



**A STRONGER,
MORE RESILIENT
NEW YORK**

GISMO

June 18, 2014



The City of New York
Mayor Michael R. Bloomberg

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

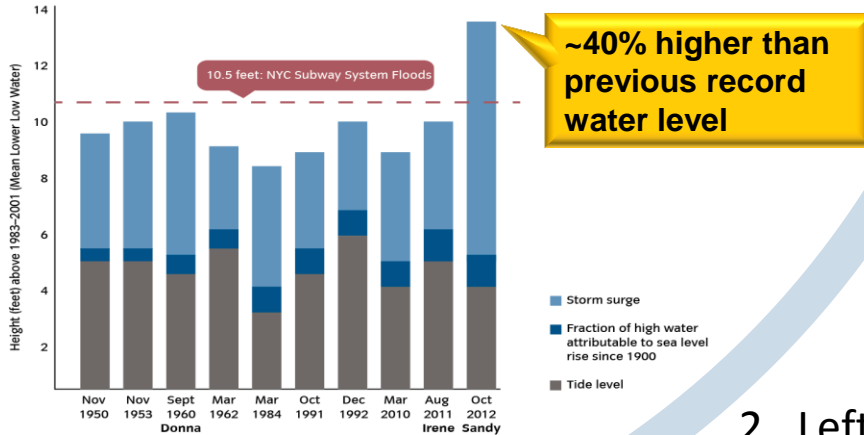
How do we rebuild post-Sandy and prepare for a future with climate change?

Agenda

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

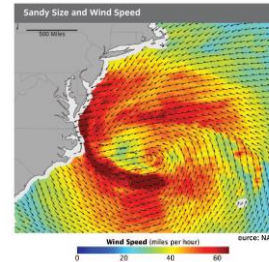
Sandy

An idiosyncratic event for NYC...



Why?

1. Wind Field



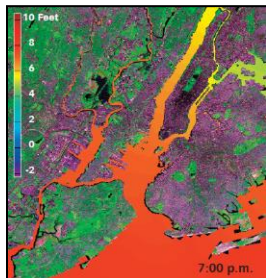
- 1,000 mile wind field pushed water into the NY Bight and caused record 32' waves off Rockaway coastline
- Wave action caused severe structural damage to buildings

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

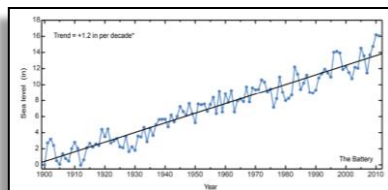
Result:

- 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.

...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 68,200 structures

...and has recently finalized climate projections out to 2100.

- Sea levels likely to rise 2-4 ft.; maybe 6 ft. by the end of the century

Sandy and the Risks of Climate Change

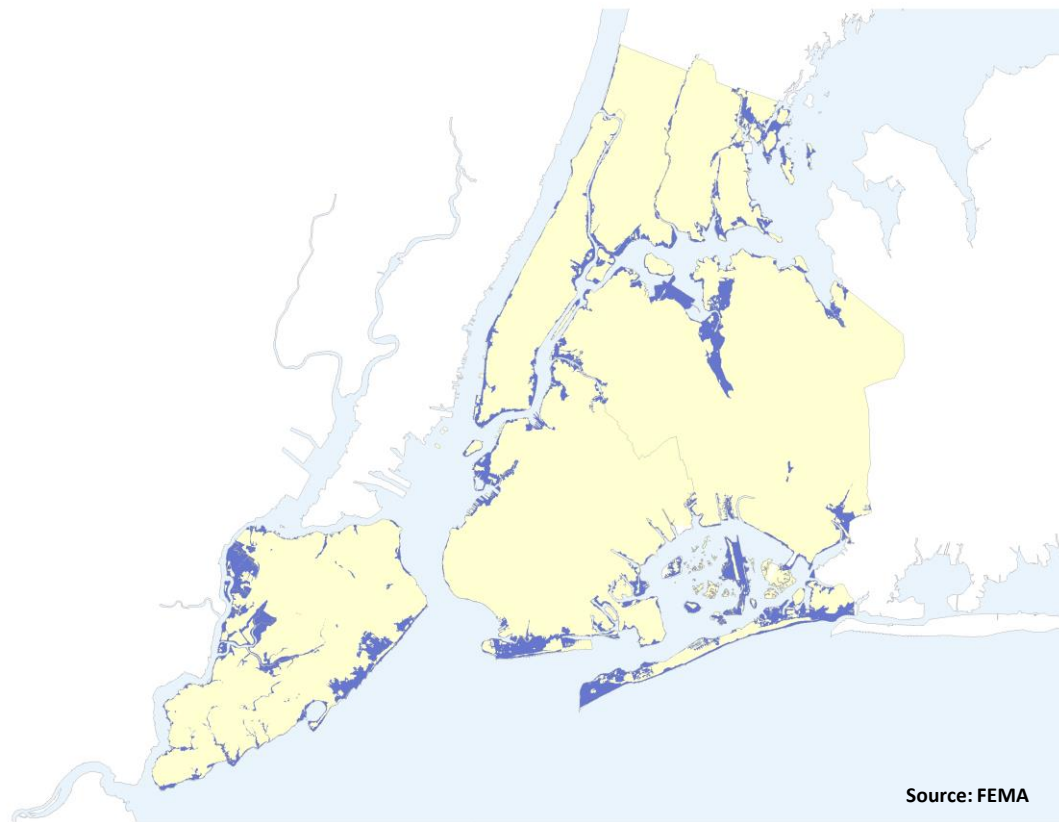
From this analysis, we learned several lessons.

