Climate Change in the NY Metro Area and Long Island: Understanding Impacts and Managing Risks

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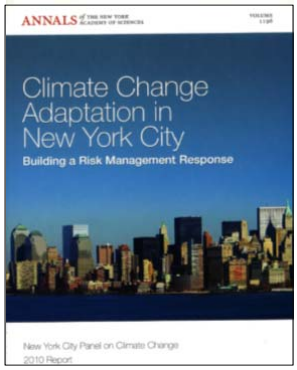
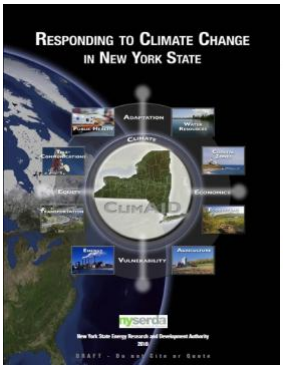


NPCC - *Climate Change Adaptation in New York City: Building a Risk Management Response*



ClimAID - *Integrated Assessment for Effective Climate Change Adaptation Strategies in New York State*

CCRUN – *Consortium for Climate Risk in the Urban Northeast*

South Shore Estuary Reserve Council Meeting • Hauppauge, NY • March 24, 2011

NYS Climate is Changing

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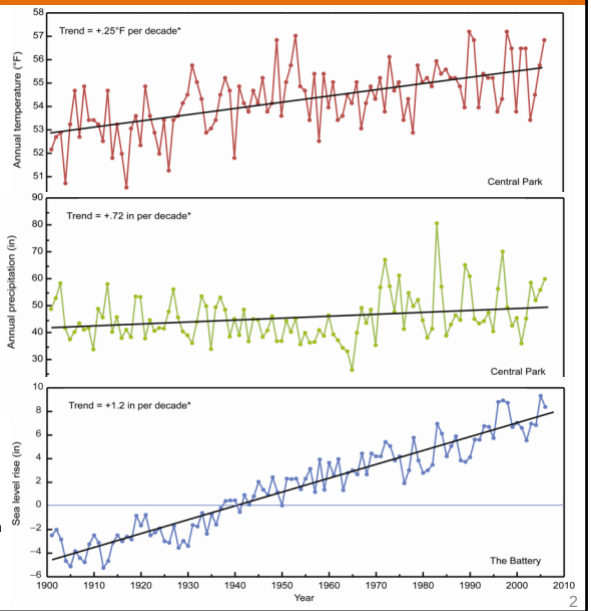
- Temperature
  - Significant warming since 1970
- Precipitation
  - Interannual variability dominates long-term trend
- Sea level
  - Significant increase over the 20th century at the Battery



Observed climate in Central Park, New York City. Temperature data are not adjusted for urbanization effects. *Trend is significant at the 95% level.

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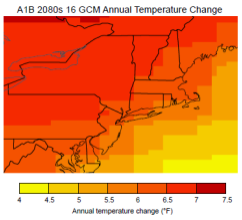
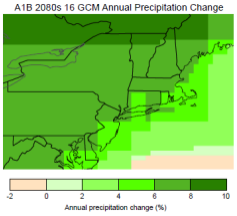
New York State Climate

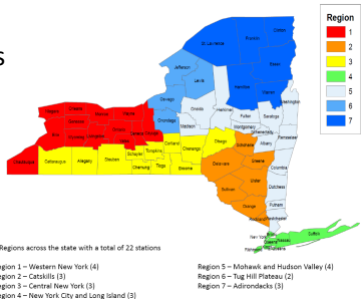
NYS ClimAID

The climate of New York State is projected to change

- Warmer temperatures with more heat waves
- More frequent and intense precipitation events







Baseline Climate and Mean Annual Changes for New York City Region

Shown are minimum, the middle 67% of values, and maximum values from model-based probabilities; temperatures ranges are rounded to the nearest half-degree, precipitation to the nearest 5%, and sea level rise to the nearest inch.

	Baseline 1971-2000	2020s	2050s	2080s
Air temperature Central range	55° F	+ 0.5 (1.5 to 3.0) 3.5° F	+ 2.5 (3.0 to 5.0) 7.5° F	+ 3.0 (4.0 to 7.5) 10° F
Precipitation Central range	46.5 in	-5 (0 to 5) 10 %	-10 (0 to 10) 10 %	-10 (5 to 10) 15 %

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New York State Climate

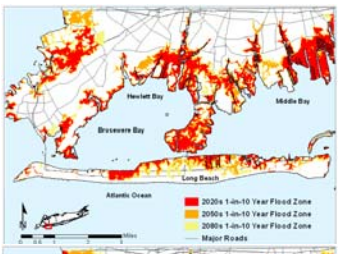
NYS ClimAID

The climate of New York State is projected to change

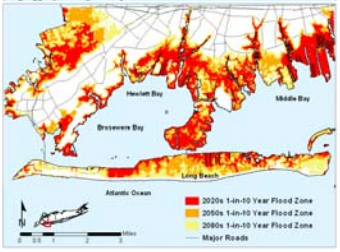
- Increased sea level rise and coastal flooding

1-in-10-year flood event

IPCC scenario



Rapid ice-melt scenario



Mean sea level rise projections

Scenario	2020s	2050s	2080s
GCM-based	+ 2 to 5 in.	+ 7 to 12 in.	+ 12 to 23 in.
Rapid ice melt	+ 5 to 10 in.	+ 19 to 29 in.	+ 41 to 55 in.

