NYC PANEL ON CLIMATE CHANGE

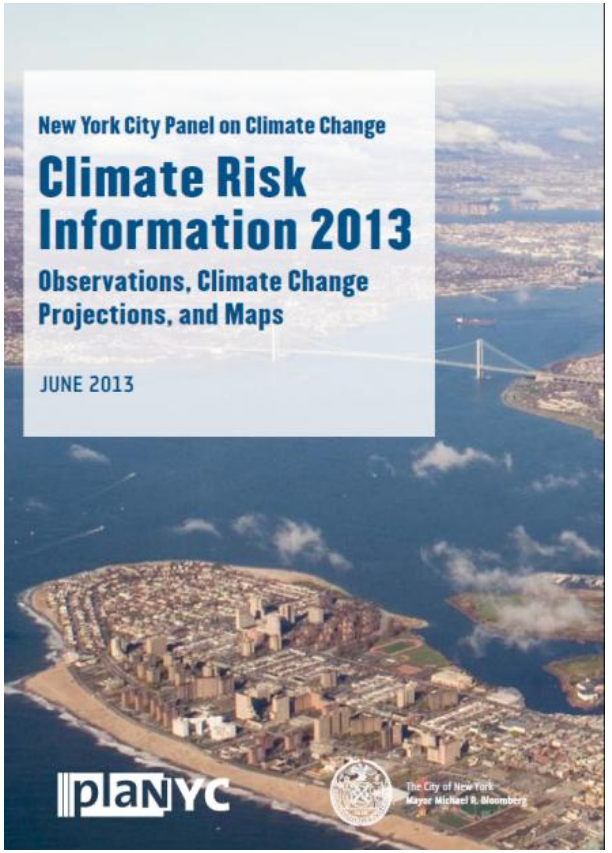
DECEMBER 18, 2013

NPCC2 Tasks

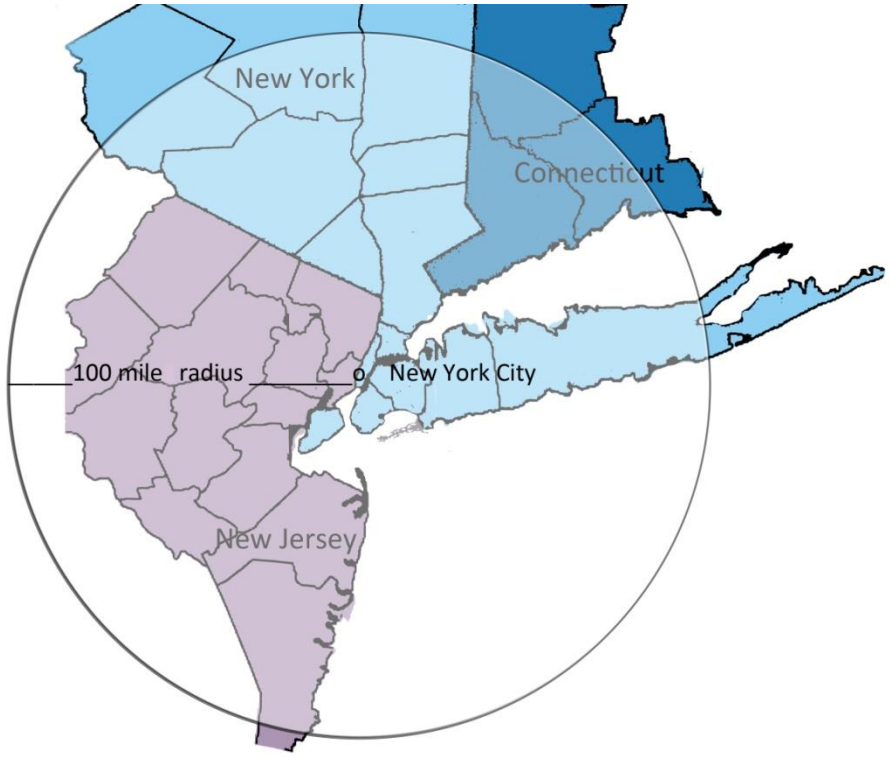
- NPCC2 Task 1 (*January – June 2013*)
  - Update 2009 NPCC climate projections and future coastal flood maps in support of SIRR
    - Temperature, precipitation, sea level rise, extreme events, and coastal storms for the 2020s and 2050s

