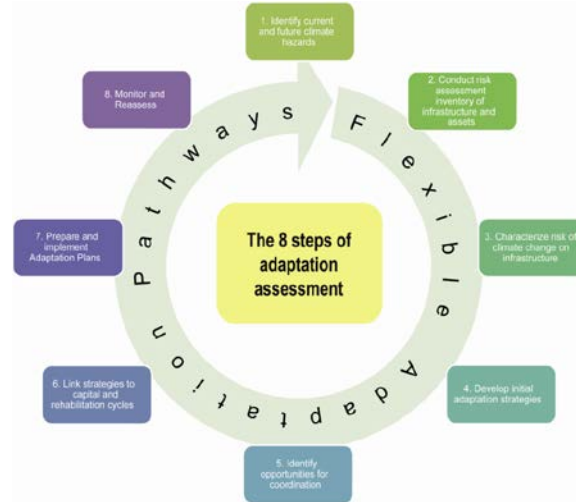
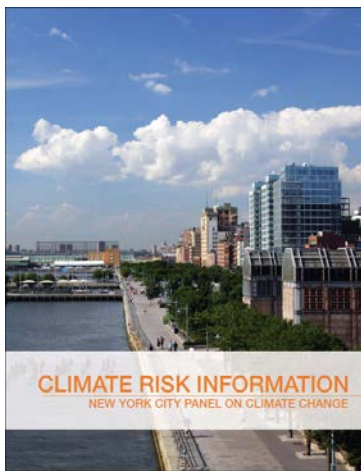


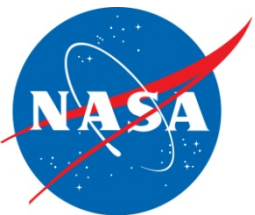
US EPA ARCHIVE DOCUMENT