Recurrence intervals for and flood levels

New York City Extreme Event	Baseline (1971–2000)	2020s	2050s	2080s
1 in 10 yr flood	~10 yr	~8 – 10 yr	~3 – 6 yr	~1 – 3 yr
1 in 10 yr swl	6.3 ft	6.5 – 6.8 ft	7.0 – 7.3 ft	7.4 – 8.2 ft
1 in 100 yr flood	~100 yr	~65 – 80 yr	~35 – 55 yr	~15 – 35 yr
1 in 100 yr swl	8.6 ft	8.8 – 9.0 ft	9.2 – 9.6 ft	9.6 – 10.5 ft
Westhampton Beach Extreme Event	**Baseline (1971–2000)**	**2020s**	**2050s**	**2080s**
1 in 10 yr flood	~10 yr	~7 – 8 yr	~2 – 5 yr	~1 – 2 yr
1 in 10 yr swl	4.9 ft	5.1 – 5.3 ft	5.5 – 5.9 ft	5.9 – 6.7 ft
1 in 100 yr flood	~100 yr	~80 – 90 yr	~60 – 70 yr	~35 – 60 yr
1 in 100 yr swl	8.5 ft	8.7 – 8.9 ft	9.1 – 9.5 ft	9.5 – 10.3 ft

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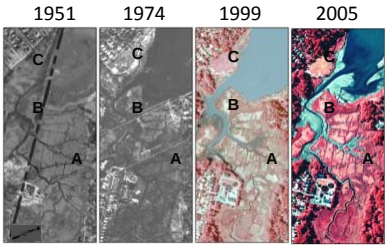
Key Impacts

	**Water**	Increased risk of river flooding, potential changes of **drinking supply**
		Increased **pollutants** in the water supply due to flooding
		Possibility of longer summer **dry periods**, impacting the ability of water supply systems to meet demands and increasing the competition for the resource
	**Coastal**	Greatly amplified risks of **storm surge-related flooding**, potential **permanent inundation** of coastal lands, increased beach erosion and alteration of barriers islands
		Loss of **key coastal habitat**, especially wetlands
		Reduction of **species diversity,** including fish and shellfish populations
	**Ecosystems**	Widespread shifts in species composition in the state's forests and other natural landscapes, with the loss of **spruce-fir forests, alpine tundra and boreal plant** communities
		Expansion of some **invasive species** into New York, such as the aggressive weed, kudzu, and the insect pest, hemlock woolly adelgid
		Increased water temperatures will negatively affect brook trout and other **native coldwater fish.**

Coastal Zones and Wetlands

- Coastal marshes and wetlands are affected by rapid **sea level rise** and wave erosion from **coastal storms**
- **Sea level rise** may become the dominant stressor acting on vulnerable salt marshes
- Bio-engineered strategies including restoring or creating wetlands are **adaptation options**



Marsh Loss Comparisons at Udalls Cove Park, Queens, NY

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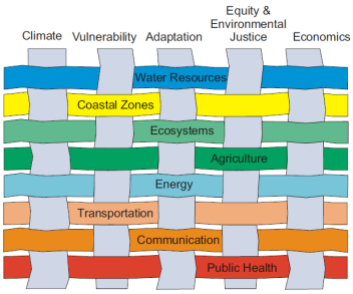
New York State ClimAID

To provide New York State with the most cutting-edge information on its **vulnerability** to climate change and to facilitate the development of **adaptation** policies informed by both local experience and state-of-the-art scientific knowledge.



Sectors: Water Resources, Coastal Zones, Ecosystems, Agriculture, Energy, Transportation, Communications, Public Health
Integrating Mechanisms: Climate, Vulnerability, Adaptation, Environmental Justice/Equity, Economic Linkages

NYSERDA · Center for Climate Systems Research, The Earth Institute at Columbia University · Cornell University · The Institute for Sustainable Cities, City University of New York

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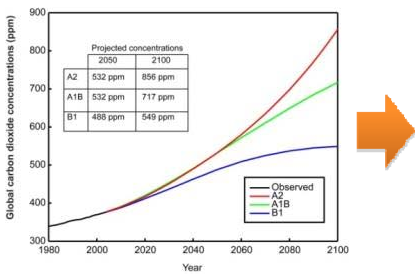
Developing Climate Risk Information

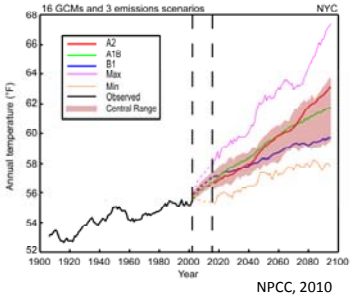
Process used to develop climate risk factors

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 NYS infrastucture used to determine critical infrastructure at-risk.