- 1 Building codes work**
 - 1-story, timber, pre-1961 were 18% of inundated buildings; 73% of heavily damaged structures
 - New development, such as Arverne-By-The-Sea, was virtually unscathed
- 2 Infrastructure systems are linked and regional**
 - When the power goes out, nearly every other system is affected
 - Supply chains outside the City need to be hardened against emergencies
- 3 Prepared communities bounce back more quickly**
 - Neighborhoods with strong ties and effective local non-profits are able to recover faster
 - Underlying challenges can hamper response, recovery, and resiliency efforts
 - The current flood insurance regime is broken
- 4 We must reject the false dichotomy of green vs. grey infrastructure**
 - The right solutions are locally-tailored and utilize hybrid solutions
 - There is no single silver bullet solution
- 5 Sandy wasn't a worst case scenario**
 - The timing of the storm, both relative to the tide and to the time of year, determined its impacts
 - Sea level rise will continue to make flooding more likely
- 6 We are vulnerable now and must act to reduce our risks**
 - The risks of extreme weather are here now
 - The Sandy supplemental funds provide a unique opportunity to invest now to reduce future costs

The Risks of Climate Change

Prior to Sandy, the best indicator of New York's vulnerability to extreme weather could be found in FEMA's 1983 flood maps.

FEMA 1983 Flood Maps (FIRMs)



The 100-year floodplain as mapped in 1983 today covers about*:

- **218,000 residents**
- **214,000 jobs**
- **36,000 buildings**
- **377MSF of floor area**

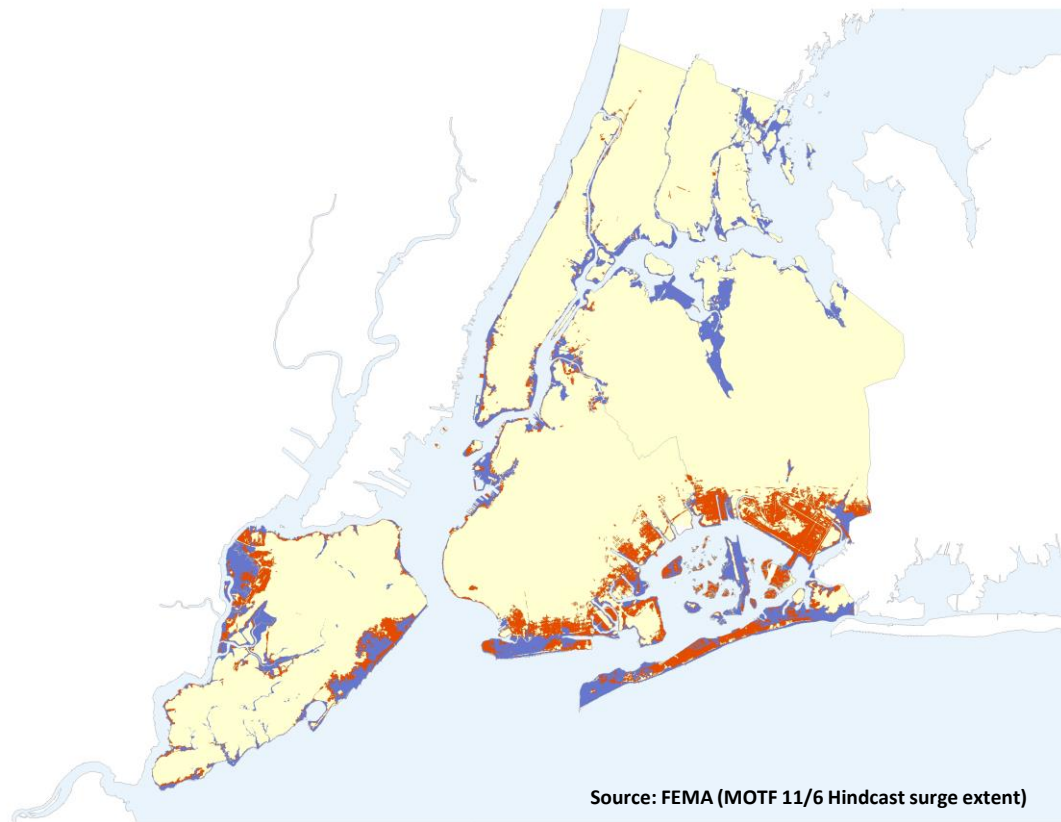
* Numbers are rounded for clarity

100-Year Floodplain (FEMA 1983 Maps)

The Risks of Climate Change

However, Sandy demonstrated that New York is actually even more vulnerable than previously thought.