- NPCC2 Task 2 (*June – December 2013*)
  - Extend climate projections to 2080s and 2100 and add humidity
  - Analyze extreme events including storms, storm surge, and coastal flooding
  - Develop indicators and monitoring system
  - Convene workgroups on special topics

- NPCC2 Full Report (*early 2014*)



Spatial Applicability of NPCC2 Projections

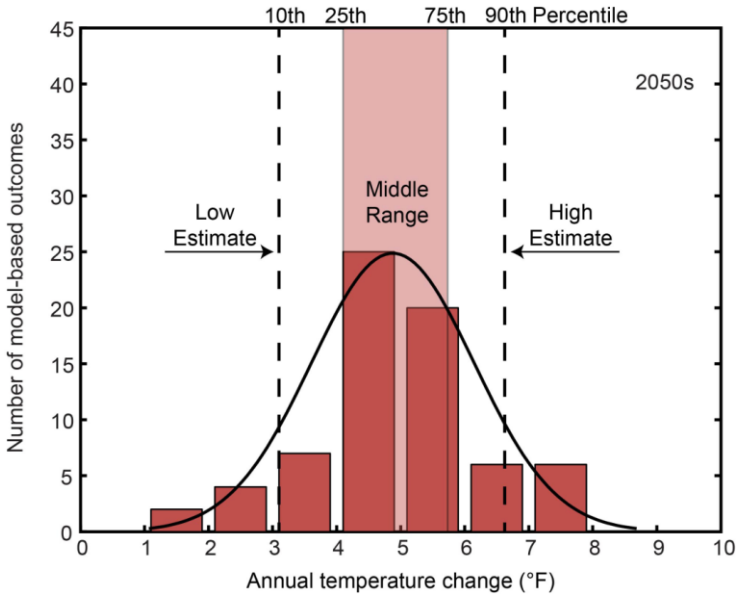


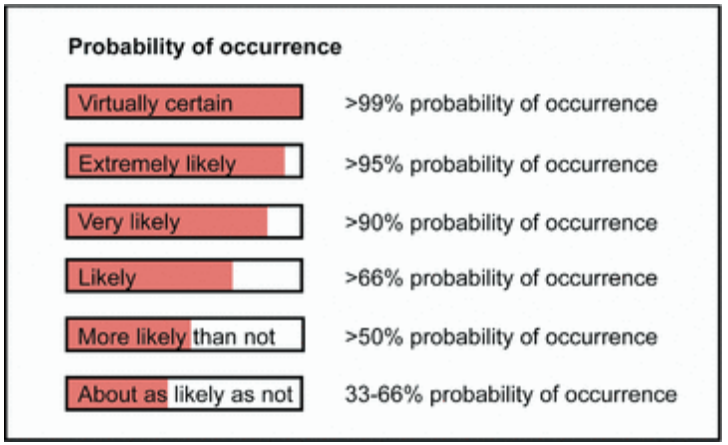
NPCC2 climate projections are generally applicable for the New York City metropolitan area, defined here as the 100-mile land radius that surrounds Central Park

NPCC2 Uncertainty and Risk Management

Projections:

- Designed to facilitate risk-based decision-making
- Used ranges of model-based outcomes and likelihoods based on scientific literature
- Based on results from 35 global climate models and 2 scenarios of future greenhouse gas emissions