# Climate Adaptation Planning in Urban Environments

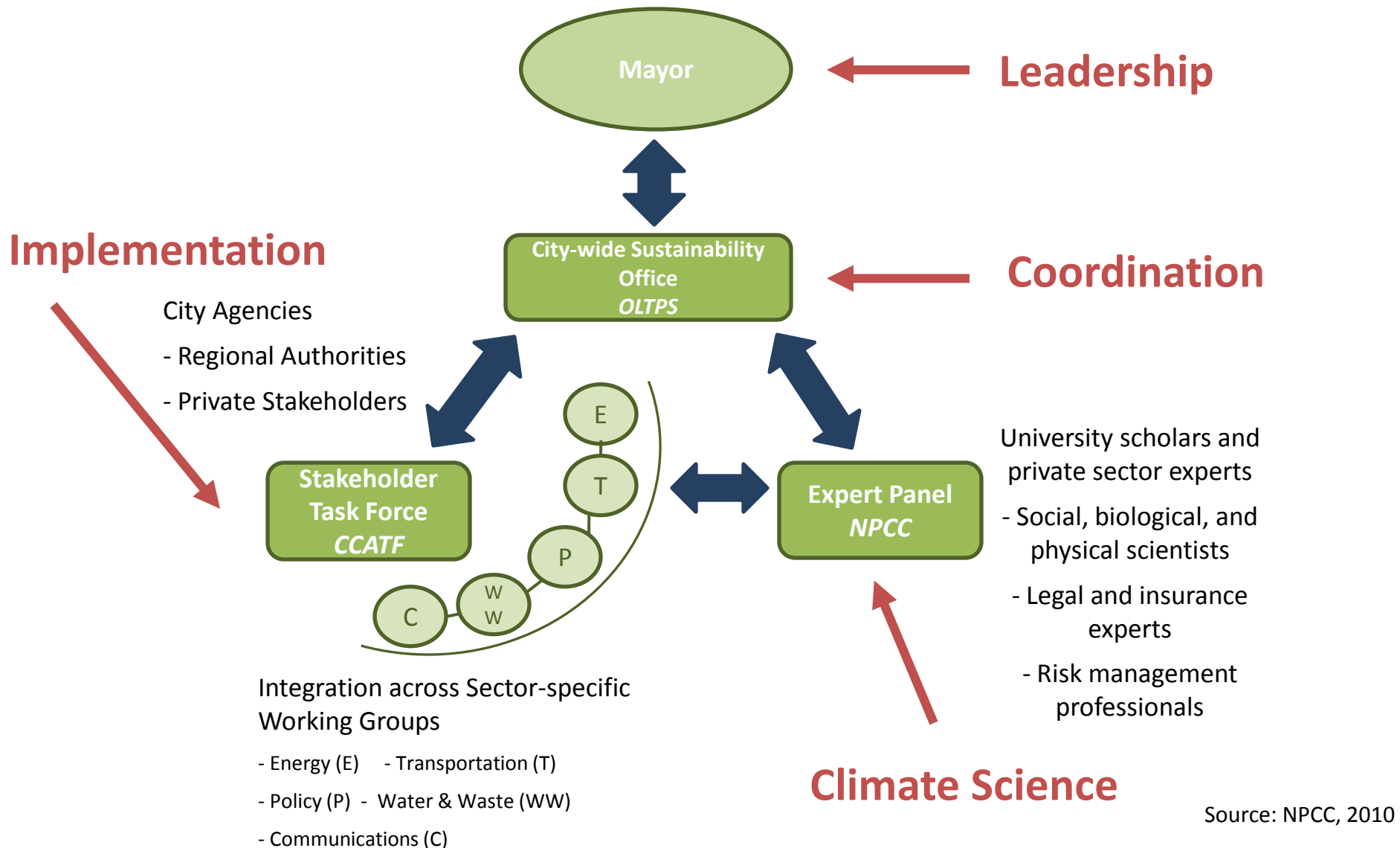
Dr. Cynthia Rosenzweig  
NASA GISS/ Columbia University