FEMA 1983 Flood Maps vs. Sandy Inundation Area



- 100-Year Floodplain (FEMA 1983 Maps)
- Sandy Inundation Area

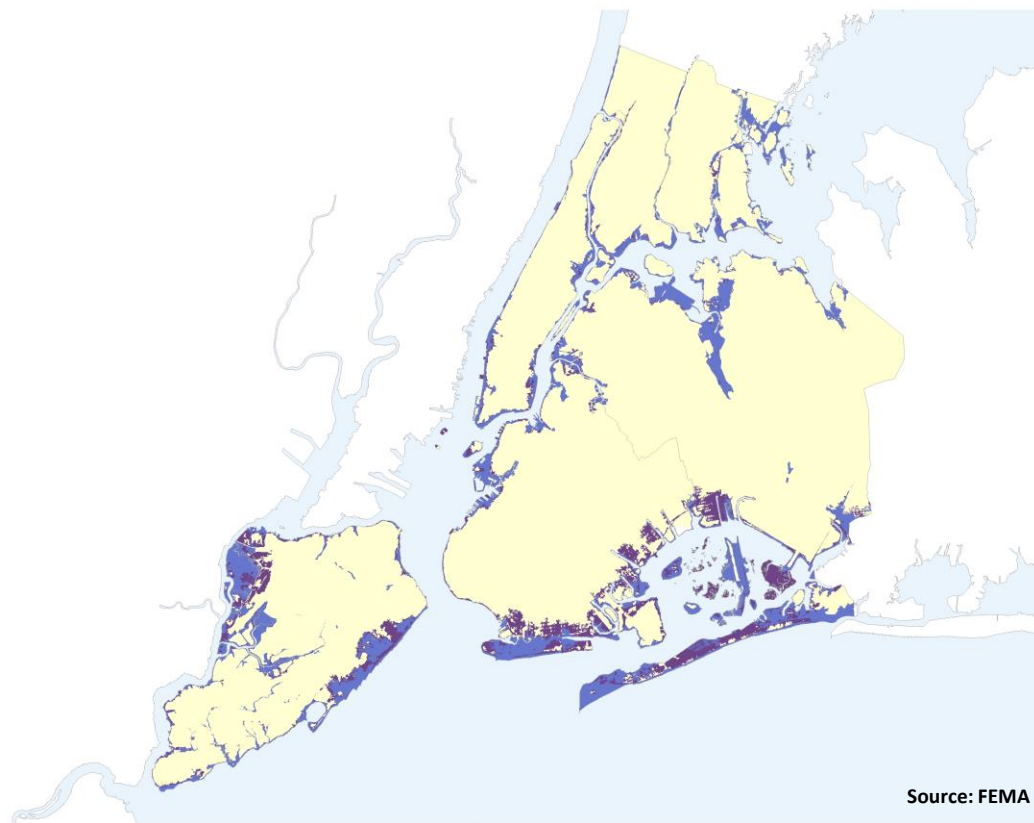
Share Outside 100-Year Floodplain

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

The Risks of Climate Change

Consistent with this analysis, FEMA has recently released new maps in a process that began before Sandy.

FEMA 1983 FIRMs vs. December 2013 Preliminary FIRMS



- 100-Year Floodplain: V and A Zone (FEMA 1983 Maps)
- 100-Year Floodplain: V and A Zone (FEMA 2013 Preliminary FIRMS)

100-YEAR FLOODPLAIN*			
	1983 Maps	2013 Pre-FIRMS	Change (%)
Residents	218,000	398,000	82%
Jobs	214,000	271,000	27%
Buildings	36,000	68,200	89%
Floor Area (SF)	377M	534M	42%

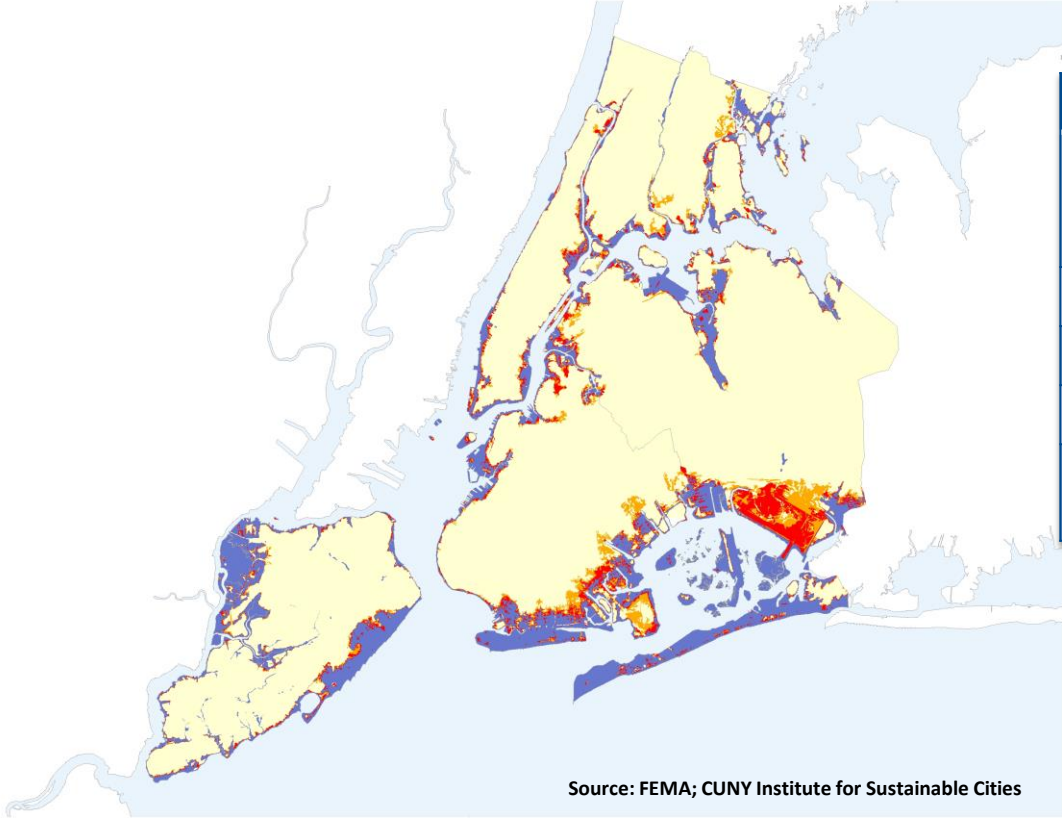
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FEMA released the first draft of regulatory flood maps (Preliminary FIRMS) in December of 2013. Final FIRMS are expected to be ready as early as 2016.

The Risks of Climate Change

Using the NPCC projections, the City, with the CUNY Institute for Sustainable Cities, developed maps showing how these floodplains will expand by the 2050s.

