

A group of women are playing soccer on a green field. In the background, the Manhattan Bridge is visible, spanning across the frame. The sky is blue with some light clouds. The players are wearing purple and blue uniforms. One player in a purple uniform is running with the ball, while others in blue uniforms are chasing her. A referee in a light blue shirt is also visible. The overall scene is an outdoor sports event.

#ONENYC

Weathering the Storm: Resilience & Sustainability in Design & Construction

ACCL/ACOEL Joint Program

April 27, 2018

Hurricane Sandy

The City's action on climate change took on new urgency after Hurricane Sandy struck the region in October 2012...



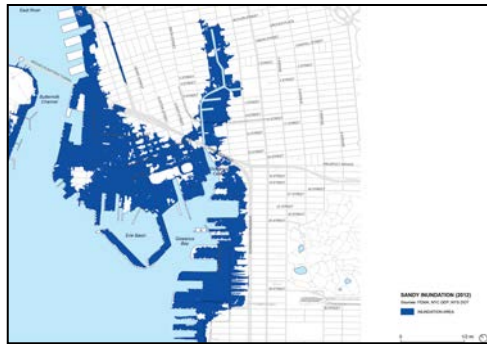
- 44 lives lost
- \$19 billion in damages and lost economic activity
- Thousands of New Yorkers were displaced from homes
- 51 square miles (17% of NYC land mass) flooded
- 88,700 buildings were inundated, including 23,400 businesses
- 2,000,000 people lost power, many for weeks and longer

Major disruptions to lives, neighborhoods, and infrastructure demonstrated our vulnerabilities to coastal storms and the risks of a changing climate.

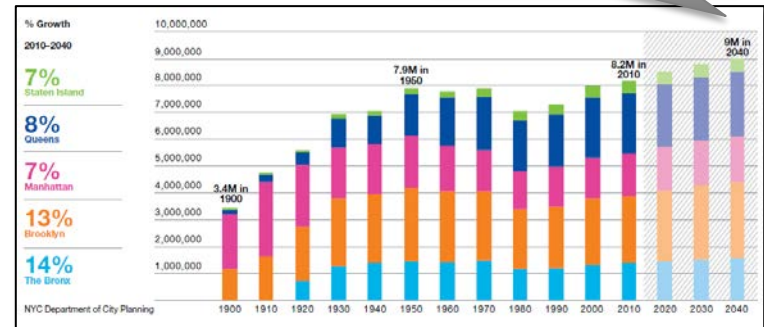
Existing Vulnerabilities

...But we know that Sandy is not the only risk we face. As we look toward the future, we must take stock of our current challenges...

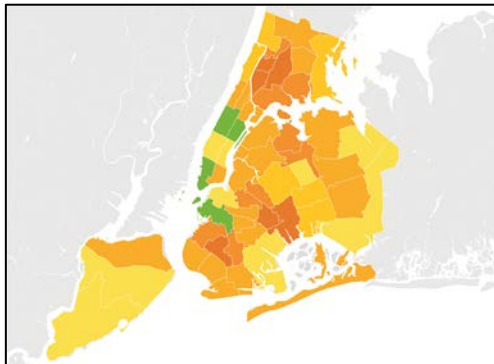
9 million by 2040



Hurricane Sandy



A growing population



Increasing inequality

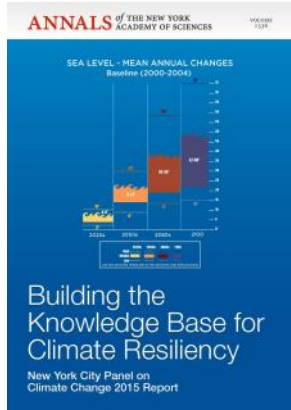


Aging infrastructure

Climate Vulnerabilities

...And grapple with the impacts of climate change on our city.