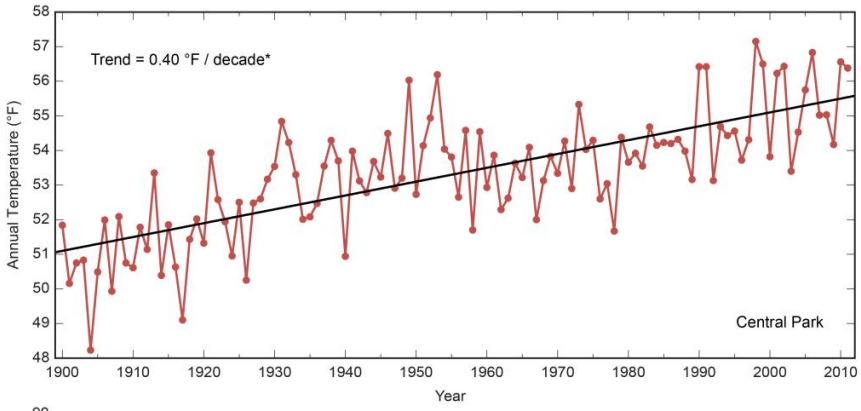
NPCC2 CRI, 2013

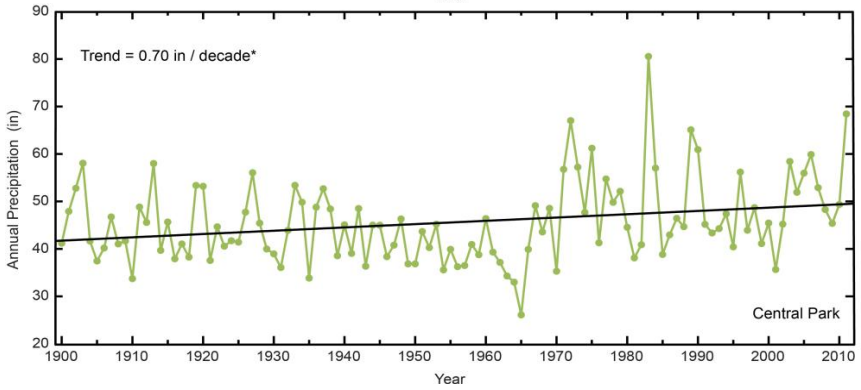
Note: model-based outcomes do not encompass the full range of possible futures

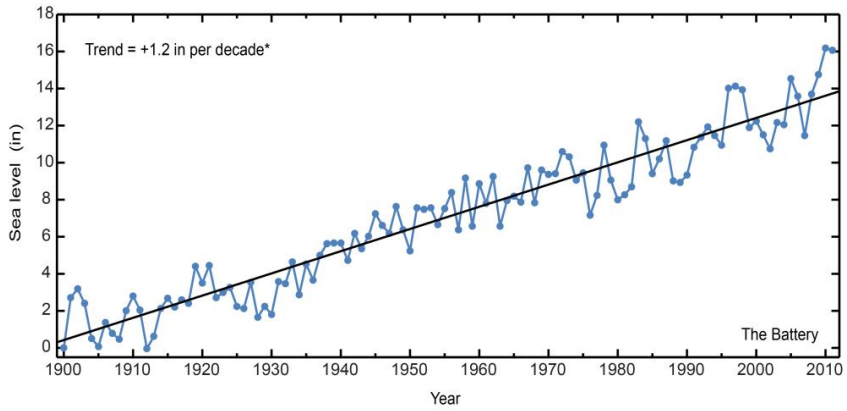
NPCC2 Climate Projection Methods

- Climate projections developed by downscaling 35 global climate model simulations developed for IPCC 5th Assessment Report (AR5)
- Qualitative projections provided for some extreme events
- Innovative, 6-component approach used to develop regional sea level rise projections
- Projections are grounded in
  - latest scientific literature and
  - observed climate data for the region and globe

NPCC2 Observed Trends







* All trends significant at the 99% level

Temperature

- Mean annual temperature in New York City has increased 4.4 F from 1900 to 2011.