Climate Change Adaptation for State and Local Governments:  
Achieving Buy-In for Adaptation  
March 21, 2013



# New York City Adaptation Process

2008 - 2011



Source: NPCC, 2010

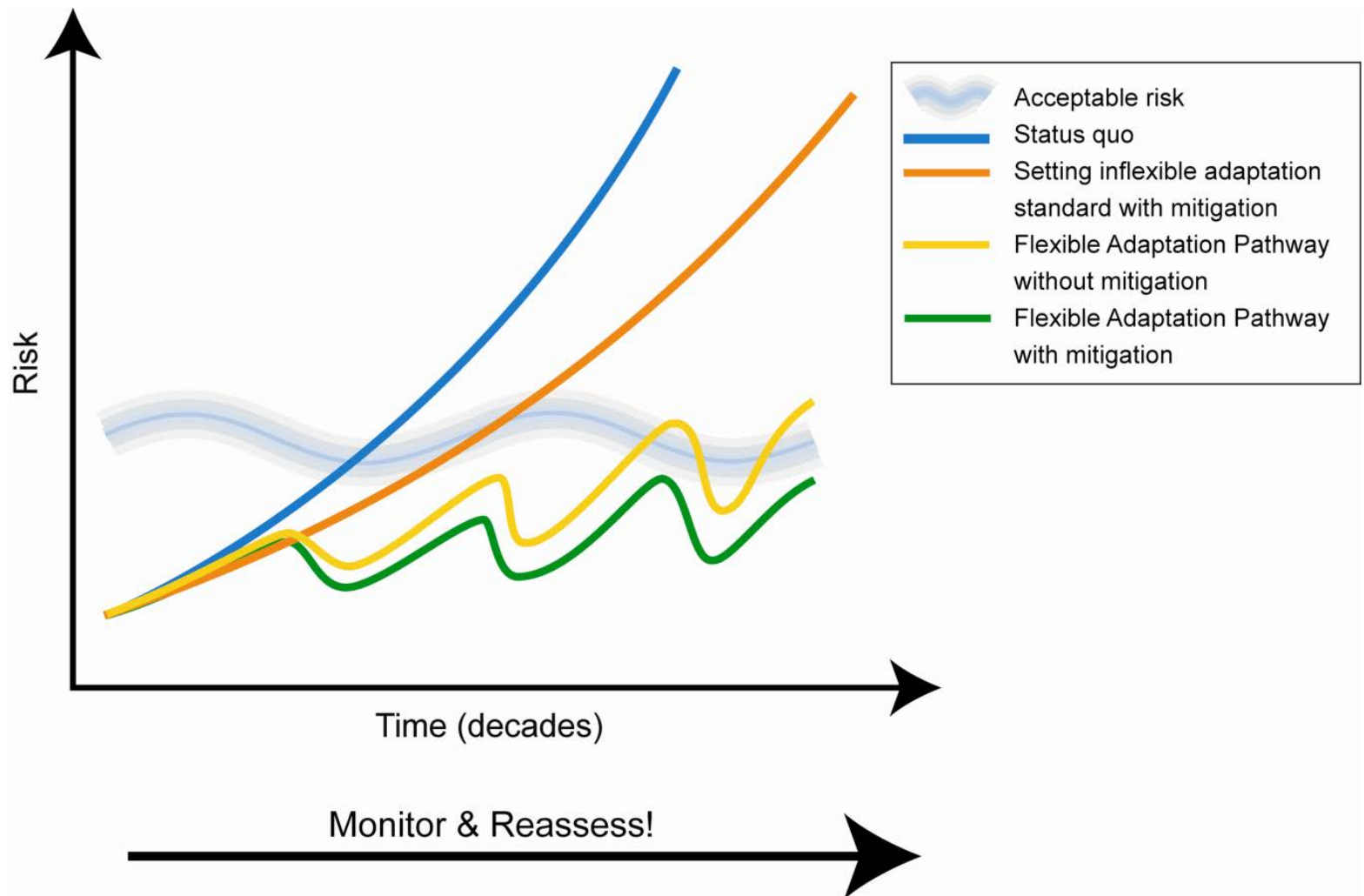


# NPCC Approach

A risk management issue



Flexible Adaptation Pathways as the response





# Information and Tools

- Foundation reports
  - Background expert knowledge
  - Best practices
  - Resource guide
- Workbooks for stakeholders
  - Climate Risk Information
  - Adaptation Assessment Guidebook
  - Climate Protection Levels
- Climate projections
  - Provided in 'tear sheet' format for stakeholders



TABLE 1. Baseline Climate and Mean Annual Changes<sup>1</sup>

	Baseline 1971-2000	2020s	2050s	2080s
<b>Air temperature</b> Central range <sup>2</sup>	55° F	+ 1.5 to 3.0° F	+ 3.0 to 5.0° F	+ 4.0 to 7.5° F
<b>Precipitation</b> Central range <sup>2</sup>	46.5 in <sup>3</sup>	+ 0 to 5 %	+ 0 to 10 %	+ 5 to 10 %
<b>Sea level rise<sup>3</sup></b> Central range <sup>2</sup>	NA	+ 2 to 5 in	+ 7 to 12 in	+ 12 to 23 in
<b>Rapid ice-melt scenario<sup>4</sup></b>	NA	~ 5 to 10 in	~ 19 to 29 in	~ 41 to 55 in