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

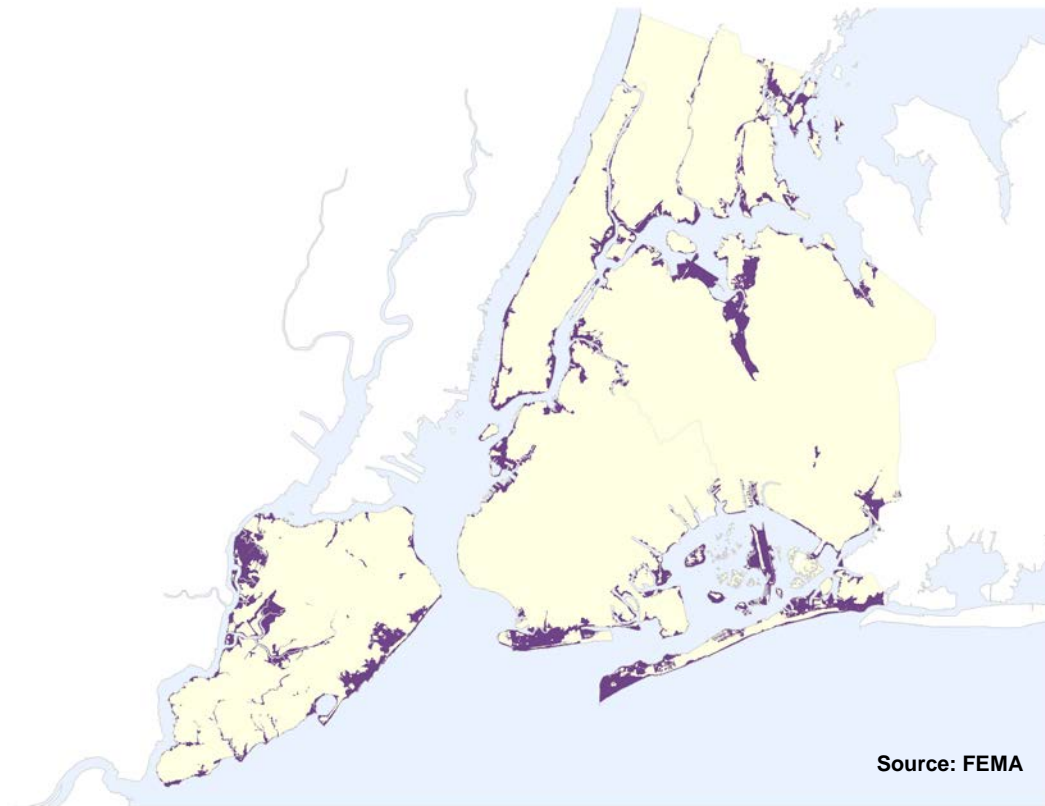
Even today:

- 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

Flood Risk

Prior to Sandy, FEMA's Flood Insurance Rate Maps, initially produced in 1983, were the best indicator of flood risk in the five boroughs...

FEMA 2007 Flood Insurance Rate Maps (FIRMs)