FEMA Preliminary FIRMs, with 2020s and 2050s Floodplain Growth



- 100-Year Floodplain (FEMA 2013 Preliminary FIRMs)
- 100-Year Floodplain (Projected 2020s)
- 100-Year Floodplain (Projected 2050s)

100-YEAR FLOODPLAIN*			
	2013 Pre-FIRMs	2050s Projected	Change (%)
Residents	398,000	801,000	101%
Jobs	271,000	430,000	59%
Buildings	68,000	114,000	68%
Floor Area (SF)	534M	855M	60%

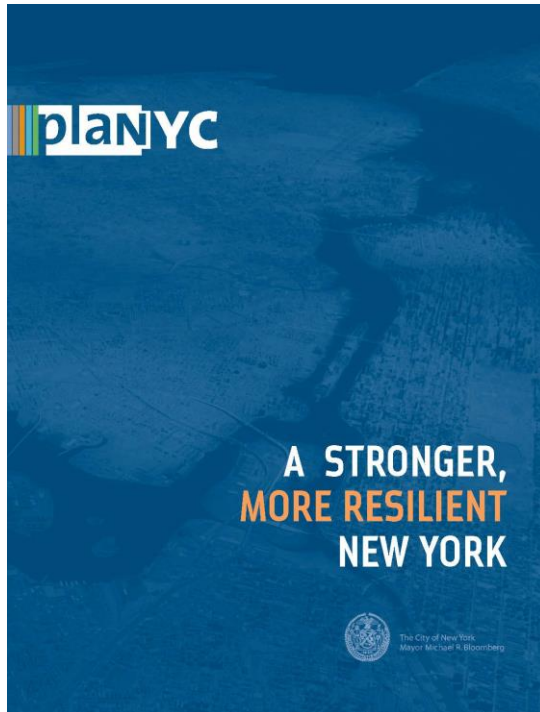
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A Stronger, More Resilient New York

The City's plan, released in June 2013, will make all New Yorkers safer using a multi-layered approach based on the best available science.



Strengthen coastal defenses

- Complete existing USACE coastal risk reduction projects
- Expand natural protections and other innovative measures

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 challenges during the rebuilding process

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.**

Overview

Spatial analyses were conducted for the city's critical infrastructure to better understand the risk to our neighborhoods, critical services, businesses, and vulnerable populations

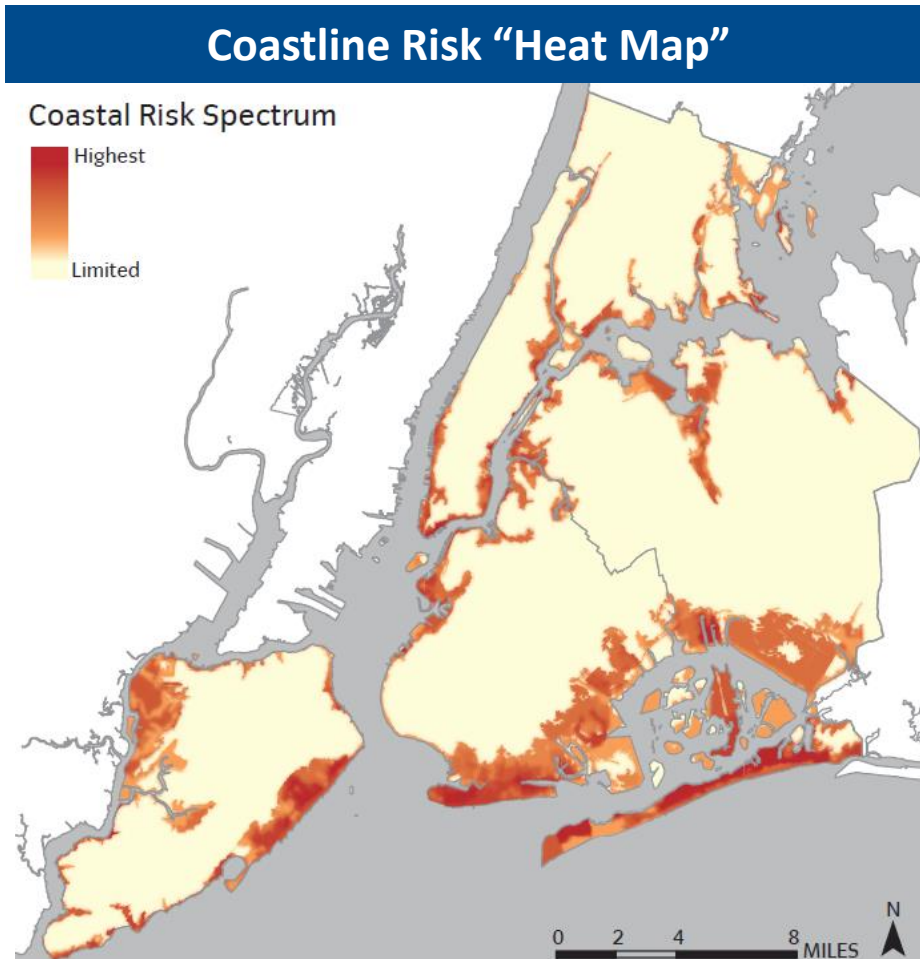


Critical Infrastructure

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

Risk Assessment

To guide its first investments, the City identified areas at highest risk from coastal storms.



Highest priorities are areas with:

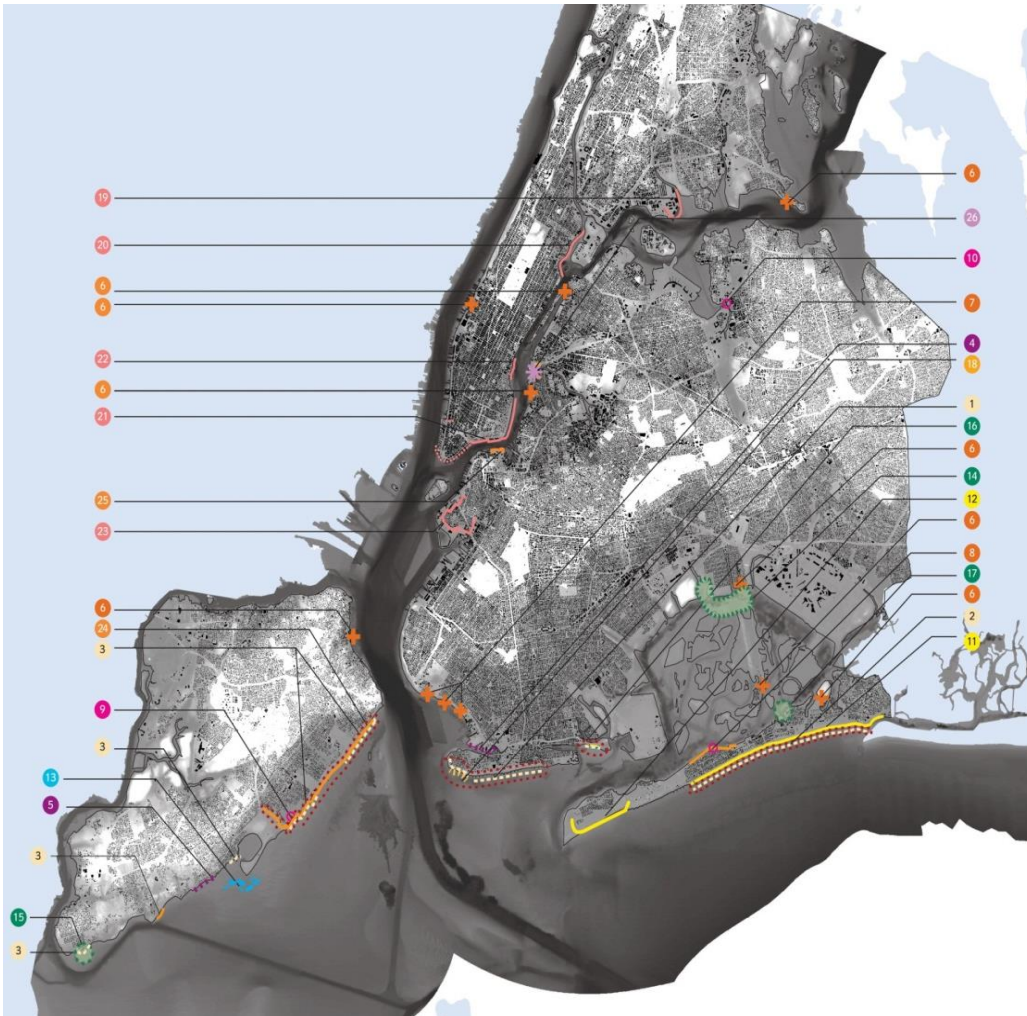
- Highest **storm surge probability**
- Most **“floodable FAR” and density**
- Most **critical infrastructure**
- Most **vulnerable populations**



Invest first in areas of highest risk

Physical Resiliency – Coastal

The City's plan includes detailed recommendations for a first line of defense on the coastline.



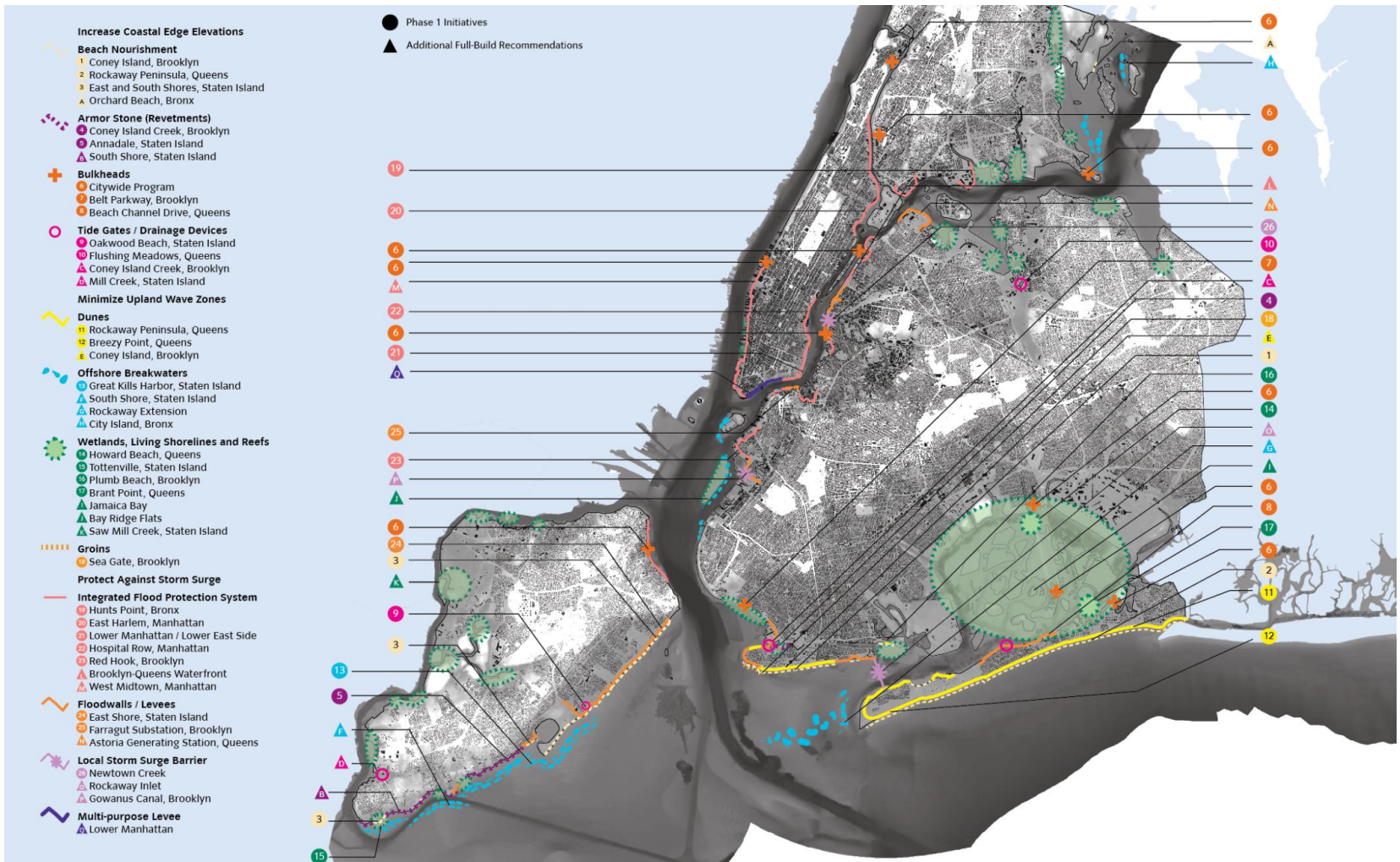
Proposals

The **1st phase** of the \$3.7 billion plan will include 37 initiatives to protect vulnerable areas from waves and inundation based on four key strategies:

1. Increase coastal edge elevations
2. Minimize upland wave zones
3. Protect against storm surge
4. Improve coastal design and governance

Physical Resiliency - Coastal

As additional resources are found, the City's plan calls for the completion of a full-build set of coastal protections that expand on its first phase strategies over time.



Physical Resiliency - Buildings

The PLUTO dataset was used to pull land use information and building typologies to determine the risk of buildings in the floodplain.



Physical Resiliency – Buildings

As well as detailed recommendations for protecting buildings...

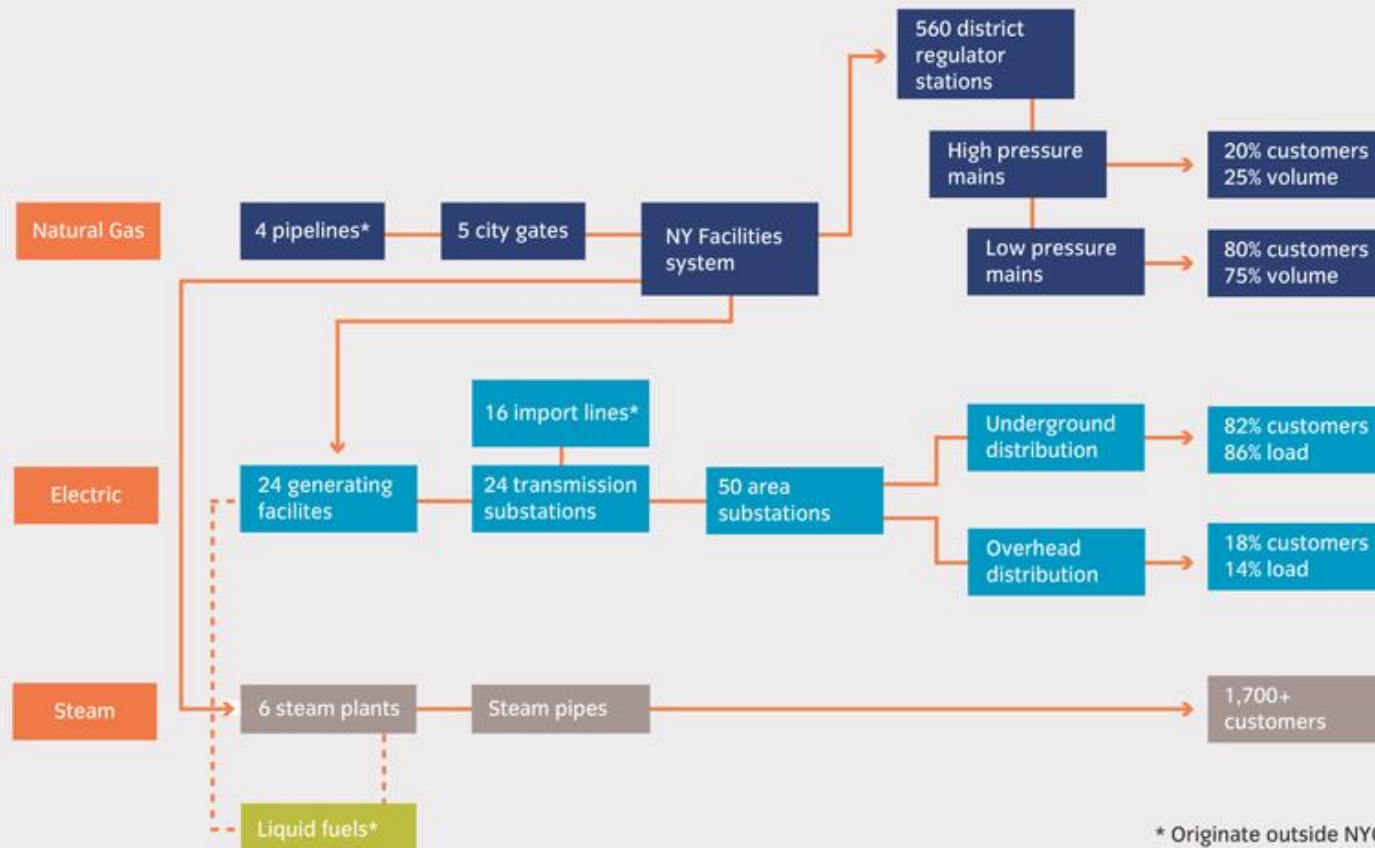


Buildings

- **Strengthen City building code** to increase flood and wind resiliency **for new buildings**
- **Guidance** to building owners on compliance
- For 68,200 existing buildings in floodplain, initiate a **\$1.2B retrofit incentive for protection** of building systems and, for the most vulnerable buildings, structural integrity. **\$120 million** is already in hand for this program.
 - **Funds reserved** for small homes, industrial buildings, and affordable housing in each borough
 - **Mandate** key system protection **for largest buildings** in City by 2030
- Work with FEMA to **reform the National Flood Insurance Program** and provide for premium credits for risk reduction measures