Source: Columbia University Center for Climate Systems Research



# Developing Climate Scenarios

## Process used to develop climate risk factors for New York City

### Global climate scenarios

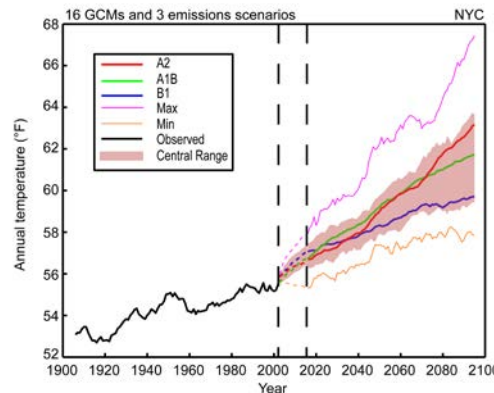
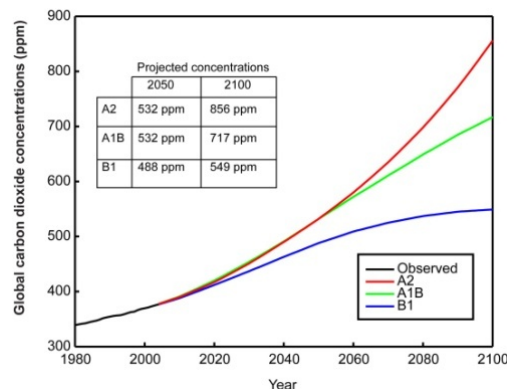
- SRES greenhouse gas emissions pathway
- GCM simulations

### Local climate change information

- Observed data
- Quantitative GCM-based projections
- Qualitative GCM-based projections

### Climate risk factors

- Generalized climate hazards of most consequence to NYC infrastructure used to determine critical infrastructure at-risk.

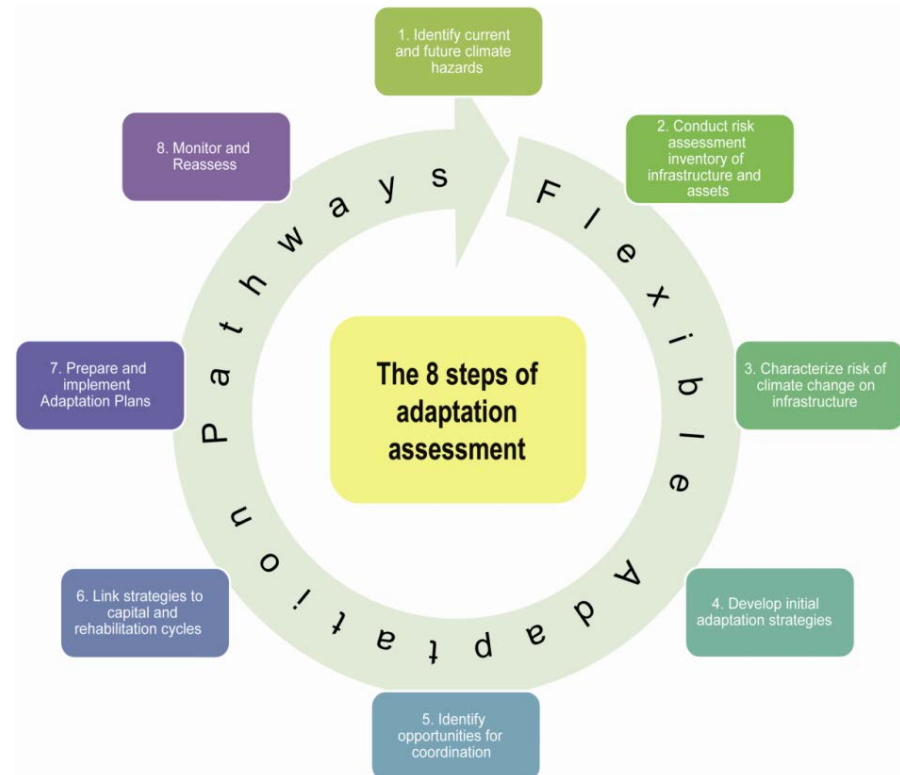


- Warmer temperatures
- More frequent and intense heat waves
- Sea level rise and coastal flooding