FEMA 2007 FIRMs 100-year Floodplain

100-year Floodplain*

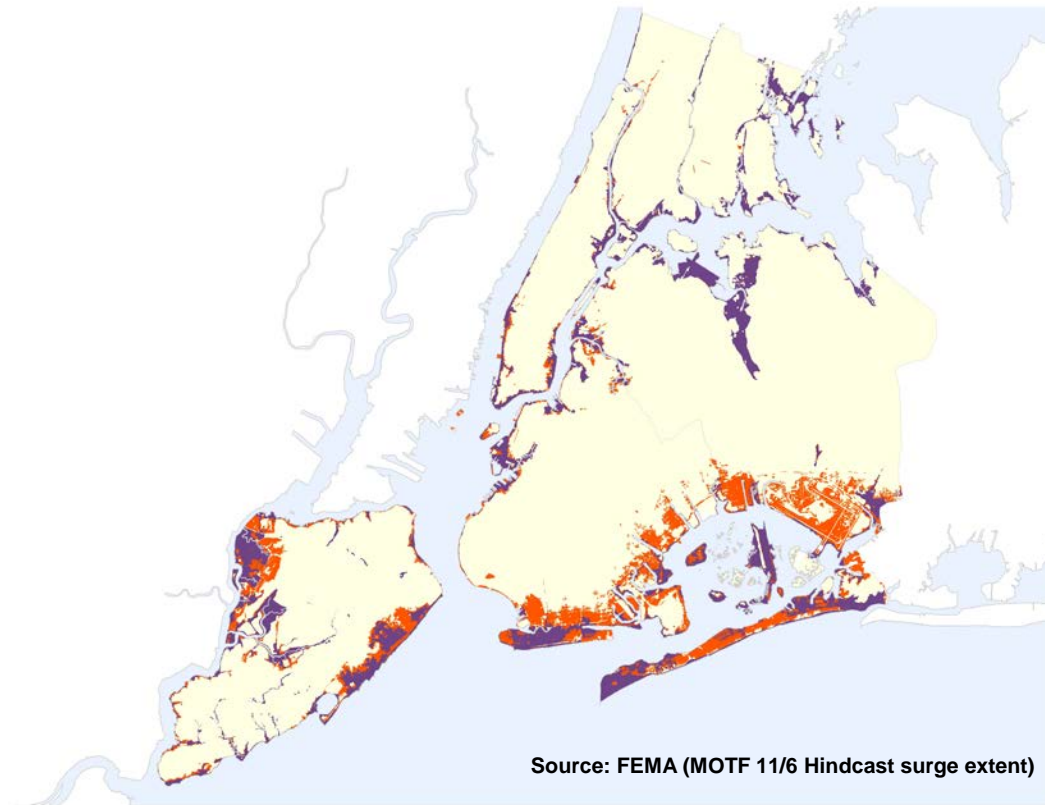
1983 FIRMs	
Residents	218,000
Jobs	214,000
Buildings	36,000
1-4 Family	26,000
Floor Area (Sq Ft.)	377M



- FIRMs not significantly updated since 1983
- City called on FEMA to initiate new maps in 2007

Flood Risk

...Although Sandy demonstrated that the city is more vulnerable than previously understood.

FEMA 2007 FIRMs vs. Sandy Inundation Area



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

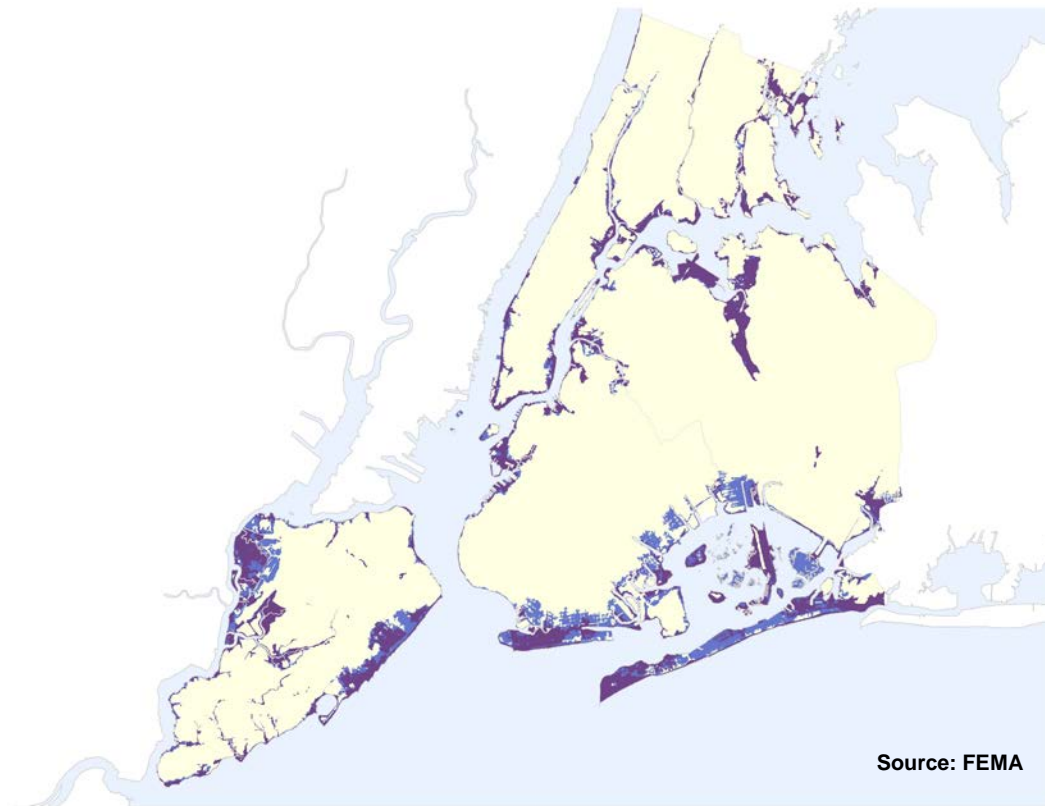
Damage outside 2007 100-year floodplain:

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

Flood Risk

The latest Preliminary FIRMs were released in December 2013 and show the city's floodplain to be 51% more expansive than previously...

FEMA 2007 FIRMs vs. Preliminary FIRMs



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

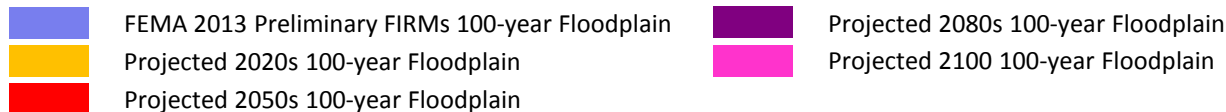
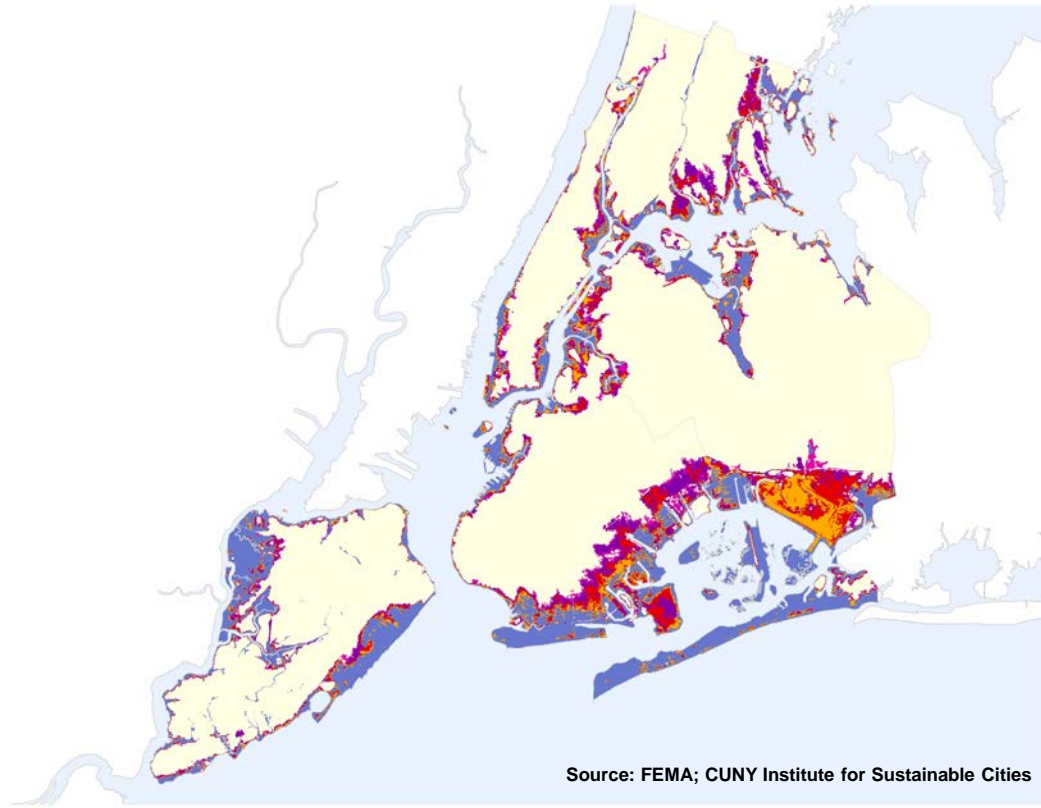
	100-year Floodplain*		
	2007 FIRMs	2013 PFIRMs	Change (%)
Residents	218,000	400,000	83%
Jobs	214,000	290,800	35%
Buildings	36,000	71,500	99%
1-4 Family	26,000	57,400	120%
Floor Area (Sq Ft.)	377M	532M	42%

* Numbers are rounded for clarity

Flood Risk

...And leading to expanded vulnerability as sea levels continue to rise.