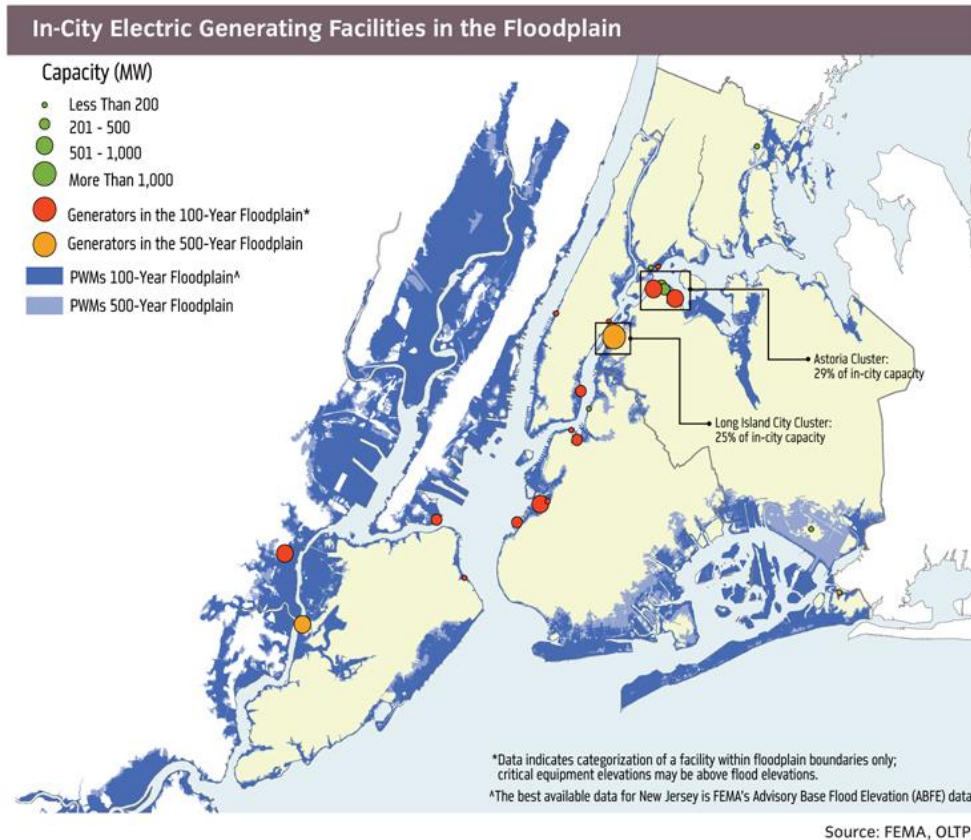
Physical Resiliency - Utilities

Diagram of the Utility Systems



Source: OLTPS

Physical Resiliency - Utilities

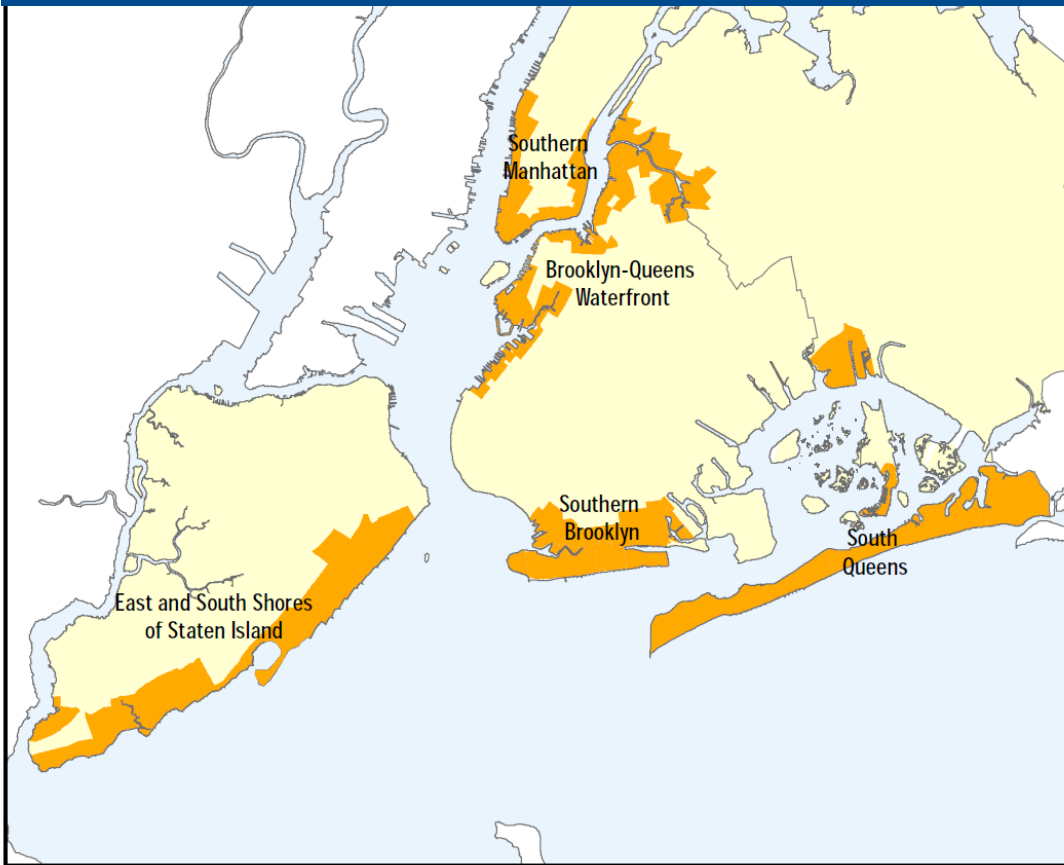


- **53%** of Electric Generating Facilities are in the 100-year floodplain.
- Data used to develop a **risk assessment model**.
- **Worked successfully with City's electric utilities to:**
 - **Harden existing infrastructure** to increase flood and heat resiliency
 - **Reconfigure networks for greater redundancy**

Social and Economic Resiliency

While focusing on citywide systems and infrastructure, the City also developed plans to help Sandy-impacted areas to rebuild safer and stronger.

