b>	Long Island Rail Road
<b>LMDC</b>	Lower Manhattan Development Corporation
<b>LPC</b>	Landmarks Preservation Commission
<b>LTCP</b>	Long-Term Control Plan
<b>MTA</b>	Metropolitan Transportation Authority
<b>NACCS</b>	North Atlantic Coast Comprehensive Study
<b>NAS</b>	National Academy of Sciences
<b>NAVD88</b>	North American Vertical Datum 1988
<b>NFIP</b>	National Flood Insurance Program
<b>NOAA</b>	National Oceanic and Atmospheric Administration
<b>NPCC</b>	NYC Panel on Climate Change
<b>NYCDOT</b>	NYC Department of Transportation
<b>NYCEDC</b>	New York City Economic Development Corporation
<b>NYCHA</b>	NYC Housing Authority

<b>NYPD</b>	NYC Police Department
<b>NYSDEC</b>	New York State Department of Environmental Conservation
<b>NYSDOH</b>	New York State Department of Health
<b>NYSDOT</b>	New York State Department of Transportation
<b>NYU</b>	New York University
<b>OEM</b>	NYC Office of Emergency Management
<b>OLTPS</b>	NYC Mayor's Office of Long-Term Planning and Sustainability
<b>PATH</b>	Port Authority Trans-Hudson
<b>PCIP</b>	Primary Care Information Project
<b>PlaNYC</b>	The City's 2007 sustainability plan, updated in 2011
<b>POPS</b>	Publicly Owned Private Space
<b>PRO</b>	Planning and Resiliency Office
<b>PSC</b>	Public Service Commission
<b>PWMS</b>	Preliminary Work Maps released by FEMA on June 2013
<b>RCP</b>	Representative Concentration Pathway
<b>RFEI</b>	Request for Expression of Interest
<b>SBS</b>	NYC Department of Small Business Services
<b>SIR</b>	MTA Staten Island Railway
<b>SIRR</b>	Special Initiative for Rebuilding and Resiliency
<b>SIUH</b>	Staten Island University Hospital
<b>SLR</b>	Sea level rise
<b>SNAP</b>	Supplemental Nutrition Assistance Program
<b>SWMP</b>	Solid Waste Management Plan
<b>Take the HELM</b>	Take the Hire and Expand in Lower Manhattan
<b>The Port Authority</b>	The Port of Authority of New York & New Jersey
<b>UHI</b>	Urban Heat Island
<b>USACE</b>	United States Army Corps of Engineers
<b>USDA</b>	United States Department of Agriculture
<b>USDOT</b>	United States Department of Transportation
<b>UWAS</b>	Urban Waterfront Adaptive Strategies
<b>VoIP</b>	Voice over Internet Protocol
<b>WAVES</b>	Waterfront Vision and Enhancement Strategy
<b>WUI</b>	Wildland-Urban Interface: a zone where homes are built near or among lands prone to wildland fire