



**A STRONGER,
MORE RESILIENT
NEW YORK**

American Water Resources Association
National Capital Region Water Resources Symposium
April 10, 2015



The City of New York

A Greener, Greater New York

PlaNYC –released in 2007, updated in 2011 – addressed four key challenges and launched the City’s sustainability and resiliency efforts...

1. Growth

- Prepare for population growth
- Accommodate growth with smart development

2. Infrastructure

- Update or replace aging infrastructure assets
- Reduce lifecycle costs with proper maintenance

3. A Global Economy

- Attract hard-working people from the globe
- Improve quality of life / health for all New Yorkers

4. Climate Change

- Reduce our contribution to the causes and adapt our city to the inevitable effects of climate change



PlaNYC included the launch of the *New York City Panel on Climate Change* and the *Climate Change Adaptation Task Force* – both of which help the City to **identify future risks** and **modernize its infrastructure** to meet those risks.

Recovery, Rebuilding, and Resiliency

In the aftermath of Sandy, the City set up a climate resiliency task force.



The goals were to identify ways to

1. Rebuild neighborhoods not just as they were, but better; and
2. Strengthen critical infrastructure systems

by answering three key questions.

Question 1

What happened during Sandy and why?

Question 2

What could happen in the future?

Question 3

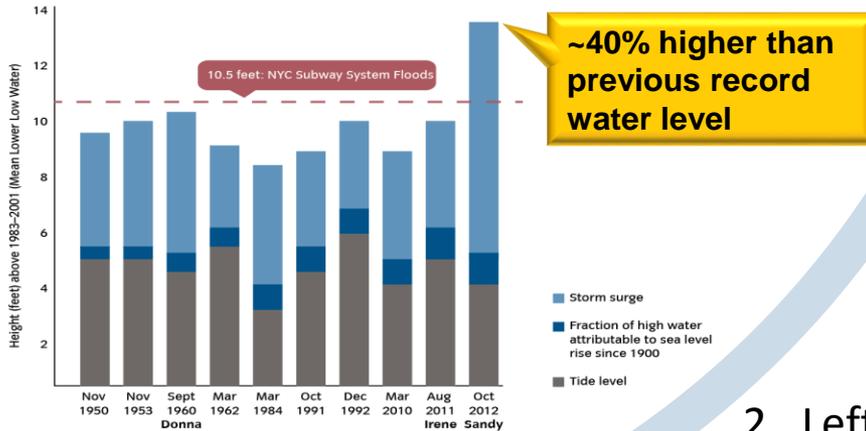
How do we rebuild post-Sandy and prepare for a future with climate change?

Agenda

- **Sandy and the Risks of Climate Change**
- PlaNYC: A Stronger, More Resilient New York
- Implementation
- Looking Ahead

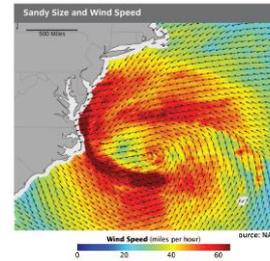
Sandy

An idiosyncratic surge event for NYC...



Why?

1. Wind Field



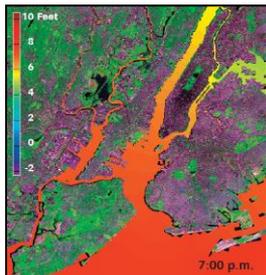
- 1,000 mile wind field pushed water into the NY Bight and caused record 32' waves off Rockaway coastline
- Wave action caused severe structural damage to buildings

2. Left Hook



- A rare "westward hook" put the city in the path of its onshore winds
- 3rd hurricane since 1878 to hit NJ

3. Tide



- Sandy's storm surge largely coincided with a rising tide in the Upper Harbor
- Spring tide added to the peak water levels

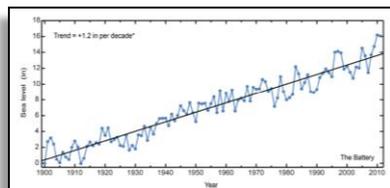
Result:

- 44 lives lost
- \$19 billion in damages
- Countless lives upended
- Major infrastructure disruptions

The Risks of Climate Change

NYC already faces a range of risks from extreme weather and climate change, and those risks grow into the 2020s, 2050s, and beyond.

The NYC Panel on Climate Change (NPCC) projects increased chronic climate hazards...



By the 2050s:

- 4.1°F to 5.7°F increase in average temperature
- 4% to 11% increase in average annual precipitation
- Sea levels likely to rise 1-2 ft.; maybe 2½ ft.

By 2100:

- High-end projections may reach 6 ft.

...and increased impact from extreme weather events.