Sandy-Impacted Communities



- Focus on areas where physical damage has lingered
- Incorporate citywide resiliency initiatives (rebuilding programs for homes, businesses, and infrastructure)
- Prioritize rebuilding, but seek to address underlying challenges
- Identify locally-preferred initiatives, like the \$18 million “Neighborhood Game Changer Competition”

A Resilient Transformation

Bold thinking can transform neighborhoods and provide for enhanced safety, economic development, and stronger communities.



Coney Island Creek Tidal Barrier

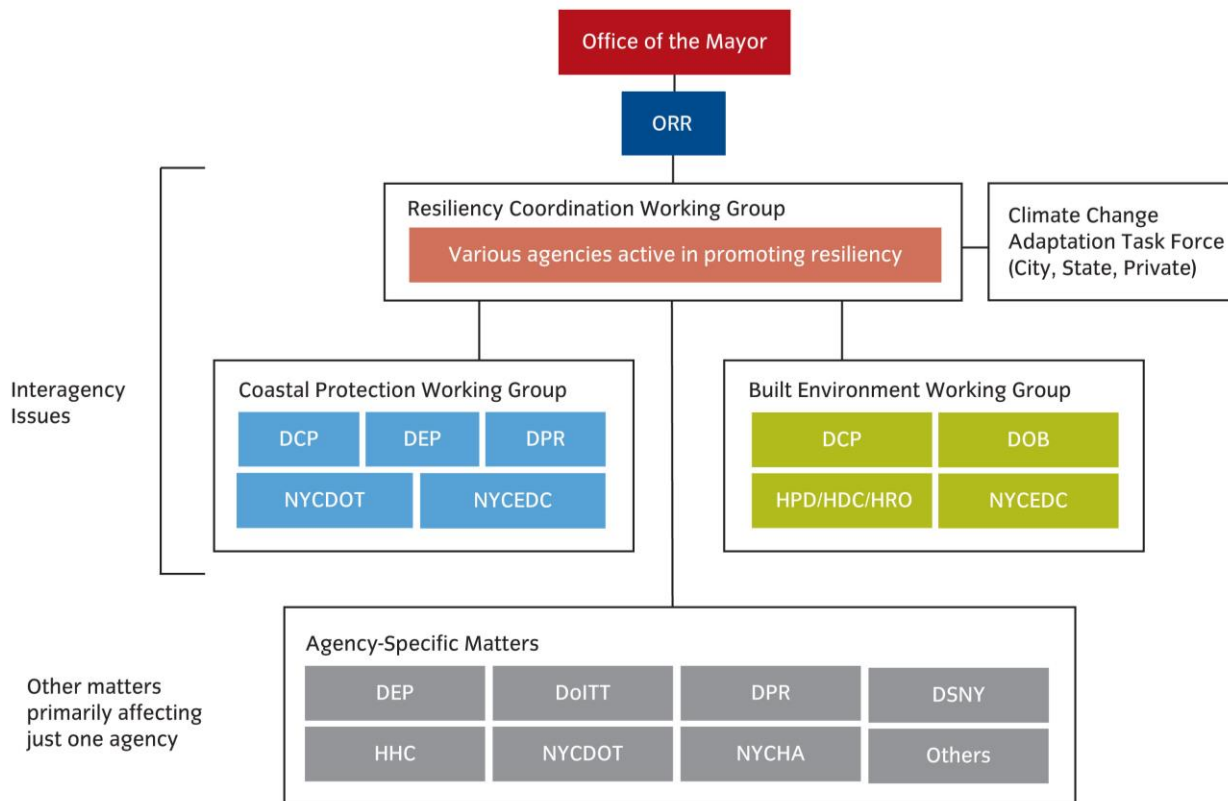
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Resiliency Team

A team of professionals is working to advance the City's interagency resiliency initiatives from within the Mayor's Office.

Interagency Coordination



Each agency has assigned a resiliency coordinator to the following groups:

- Coastal Protection Working Group
- Built Environment Working Group
- Resiliency Coordination Working Group

The Climate Change Adaptation Task Force includes City, State, and private infrastructure operators. *See LL42 (2012)*

Implementation

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

1

Strengthening Coastal Defenses



- Placed 1.2m cy of sand on City beaches
- Secured \$50 million of State HMGP for Howard Beach
- Launched feasibility study of multi-purpose levee

2

Upgrading Buildings



- Signed 17 of 22 local laws to improve building resiliency
- Launching building resiliency incentive program

3

Protecting Critical Infrastructure and Services



- Supported ConEd's \$1 billion in resiliency investments
- Secured \$7.5 million USDA grant for bluebelts
- Launching telecom resiliency office

4

Making Neighborhoods Safer and More Vibrant



- Advocated for affordability measures in NFIP
- Released Staten Island beach concession RFEI
- Cooperated with NY Rising / Rebuild by Design

Other Resiliency Programs

Continued collaboration and coordination with other State, Federal, and private resiliency efforts will pay long-term benefits.



NY Rising Community Reconstruction Program

- Sixteen local communities with a total of \$194 million
- Community planning process will guide upcoming allocation decisions



HUD's Rebuild by Design Program

- Regional competition to identify innovative resiliency projects
- Five teams currently working locally, with City collaboration
- Winners announced in Spring 2014 with implementation pending



USACE North Atlantic Coast Comprehensive Study

- \$20 million study of flood vulnerabilities from Virginia to Maine
- Will be delivered to Congress by January 2015
- Could result in new Congressional authorizations for projects in New York City



Rockefeller Foundation's 100 Resilient Cities

- \$100 million initiative to promote urban resiliency
- New York City was selected in the first round with 32 other global cities

These Risks Demand Leadership

New York City is uniquely positioned 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 must take immediate steps to address these climate challenges;
New York City can not ignore these risks.**



Website: www.nyc.gov/resiliency
Email: elindsey@cityhall.nyc.gov

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The City of New York