# Design Adaptation Process

1. Identify current and future climate hazards
2. Conduct inventory of infrastructure and assets and begin to identify vulnerabilities
3. Characterize risk
4. Develop initial list of strategies
5. Identify opportunities for coordination
6. Prioritize strategies
7. Prepare and implement Resilience Plans
8. Monitor and reassess







# Framing Adaptation

- *Reduce the level of physical, social, and economic impacts of climate*
- *Take advantage of new opportunities*



## Types

- Management/operations
- Infrastructure – physical components of each sector
- Policy

## Administrative Groups

- Private vs. public organizations
- Local/municipal, county, state, national

## Level of Efforts

- Incremental action
- Large-scale shifts

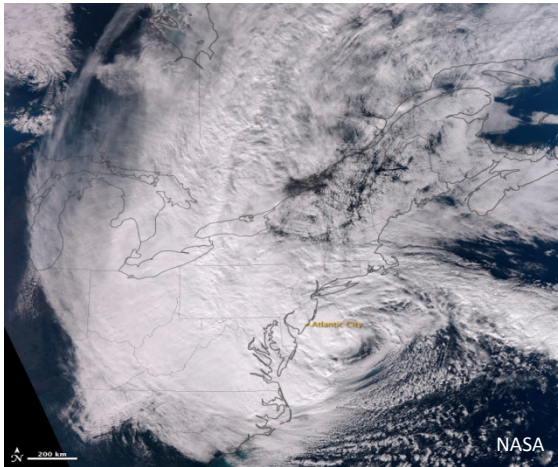
## Timing

- Short term <5 yrs; medium term 5-15 yrs; long term >15 years
- Abrupt Changes - tipping points/policy triggers