By the 2050s:

- Number of days in NYC above 90° could triple

Even today:

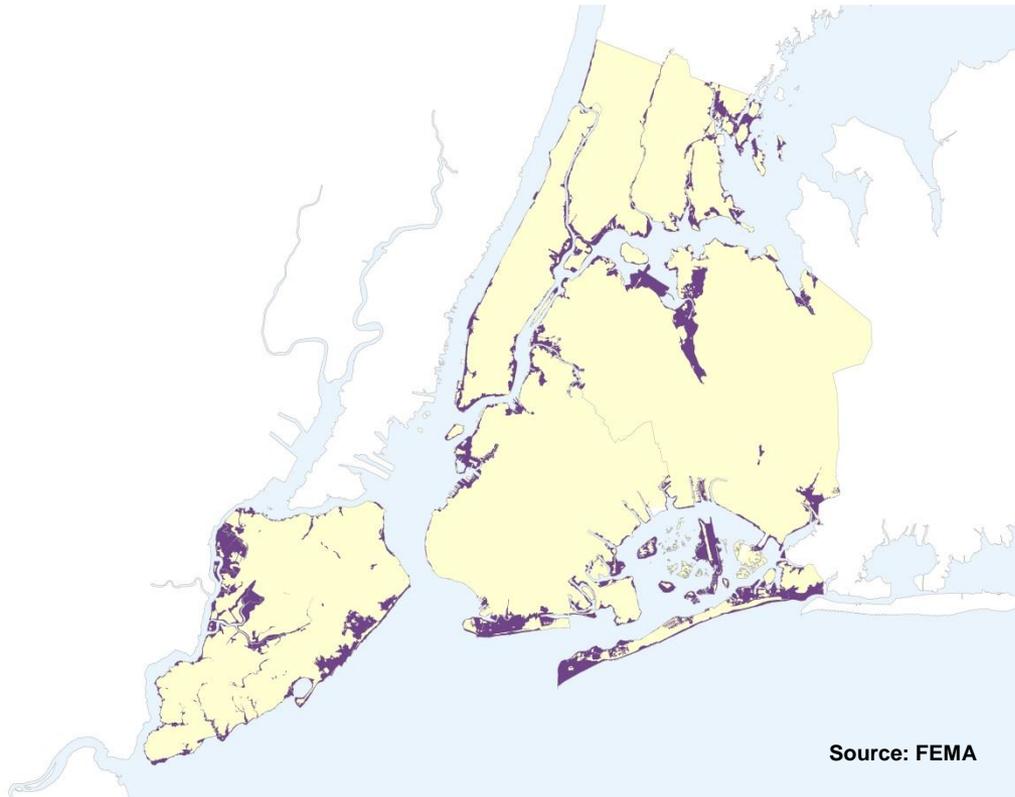
- 100-year floodplain expanded by 17 square miles (51%) citywide; 2.3 ft. average increase in 100-year flood elevations; will increase with further sea level rise; now encompasses 71,500 structures

Clearly, Sandy only represents one type of threat to New York City.

Flood Insurance Rate Maps

Prior to Sandy, FEMA's 2007 FIRMs were the best indicator of the city's vulnerability to flooding.

FEMA 2007 Flood Insurance Rate Maps (FIRMs)



FEMA 2007 FIRMs 100-year Floodplain

100-year Floodplain*

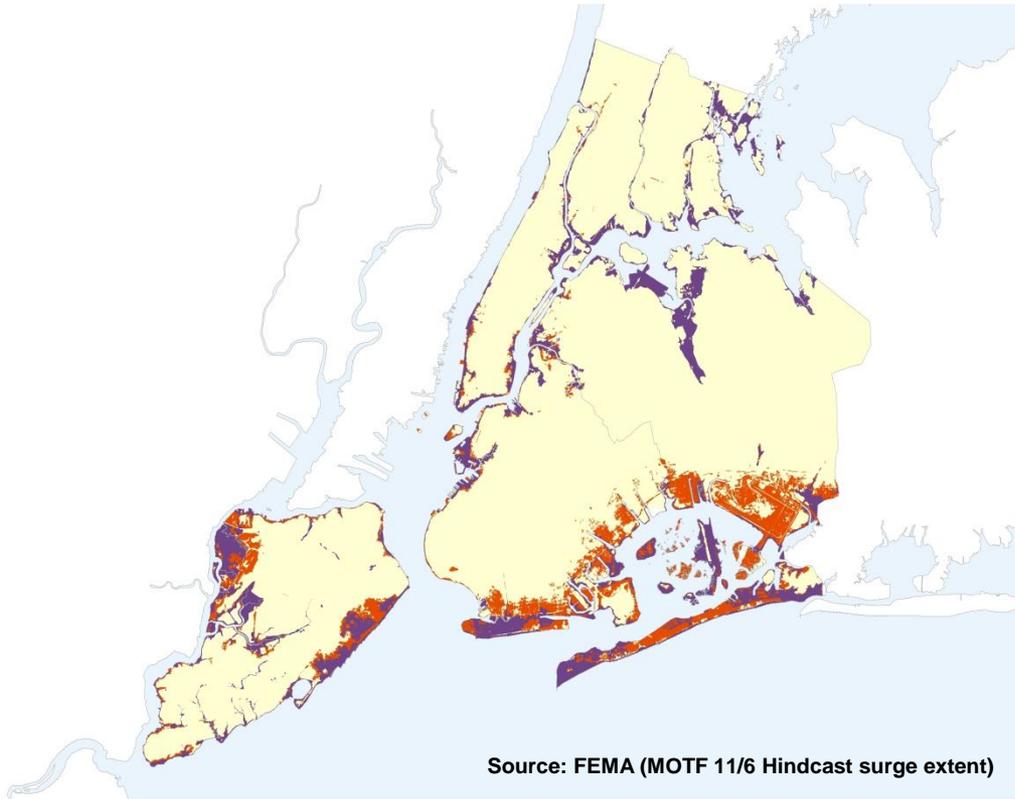
	1983 FIRMs
Residents	218,000
Jobs	214,000
Buildings	36,000
1-4 Family	26,000
Floor Area (Sq Ft.)	377M