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%

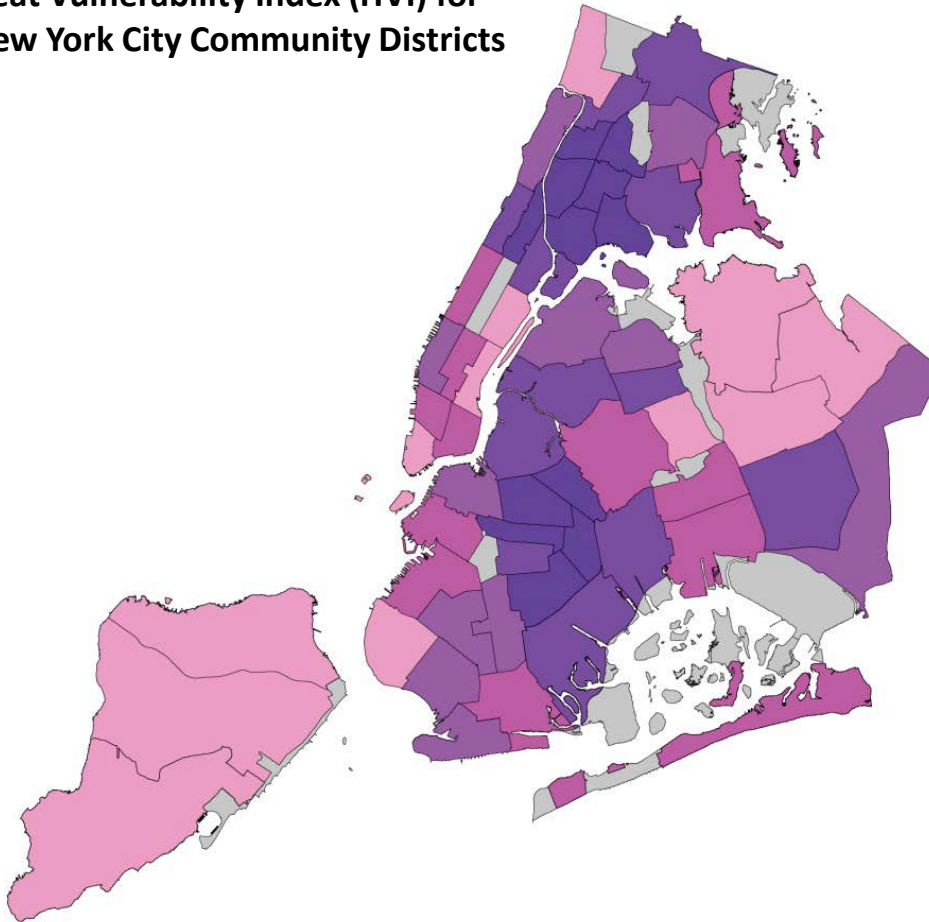
* Numbers are rounded for clarity

Over 171,000 buildings and 1.2 million New Yorkers projected to live in the floodplain by 2100.

Heat Vulnerability

Flooding is of course not our only climate vulnerability. Heat kills more than every other natural hazard, with certain neighborhoods at higher risk.