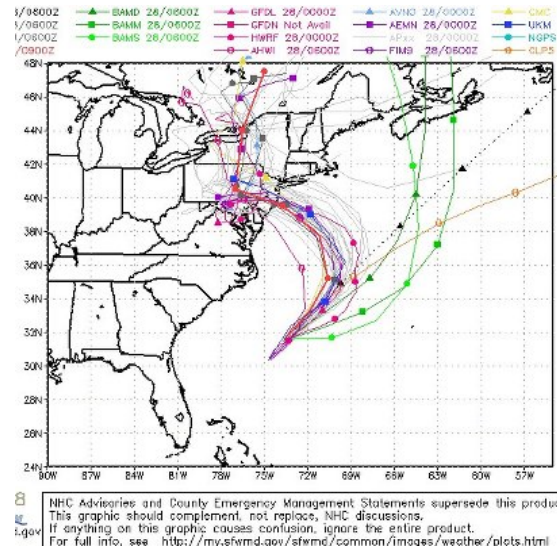


# Hurricane Sandy

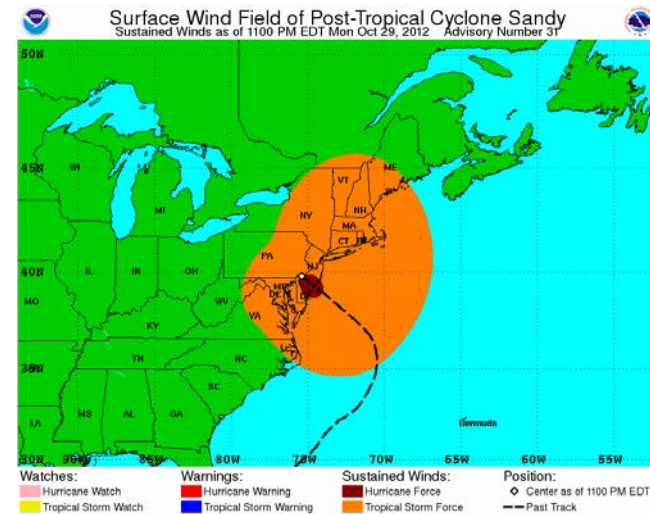
## Forecasting the Storm



**Lowest recorded central pressure north of Cape Hatteras, NC at 943 mb**



**Storm track forecasts**



**Exceptionally large wind field  
tropical storm force winds  
over ~500 miles from the  
center**

***Storm forecast well in advance***

# Hurricane Sandy

## Forecasting the Impacts

Climate Change and a  
Global City 2001

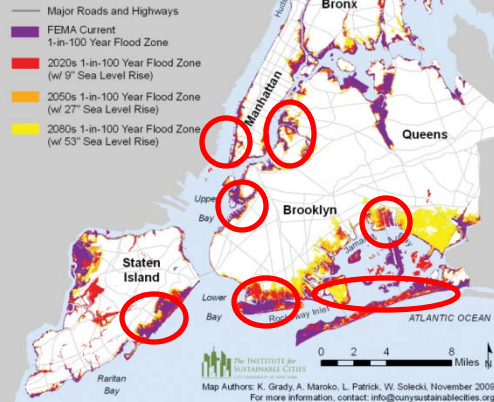
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RESPONDING TO CLIMATE CHANGE  
IN NEW YORK STATE  
SYNTHESIS REPORT

ANNALS of THE NEW YORK  
ACADEMY OF SCIENCES

Climate Change  
Adaptation in  
New York City  
Building a Risk Management Response

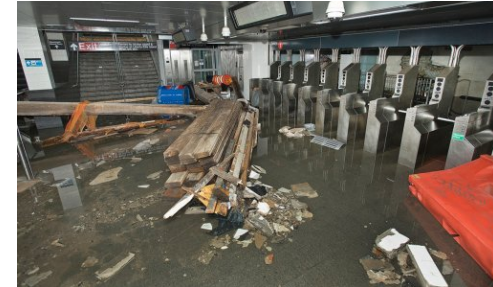
Potential future 1-in-100 yr flood  
zones for NYC using rapid ice melt  
model-based SLR projections



**Hard-hit  
areas**

*Interdependent Critical  
Infrastructure Systems  
and  
Vulnerable Communities*

**South Ferry Subway Station**



**Beach erosion and boardwalk  
damage in the Rockaways**



**Extensive power outages**



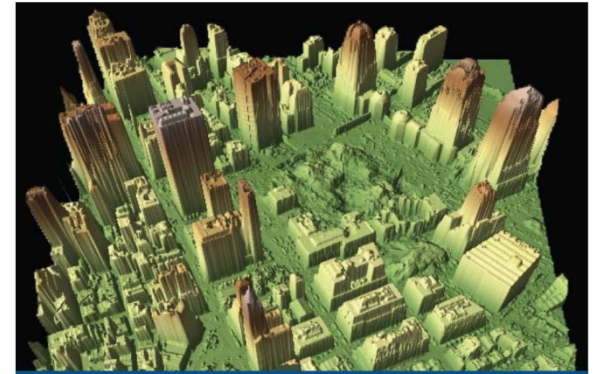
**Many impacts forecast  
well in advance**



# Hurricane Sandy

## Links to Climate Risk Responses

- Actions already underway in New York City to mitigate the impacts of climate risks
  - Planting over 300 Greenstreets, vegetation that absorbs stormwater
  - Securing citywide high-resolution LiDAR elevation data, which helps to identify the most vulnerable area
  - Incorporating sea level rise into the City's Comprehensive Waterfront Plan
  - NYC Office of Emergency Management launched enhanced emergency response and preparedness programs
- Post Sandy intensifying efforts