- FIRMs not significantly updated since 1983
- In 2007, digitized existing paper maps, did not update accuracy
- 1983 maps based on outdated topography and weather data

Flood Insurance Rate Maps

Sandy demonstrated that New York was more vulnerable than previously thought.

FEMA 2007 FIRMs vs. Sandy Inundation Area



Damage outside 2007 100-year floodplain:

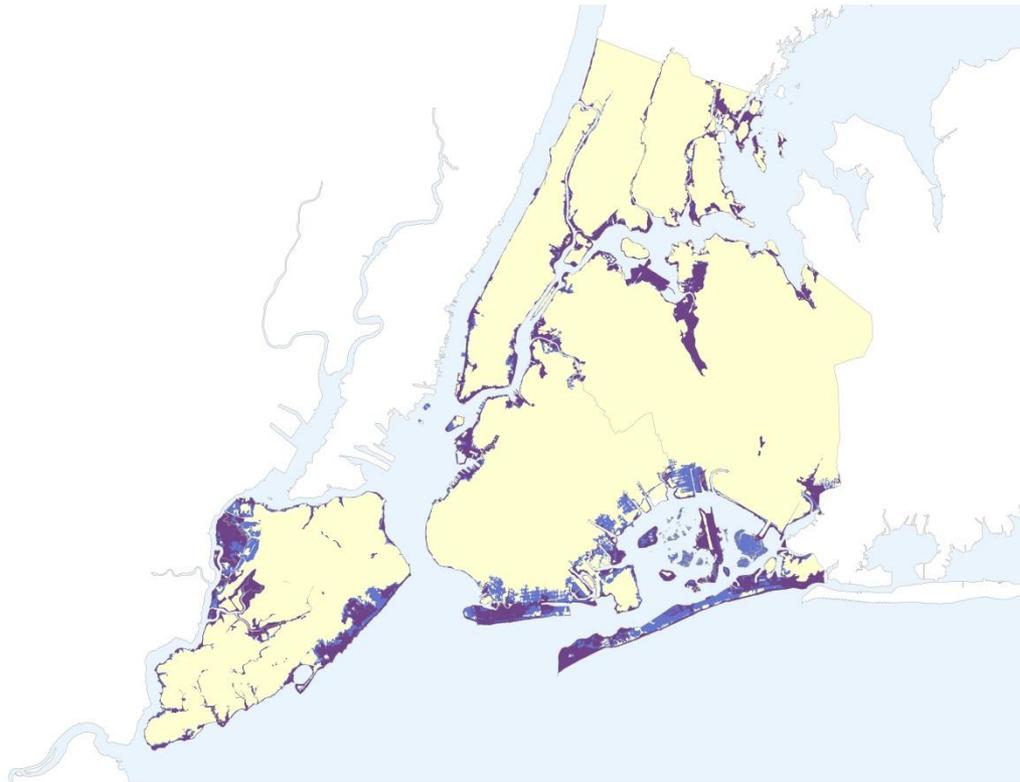
- > 1/3 of red- and yellow-tagged buildings
- ~ 1/2 of impacted residential units
- > 1/2 of impacted buildings

- FEMA 2007 FIRMs 100-year Floodplain
- Sandy Inundation Area (outside the 100-year Floodplain)

Flood Insurance Rate Maps

The most recent maps, called Preliminary FIRMs, were released in December 2013 and show a floodplain that is 51% larger than previously.

FEMA 2007 FIRMs vs. Preliminary FIRMs



- FEMA 2007 FIRMs 100-year Floodplain
- FEMA 2013 Preliminary FIRMs 100-year Floodplain

	100-year Floodplain*		
	2007FIR Ms	2013 PFIRMs	Change (%)
Residents	218,000	400,000	83%
Jobs	214,000	290,800	35%
Buildings	36,000	71,500	99%
1-4 Family	26,000	53,000	104%
Floor Area (Sq Ft.)	377M	532M	42%