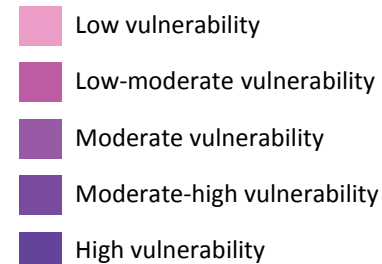
Heat Vulnerability Index (HVI) for New York City Community Districts



Top Tier Heat Vulnerable Neighborhoods

CD 316	Brownsville, Ocean Hill
CD 203	Morrisania, Crotona Park East
CD 202	Hunts Point, Longwood
CD 201	Melrose, Mott Haven, Port Morris
CD 206	East Tremont, Belmont
CD 303	Bedford Stuyvesant
CD 110	Central Harlem
CD 304	Bushwick
CD 205	University Hts., Fordham, Mt. Hope
CD 317	East Flatbush, Rugby, Farragut

Additionally, there are vulnerable populations living in all of the city's neighborhoods



OneNYC

On April 22nd, 2015, Mayor Bill de Blasio released a new long-term strategic plan to address our most pressing challenges.



One New York: The Plan for a Strong and Just City

OneNYC recognizes a historical moment:
in 2025, we will celebrate our 400th
anniversary and **begin our fifth century**

The plan **envisions** how we want our City
to look in ten years and beyond

We commit to the **goals and initiatives**
designed to achieve that long-term vision



OneNYC: Our Four Visions

This plan is organized across four strategic visions for growth, equity, sustainability, and resiliency.



**Our Growing,
Thriving City**



**Our Just and
Equitable
City**



**Our Sustainable
City**



**Our Resilient
City**

OneNYC: Our Resilient City

OneNYC strengthens and expands the City's commitment to a multilayered approach to resiliency.



Neighborhoods

Every city neighborhood will be safer by strengthening community, social, and economic resiliency



Buildings

The city's buildings will be upgraded against changing climate impacts



Infrastructure

Infrastructure systems across the region will adapt to enable continue services



Coastal Defense

New York City's coastal defenses will be strengthened against flooding and sea level rise

OneNYC: Our Resilient City

Since Sandy, the City has advanced the first phase of its coastal protection plan; along with investments in buildings, infrastructure, and communities citywide.



KEY HIGHLIGHTS

- Investing over \$20 billion in climate change adaptation citywide
- A mix of traditional engineering and nature-based infrastructure for coastal protection
- Strong partnership with USACE in Rockaways, Staten Island, Sea Gate
- \$591 million in innovative project awards from HUD across the City
- Investments tailored to specific local risks – no silver bullet solution

OneNYC: Coastal Defenses

As we strengthen coastal defenses, we also aim to create co-benefits such as improved waterfront access, recreational amenities, and more livable neighborhoods.



Existing Delancey Street Bridge crossing FDR Drive into East River Park

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Delancey Street Bridge in Preliminary Design of East Side Coastal Resiliency Project

OneNYC: Coastal Defenses

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Delancey Street Bridge During Storm Surge Event in Preliminary Design of East Side Coastal Resiliency Project

“Mainstreaming” Resilience: Climate Resiliency Design Guidelines

Goals:

- Institutionalize resiliency in capital programs.
- Establish consistent design standard for using climate data across City agencies to account for:
 - extreme heat;
 - extreme precipitation;
 - coastal storms; and
 - sea level rise.
- Make upfront investments in resiliency that provide long-term benefits:
 - preserve health and safety;
 - avoid losses from damage; and
 - maintain the services New Yorkers rely upon.
- Meet requirements of Local 42 (2012).

Climate Resiliency Design Guidelines

Historic climate data

- NOAA Atlas 14
- NWS Climate Normals
- ASHRAE Climate Zones
- Etc.

NYC BUILDING
CODE AND
ENGINEERING
STANDARDS

Forward-looking climate data

NEW YORK CITY
PANEL ON CLIMATE
CHANGE (NPCC)

ORR
Climate Resiliency
Design Guidelines

City Agency Guidelines

Climate Resiliency Design Guidelines

Who will use the guidelines?

- City agencies.
- Engineers, architects, and planners.

What kinds of projects?

- Buildings and infrastructure.
- City of New York - new capital construction and major rehabilitations.

What kinds of assets are not included?

- Coastal protection projects.
- Private developments.

What's next?

- Release version two of the guidelines, while pilot testing continues.

#ONENYC



nyc.gov/resiliency
[@NYClimate](https://twitter.com/NYClimate)