Precipitation

- Mean annual precipitation has increased 7.7 inches from 1900 to 2011 (a change of 1.4% per decade).
- Year-to-year variability greater from 1956 to 2011 than from 1900 to 1955.

Sea Level

- Sea level in New York City (at the Battery) has risen 1.1 feet since 1900.

Extreme Events

- Very difficult to assign trends significance to local scales
- 75% increase in heaviest rain events in Northeast in last 50 years
- Increase in the number of strong (Category 4 and 5) hurricanes in the North Atlantic since the early 1980s.

Mean Annual Changes – Temperature

Air temperature Baseline (1971-2000) 54° F	Low-estimate (10th percentile)	Middle range (25th to 75th percentile)	High-estimate (90th percentile)
2020s	+ 1.5°F	+ 2.0°F to 2.8°F	+ 3.2°F
2050s	+ 3.1°F	+ 4.1°F to 5.7°F	+ 6.6°F
2080s	+ 3.8°F	+ 5.3°F to 8.8°F	+ 10.3°F
2100	+ 4.2°F	+ 5.8°F to 10.3°F	+ 12.1°F

Based on 35 GCMs and two Representative Concentration Pathways. Baseline data are from the National Oceanic and Atmospheric Administration (NOAA) National Climatic Data Center (NCDC). Shown are the low-estimate (10th percentile), middle range (25th percentile to 75th percentile), and high-estimate (90th percentile) 30-year mean values from model-based outcomes.

Temperatures are extremely likely to be higher in New York City through the end of the century

Mean Annual Changes – Precipitation

Precipitation Baseline (1971-2000) 50.1 inches	Low-estimate (10th percentile)	Middle range (25th to 75th percentile)	High-estimate (90th percentile)
2020s	-1 percent	+ 1 to + 8 percent	+ 11 percent
2050s	+ 1 percent	+ 4 to + 11 percent	+ 13 percent
2080s	+ 2 percent	+ 5 to + 13 percent	+ 19 percent
2100	- 6 percent	- 1 to + 19 percent	+ 25 percent

Based on 35 GCMs and two Representative Concentration Pathways. Baseline data are from the National Oceanic and Atmospheric Administration (NOAA) National Climatic Data Center (NCDC). Shown are the low-estimate (10th percentile), middle range (25th percentile to 75th percentile), and high-estimate (90th percentile) 30-year mean values from model-based outcomes.

Total annual precipitation in New York City will very likely increase

Mean Annual Changes – Sea Level Rise

Sea Level Rise Baseline (2000 – 2004)	Low-estimate (10th percentile)	Middle range (25th to 75th percentile)	High-estimate (90th percentile)
2020s	+ 2 in	+ 4 in to 8 in	**+ 10 in**
2050s	**+ 8 in**	+ 11 in to **21 in**	**+ 30 in**
2080s	+ 13 in	+ 18 in to 39 in	+ 58 in
2100	+ 15 in	+ 22 in to 50 in	+ 75 in

Based on 24 GCMs and two Representative Concentration Pathways. Shown are the low-estimate (10th percentile), middle range (25th percentile to 75th percentile), and high-estimate (90th percentile).

The NPCC incorporated additional information based on recently-released IPCC AR5 Report, resulting in small changes to the sea level rise projections for 2020s and 2050s

Higher sea levels are extremely likely for New York City

Extreme Events – Temperature

Number of days/year with maximum temperature at or above 90°F (1971-2000) 18 days/year	Low-estimate (10th percentile)	Middle range (25th to 75th percentile)	High-estimate (90th percentile)
2020s	24	26 to 31	33
2050s	32	39 to 52	57
2080s	38	44 to 76	87

Number of days/year with minimum temperature at or below 32°F 72 days/year	Low-estimate (10th percentile)	Middle range (25th to 75th percentile)	High-estimate (90th percentile)
2020s	50	52 to 58	60
2050s	37	42 to 48	52
2080s	25	30 to 42	49

Based on 35 GCMs and two Representative Concentration Pathways. Baseline data are from the National Oceanic and Atmospheric Administration (NOAA) National Climatic Data Center (NCDC) . Shown are the low-estimate (10th percentile), middle range (25th percentile to 75th percentile), and high-estimate (90th percentile) 30-year mean values from model-based outcomes.