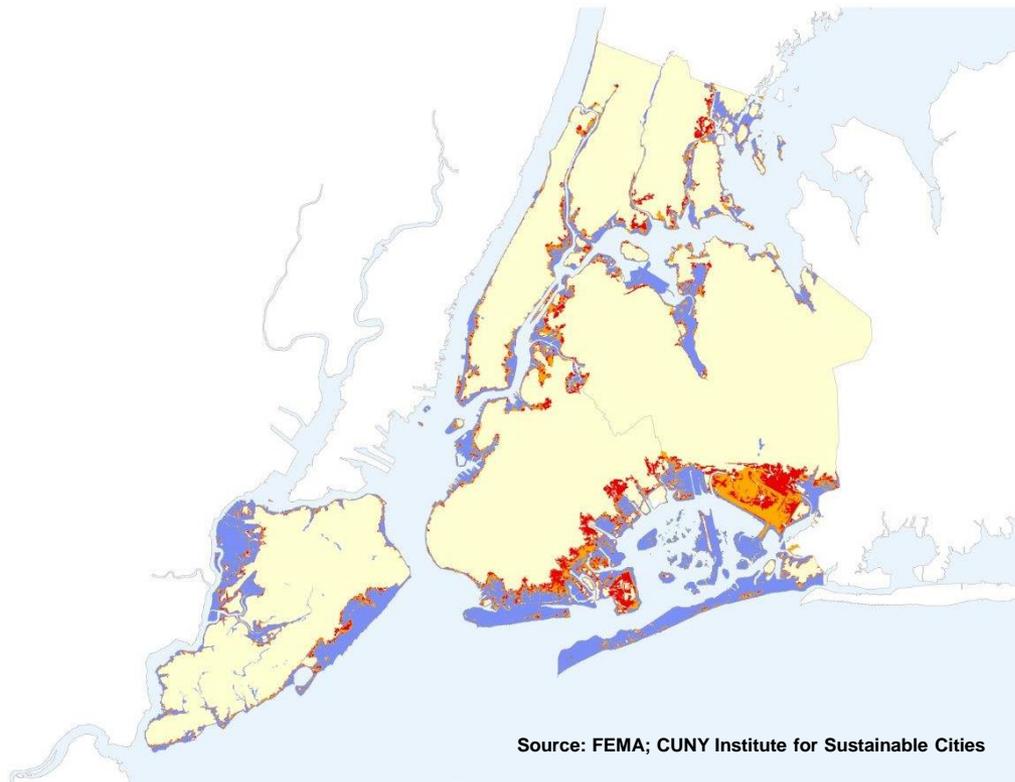
* Numbers are rounded for clarity

Homeowners with a mortgage in the 100-year floodplain are required to buy flood insurance

Flood Insurance Rate Maps

Given the City's projections on sea level rise, these floodplains will extend even further by the 2020s and into the 2050s.