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Adaptation Assessment

- Climate scenarios were used to identify impacts on infrastructure and start the adaptation assessment process
- Climate information helped guide stake-holders through:
  - Inventory of At-Risk Infrastructure
  - Risk Assessment Matrix
  - Strategy Prioritization Framework

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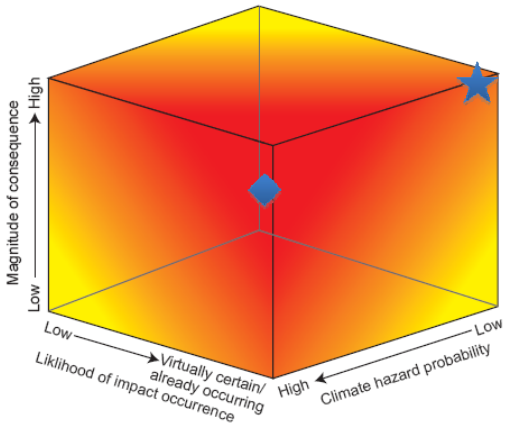
Adaptation Assessment



Red	risks for which adaptation strategies should be developed
Orange	risks for which adaptation strategies may need to be developed or for which further information is needed
Yellow	risks for which impacts should be monitored but which may not need actions at this time

To determine risk of climate change on infrastructure:

•Probability of a climate change hazard

•Likelihood of that hazard causing an impact

•Magnitude of consequence, should that impact occur

Examples:

Rapid ice melt storm surge

Heat wave

Source: Columbia University Center for Climate Systems Research

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Framing Adaptation

- *Reduce the level of physical, social, or economic impact of climate change and variability*
- *Take advantage of new opportunities emerging from climate change*

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

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

Level of Effort
- 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

Scale
- Wide-spread, clustered, isolated/unique

References and Links

- http://www.nyas.org
  - Climate Change Adaptation in New York City: Building a Risk Management Response
- http://www.nyclimatechange.us/
  - New York State Climate Action Council
  - Features ClimAID and NYS Climate Action Plan
- http://www.dec.ny.gov/
  - NYS SLR Task Force

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Consortium for Climate Risk in the Urban Northeast (CCRUN)

A NOAA Regional Integrated Sciences and Assessments (RISA) Project

Boston

New York

Philadelphia

CCRUN

Mission

CCRUN conducts stakeholder-driven research that reduces climate-related vulnerability and advances opportunities for adaptation in the urban Northeast

Storm damage in Westchester County, NY, March 12-15, 2010.
Source: James Estrin / *The New York Times*

Striped bass fishing in Boston Harbor.
Source: Capt. Bill Smith / FishBoston.com

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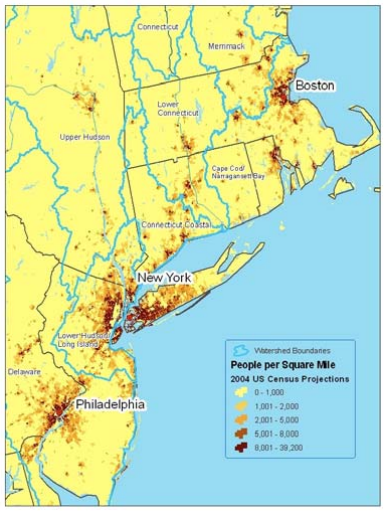
Overview

- Five-year project, starting October 2010
- Geographic scope includes the Boston – New York – Philadelphia urban corridor
- Focus on vulnerable populations, infrastructure, and sectors (watersheds, coastal zones, and health)
- Team members from Columbia, UMass-Amherst, Drexel, Stevens Institute, and City College-CUNY



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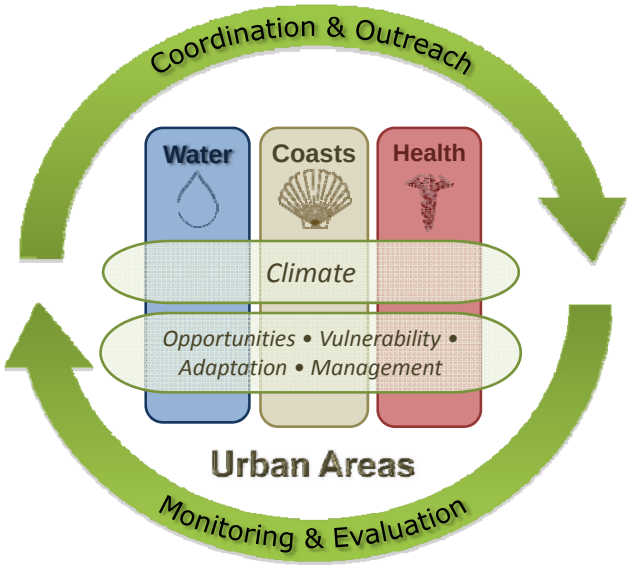
CCRUN Project Sphere



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