The number of hot days is projected to increase
The number of cold days is projected to decrease

Extreme Events – Heat Waves

Number of heat waves/year 2 heat waves	Low-estimate (10th percentile)	Middle range (25th to 75th percentile)	High-estimate (90th percentile)
2020s	3	3 to 4	4
2050s	4	5 to 7	7
2080s	5	6 to 9	9

Average heat wave duration (in days) 4 days	Low-estimate (10th percentile)	Middle range (25th to 75th percentile)	High-estimate (90th percentile)
2020s	5	5 to 5	5
2050s	5	5 to 6	6
2080s	5	5 to 7	8

Based on 35 GCMs and two Representative Concentration Pathways. Baseline data are from the National Oceanic and Atmospheric Administration (NOAA) National Climatic Data Center (NCDC) . Shown are the low-estimate (10th percentile), middle range (25th percentile to 75th percentile), and high-estimate (90th percentile) 30-year mean values from model-based outcomes.

Heat waves are very likely to become more frequent, more intense, and longer in duration

Extreme Events – Intense precipitation

Number of days/year with rainfall at or above 2 inches 3 days/year	Low-estimate (10^{th} percentile)	Middle range (25^{th} to 75^{th} percentile)	High-estimate (90^{th} percentile)
2020s	3	3 to 4	5
2050s	3	4 to 4	5
2080s	3	4 to 5	5

Based on 35 GCMs and two Representative Concentration Pathways. Baseline data are from the National Oceanic and Atmospheric Administration (NOAA) National Climatic Data Center (NCDC) . Shown are the low-estimate (10th percentile), middle range (25th percentile to 75th percentile), and high-estimate (90th percentile) 30-year mean values from model-based outcomes.

Heavy downpours are very likely to increase in frequency, and intensity

Qualitative Extreme Event Projections

Projected direction of change by the end of the century, as well as likelihood associated with the qualitative projection

	Spatial Scale of Projection	Direction of Change by 2050s	Likelihood	Sources
Tropical Cyclones				
Total number	North Atlantic Basin	Unknown	--	--
Number of intense hurricanes	North Atlantic Basin	Increase	More likely than not	USGCRP, 2013; IPCC, 2012
Extreme hurricane winds	North Atlantic Basin	Increase	More likely than not	USGCRP, 2013; IPCC, 2012
Intense hurricane precipitation	North Atlantic Basin	Increase	More likely than not	USGCRP, 2013; IPCC, 2012
Nor'easters	NYC area	Unknown	--	IPCC 2012; Colle et al. 2013

Probability of occurrence and likelihood defined as (IPCC, 2007): Virtually certain; >99% probability of occurrence, Extremely likely; >95% probability of occurrence, Very likely; >90% probability of occurrence, Likely; >66% probability of occurrence, More likely than not; >50% probability of occurrence, About as likely as not; 33 to 66% probability of occurrence.

Number of intense hurricanes in the North Atlantic Basin more likely than will not increase

NPCC2 Climate Memorandum

- Spatial Extent of NPCC2 Projections
- Methods for 2100 Projections
- Adjustments to 2020s and 2050s Sea Level Rise Projections
- Comparison of NPCC2 Projections to IPCC AR5 Projections

NPCC2 Links and Contact Information

- NPCC2 Climate Risk Information 2013 Report (released in June) available online at:

  www.nyc.gov/planyc

  www.nyc.gov/resiliency

  www.ccrun.org

  www.cunysustainablecities.org

- Extended NPCC2 climate projections and Climate Memorandum will be available shortly following this meeting

Q and A