Projected floodplain for the 2020s and 2050s

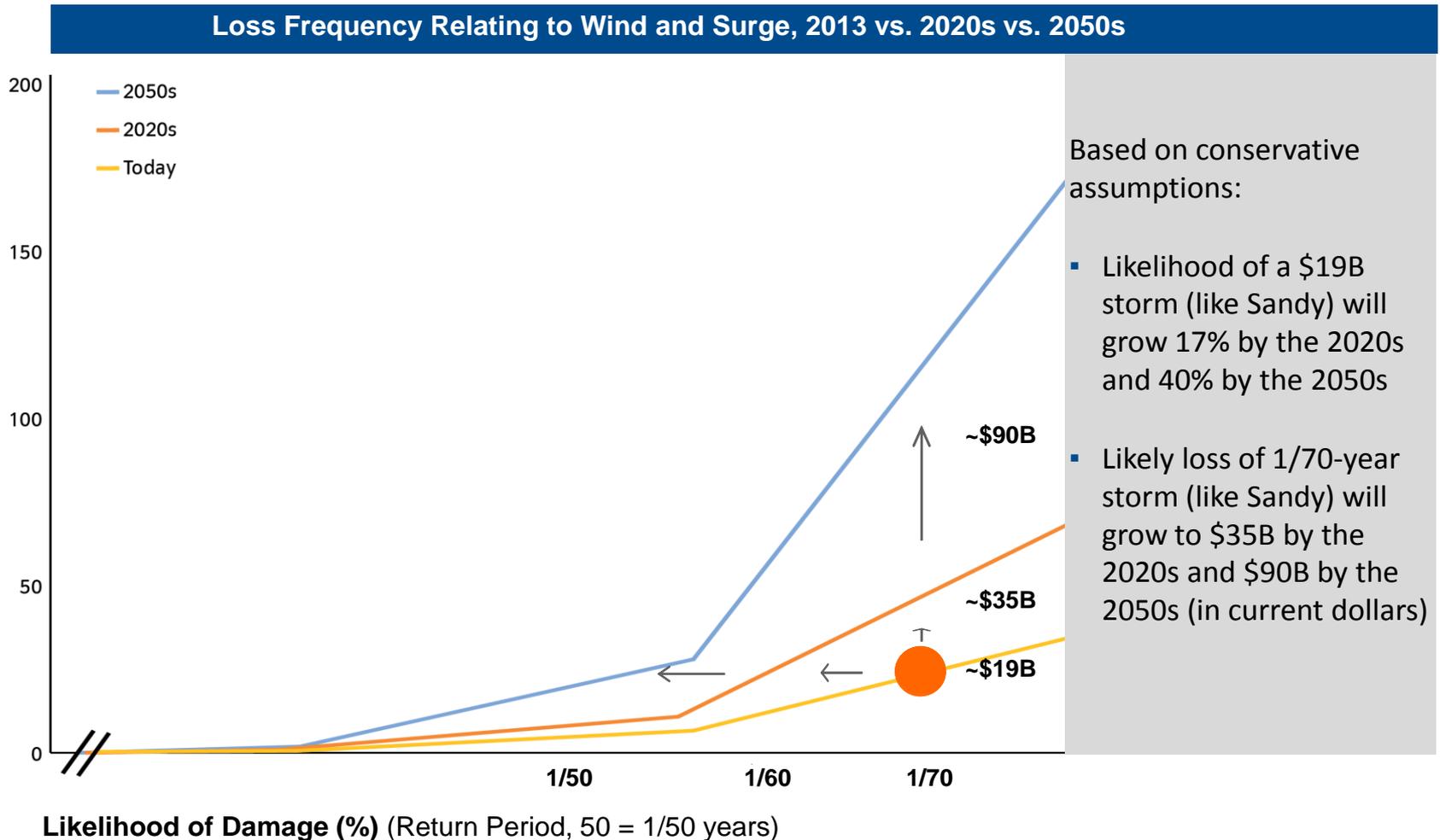


	100-year Floodplain*		
	2013 PFIRMs	2050s Projected	Change (%)
Residents	400,000	808,900	102%
Jobs	290,800	555,700	91%
Buildings	71,500	118,000	65%
1-4 Family	57,400	89,000	55%
Floor Area (Sq Ft.)	534M	855M	42%

- FEMA 2013 Preliminary FIRMs 100-year Floodplain
- Projected 2020s 100-year Floodplain
- Projected 2050s 100-year Floodplain

Sandy and the Risks of Climate Change

Working with Swiss Re, the City quantified the potential monetary impacts resulting from an increased frequency in damaging storms as a result of climate change.

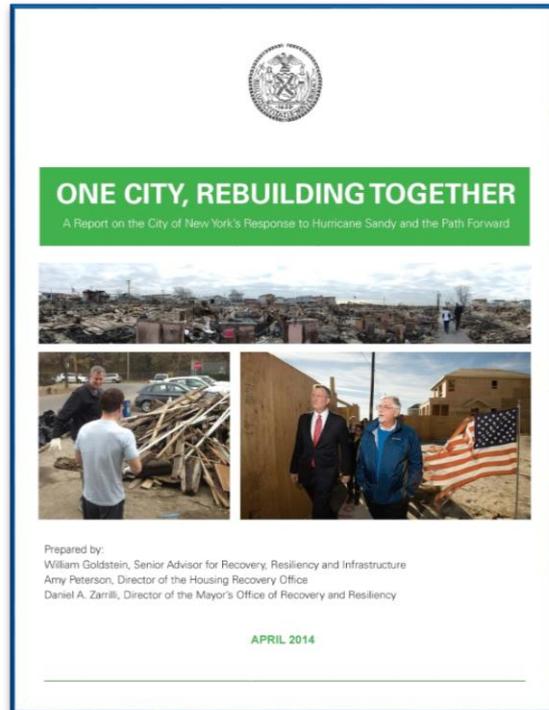


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One City, Rebuilding Together

In March 2014, Mayor de Blasio released *One City, Rebuilding Together* to accelerate the City's housing recovery program and expand the City's climate resiliency plan...



Enhance policy and planning

- Place-based coordination of land use and infrastructure
- Disclosure of key information via the Sandy Tracker

Expedite efforts to secure Federal funds

- Work to secure additional USACE authorizations
- Accelerate FEMA and HUD investments

Continue collaboration with State efforts

- Secure hazard mitigation funds
- Collaborate with NY Rising community planning process

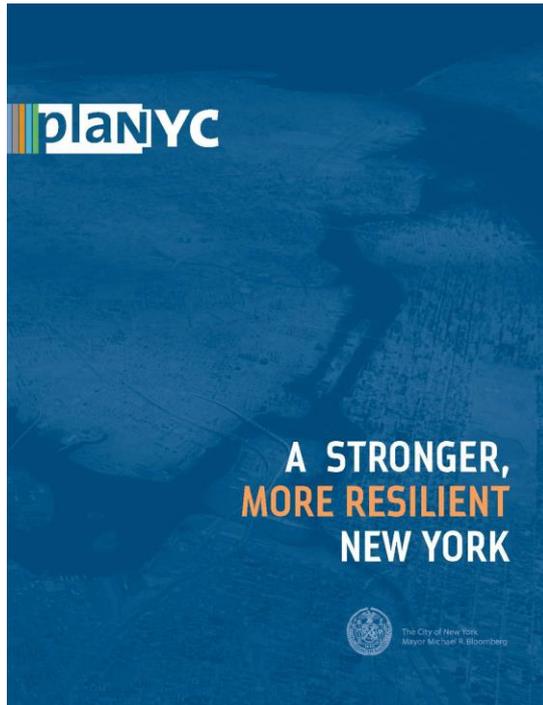
Expand economic opportunity for New Yorkers

- Expand workforce development opportunities
- Ensure local hiring opportunities in resiliency projects

These changes have accelerated the delivery of key resiliency projects, and have ensured that the Sandy recovery works better for all New Yorkers. These efforts are run through the Mayor's Office of Recovery and Resiliency.