# Conclusions

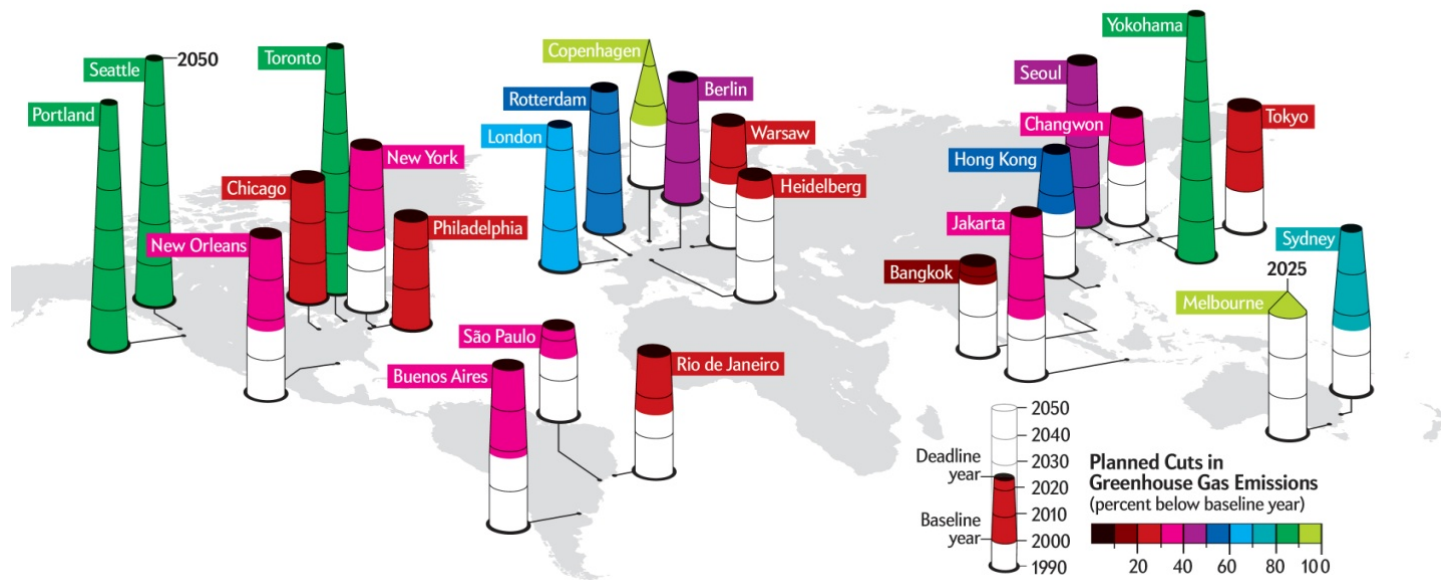
- The climate adaptation process developed in New York City can be modified for use by other agencies and cities
- Response actions are already underway in New York City and helped to reduce damages
- Recommendations include climate risk management in operations and management, infrastructure planning, and policy
- Implement both adaptation and mitigation to reduce the magnitude of risks

# KEY MESSAGE

ARC3

First UCCRN Assessment Report on  
Climate Change and Cities

## *Cities are emerging as first responders to climate change*



Mitigation: Planned cuts in greenhouse gas emissions (percent below baseline year) for cities around the globe

# URBAN CLIMATE CHANGE RESEARCH NETWORK

ARC3

First UCCRN Assessment Report on  
Climate Change and Cities



- UCCRN's Climate Change and Cities program aims to
  - Institutionalize a sustained state-of-the-knowledge assessment process of climate change science tailored for urban needs
  - Draw on the experience of cities as they act to adapt to and mitigate the impacts of climate change.
- Objectives will be accomplished through
  - Development and publication of ARC3-2
  - Development of Regional Research Centers of Action
  - Workshops
  - Networking
  - City Strategies

# References and Links

- Consortium for Climate Risk in the Urban Northeast ([www.ccrun.org](http://www.ccrun.org))
- NYSERDA ClimAID ([www.nyserda.ny.gov/climaid](http://www.nyserda.ny.gov/climaid))
- New York City Panel on Climate Change report available online at ([www.nyas.org](http://www.nyas.org))
- Urban Climate Change Research Network ([www.uccrn.org](http://www.uccrn.org))
- ClimateYou ([www.climateyou.org](http://www.climateyou.org))
  - “Learn, Share, Act” about climate change