A Stronger, More Resilient New York

...Including this roadmap, released in June 2013, to make all New Yorkers safer using a multi-layered approach and based on the best available science.



Strengthen coastal defenses

- Complete existing USACE coastal risk reduction projects
- Expand protections citywide

Upgrade buildings

- Amend the building code to strengthen new construction
- Incent investments in existing buildings

Protect infrastructure and services

- Harden critical assets and supply chains
- Expand natural infrastructure systems

Make neighborhoods safer and more vibrant

- Advocate for flood insurance affordability
- Address underlying social and economic challenges

The City's 257 initiatives comprise a **comprehensive plan** to reduce the risk of extreme weather and climate change. This innovative plan includes funding, an implementation schedule, and **can be achieved over the next ten years.**

Physical Resiliency

Taken together, the plans call for investing in new infrastructure that can reduce the risk to our neighborhoods, critical services, businesses, and vulnerable populations.

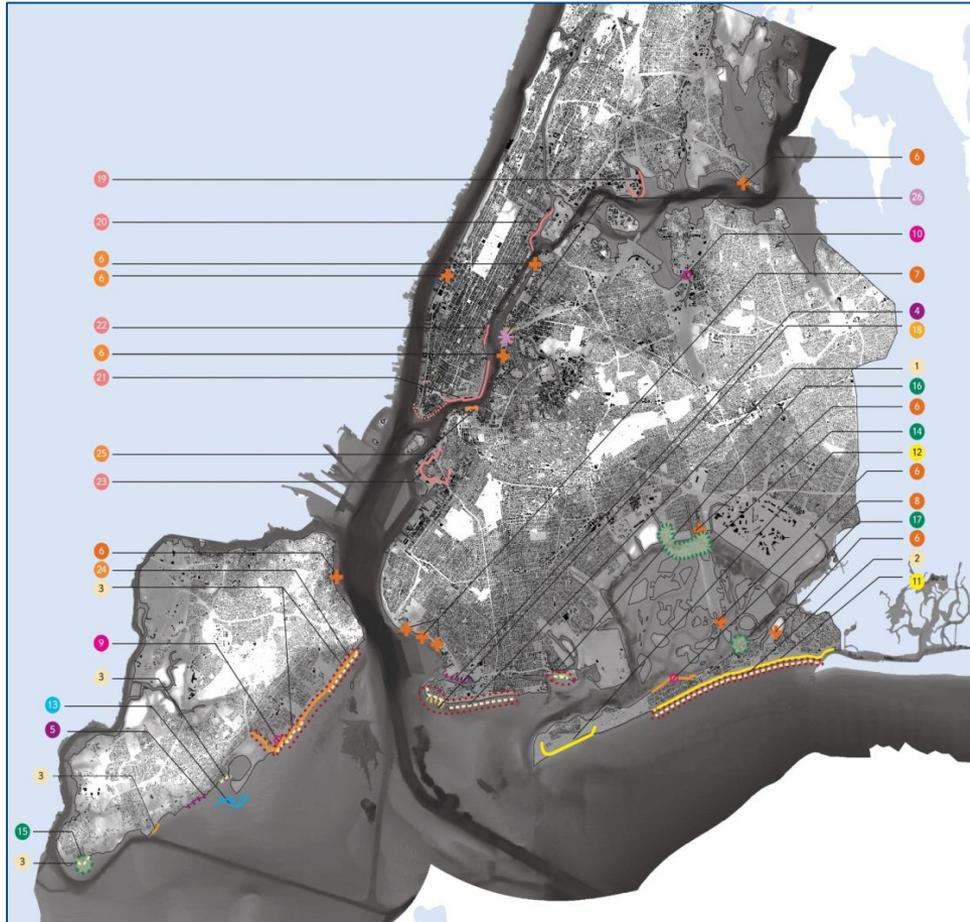


Critical Infrastructure

- Coastal Protection
- Buildings
- Insurance
- Utilities
- Liquid Fuels
- Healthcare
- Telecommunications
- Transportation
- Parks
- Water and Wastewater
- Food Supply
- Solid Waste

Physical Resiliency

The City's first-ever coastal protection plan was launched and included detailed recommendations for a first phase of investments on the coastline.

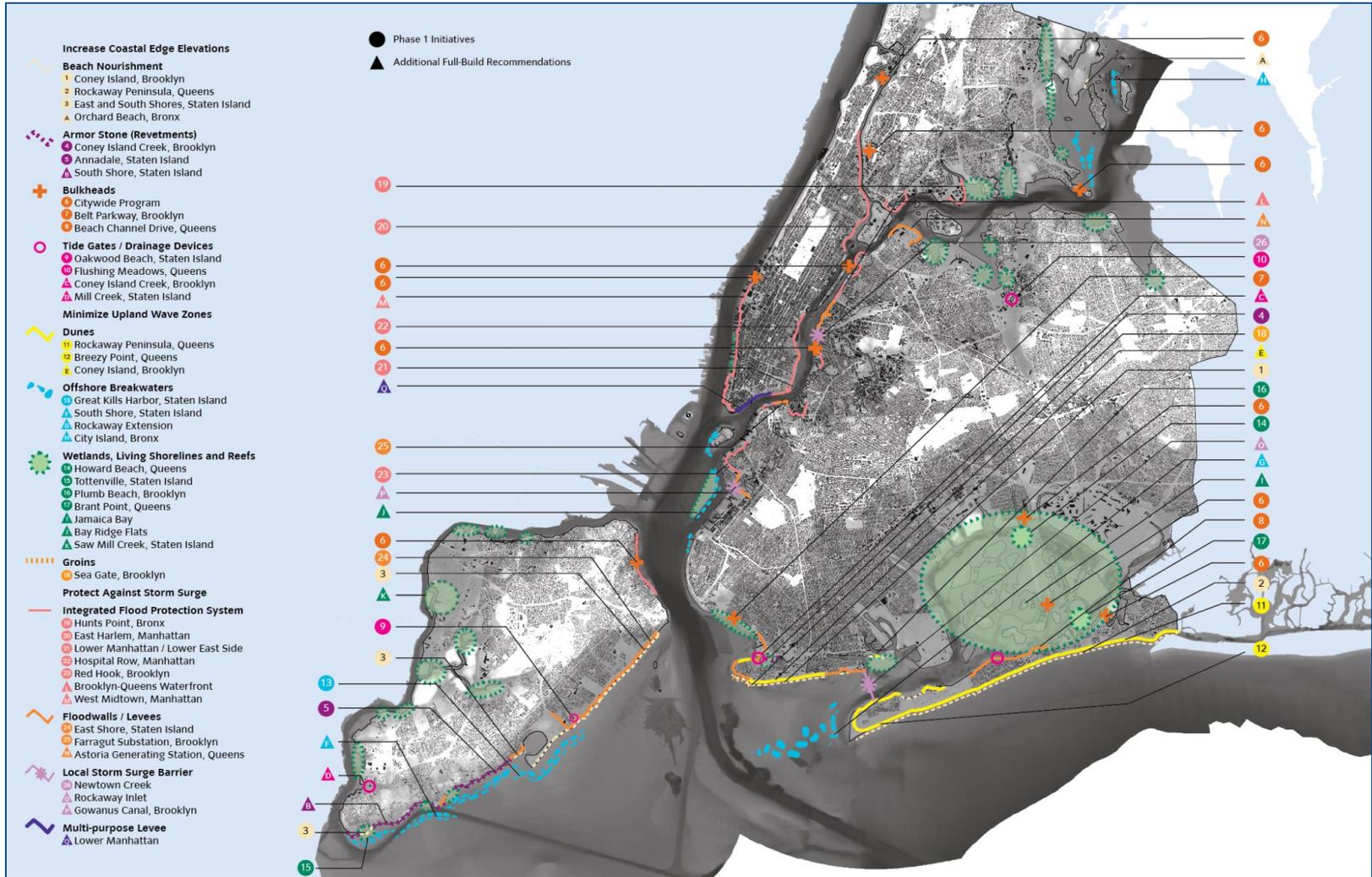


Highlights

- Investing \$3.7 billion into the City's first-ever coastal protection plan
- A mix of traditional engineering and nature-based infrastructure
- Strong partnership with USACE in Rockaways, Staten Island, Sea Gate
- \$415 million in Rebuild by Design project awards in the City
- Investments tailored to specific local risks – no silver bullet solution

Physical Resiliency

As additional resources are found, the City will continue to pursue a full-build set of coastal protections that expand on its first phase strategies over time.



Protect Infrastructure and Services

A focus on securing more funds to expedite green elements of infrastructure that can reduce extreme weather impacts.



Highlights

- Fund additional Bluebelt acquisition and build-out of BMPs
- Secure HMGP funds for living shoreline and wetland improvements in Howard Beach
- Continue to plant trees citywide, reaching over 900,000 trees
- Plant dunes for additional strength in Staten Island and the Rockaways
- Advance DEP's green infrastructure program
- Coat more than 6,000,000 square feet of rooftops through NYC Cool Roofs
- Study urban heat island effect in pilot neighborhoods

Social and Economic Resiliency

Land use changes, economic development, community strengthening, job creation, and capacity-building can also promote quicker and more sustained recovery...



- Prioritize rebuilding, but seek to address underlying challenges
- Conduct land use studies to promote resiliency
- Cooperate with NY Rising and HUD's Rebuild by Design
- Work with OEM to enhance community preparation

Rebuild by Design: BIG on the Lower East Side

A Resilient Transformation

... While bold thinking about resiliency can transform neighborhoods and provide for enhanced safety, economic opportunities, and stronger communities.



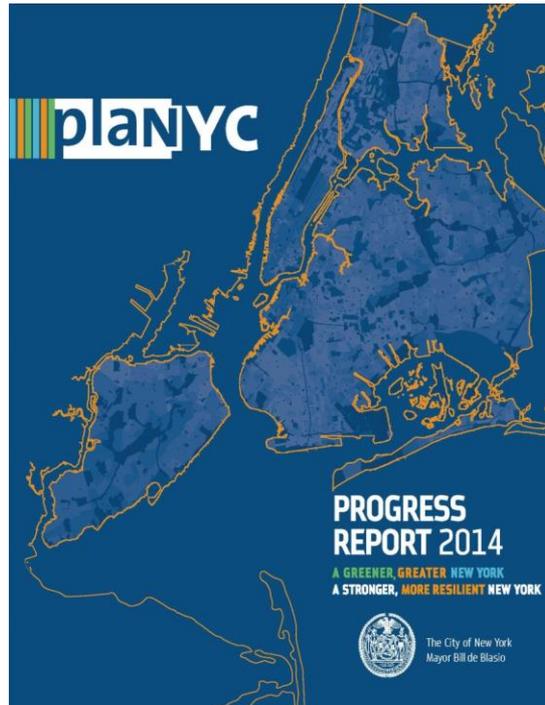
Coney Island Creek Wetlands & Tidal Barrier

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Status Report

And, while this is necessarily a long-term endeavor, the City has already taken steps, with many partners, to advance many of its key initiatives, including these highlights:



Strengthen coastal defenses

- Launched \$3.7 billion coastal protection plan
- Placed over 4.2 million cy of sand on city beaches

Upgrade buildings

- Passed 16 local laws to upgrade the building code
- Published building resiliency retrofit manual
- Secure \$3 billion for public housing investments

Protect infrastructure and services

- Secured \$1 billion electric grid resiliency investments
- Launched \$1.6 billion public hospital investment program

Make neighborhoods safer and more vibrant

- Secured flood insurance affordability reforms
- Launched citywide planning effort for coastal communities

With this substantial early progress, the City is poised to continue its difficult work to achieve long-term success.

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Looking Ahead: One City, Built to Last

In September, Mayor de Blasio committed to reduce GHG emissions 80% by 2050, acting now on building energy efficiency.

Make public buildings a model of sustainability

- Retrofit all City buildings with significant energy usage
- Expand solar power on City rooftops (100 MW)

Create a thriving market for energy efficiency

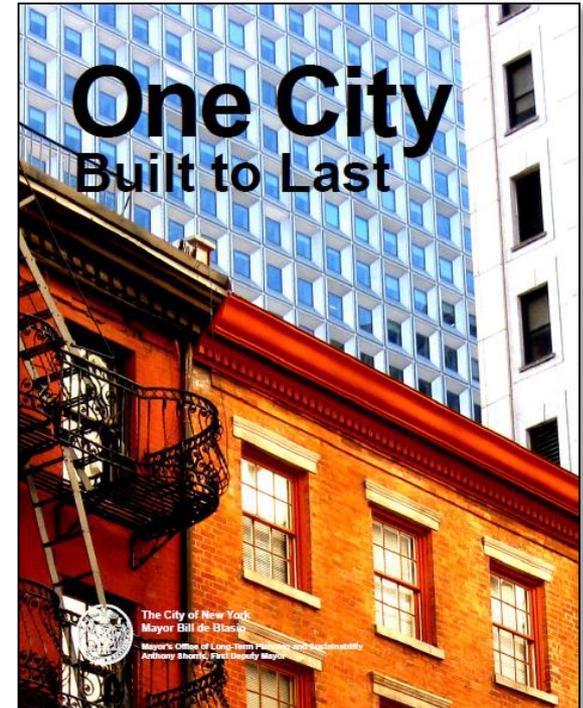
- Launch a retrofit accelerator to assist private building owners
- Expand solar power on private rooftops (250 MW)

Develop world-class building and energy codes

- Raise code standards for new construction
- Enhance enforcement of existing codes

Become a hub for cleantech and innovation

- Support research in clean energy trends
- Expand incubator programs for energy entrepreneurs



In the spring, the City will continue this effort with the release of PlaNYC, upgrading its entire sustainability and resiliency agenda to support equity and growth in all five boroughs.

These Risks Demand Leadership

New York City continues to lead the way in adapting to the risks of extreme weather and a changing climate.



- Though New York has always been **vulnerable to coastal flooding**, Sandy and FEMA's maps show this **vulnerability** to be **greater than previously understood**.
- The City's work shows that not only is this **vulnerability likely to grow with climate change**, but that it also will involve **more than just coastal storms**.
- An economic analysis shows a **real cost of inaction**
- According to FEMA, **every \$1 invested now saves \$4 later** through reduced damage



We've made significant early progress on this plan; we have more work to do to build a stronger, more resilient New York.



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The City of New York