6 NYCRR Part 490, Projected Sea-level Rise

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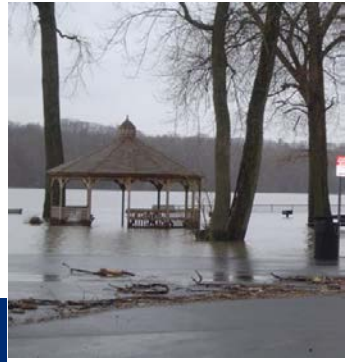
Agenda

- Welcome and Introduction, *Joan Kennedy*
- Community Risk and Resiliency Act Overview, *Dazzle Ekblad/Jon Binder*
- Scientific Basis of Sea-level Rise Projections, *M. Lowery*
- Questions, Answers and Discussion, *J. Kennedy*
- Next Steps, *J. Kennedy*

Community Risk and Resiliency Act: An Overview



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Community Risk and Resiliency Act (CRRA)

- Signed: September 22, 2014
- Purpose: ensure that state monies and permits include consideration of future physical climate risk and extreme weather events
- Includes stakeholder engagement and integration with other climate programs, as per governor

The Five CRRA Requirements

1) Sea-level rise projections by January 1, 2016 (DEC); updates every 5 years
2) Mitigation of sea-level rise (SLR), storm surge and flooding added to Smart Growth Public Infrastructure Policy Act criteria
3) Model local laws to enhance resiliency (DOS, DEC)

The Five CRRA Requirements (cont.)

4) Consideration of SLR, storm surge and flooding
   - 19 affected programs
   - 3 types: permits, facility-siting regulations & funding
5) Guidance on implementing CRRA and the use of natural resiliency measures to reduce risk by January 1, 2017 (DEC, DOS)

Programs Affected by the Community Risk and Resiliency Act

DEC Permits

- Oil and natural gas wells
- Major projects under these seven programs:
  - Protection of waters (Art.15)
  - Freshwater wetlands (Art.24)
  - Tidal wetlands (Art.25)
  - Coastal erosion hazard areas
  - Sewerage service
  - Mined land reclamation
  - Liquefied natural gas and liquefied petroleum gas facilities

Programs Affected by the Community Risk and Resiliency Act

DEC Facility-siting Regulations

- Hazardous waste transportation, storage and distribution facility siting
- Petroleum bulk storage (including conformity with the uniform fire prevention and building code)
- Hazardous substance bulk storage

Programs Affected by the Community Risk and Resiliency Act

Funding Programs

- Water Pollution Control Revolving Fund (DEC, Env. Facilities Corp)
- Drinking Water Revolving Fund (DOH, EFC)
- Open space acquisition (DEC, OPRHP)
- Open space project operation and maint. agreements (OPRHP)
- Landfill closure assistance (DEC)
- Coastal rehabilitation project assistance (DEC)
- Local waterfront revitalization (DOS)
- Agricultural and farmland protection (Ag. & Mkts)

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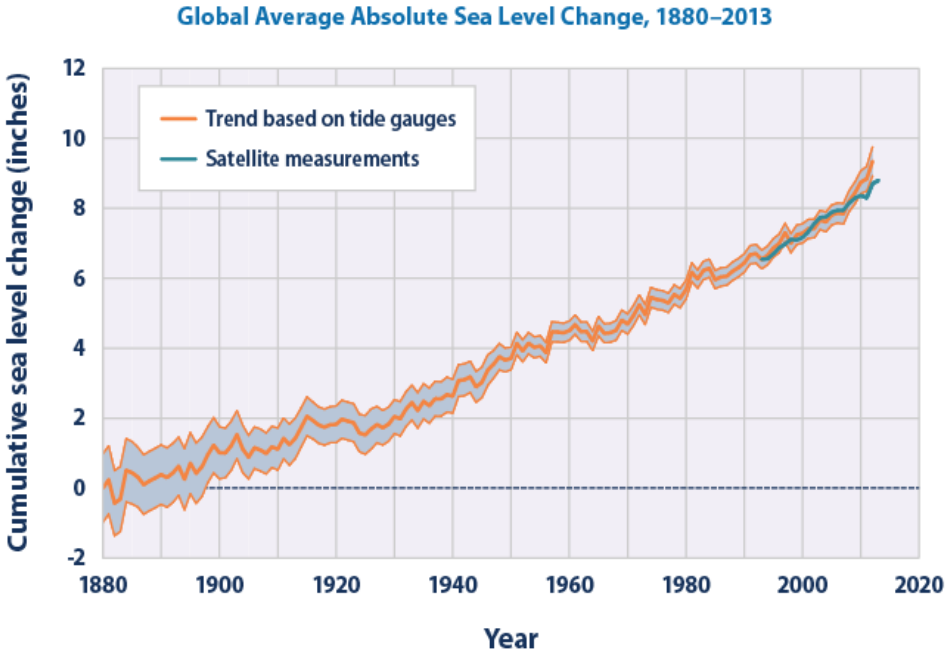
Projected Sea-level Rise

6 NYCRR Part 490

Global Sea-level Rise



Data sources:
- CSIRO (Commonwealth Scientific and Industrial Research Organisation). 2013 update to data originally published in: Church, J.A., and N.J. White. 2011. Sea-level rise from the late 19th to the early 21st century. Surv. Geophys. 32:585–602.
- NOAA (National Oceanic and Atmospheric Administration). 2014. Laboratory for Satellite Altimetry: Sea level rise. Accessed April 2014. http://ibis.grdl.noaa.gov/SAT/SeaLevelRise/LSA_SLR_timeseries_global.php.

For more information, visit U.S. EPA's "Climate Change Indicators in the United States" at www.epa.gov/climatechange/indicators.

Recent acceleration:

- 1880-2012 – 0.6 inch/decade
- Since 1993 – 1.1-1.2/inches/decade

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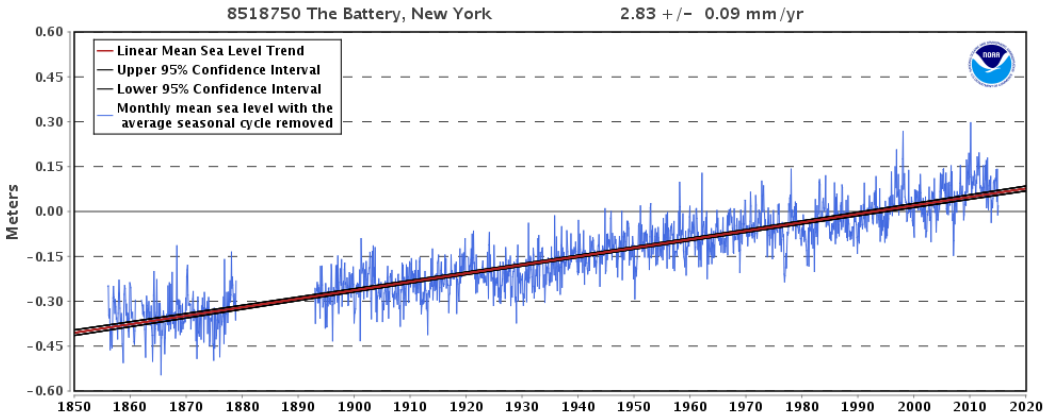
New York Sea-level Rise



- 1.2 inches/decade
  - Almost twice global rate
- About 40% due to subsidence
- Remainder expansion and melt

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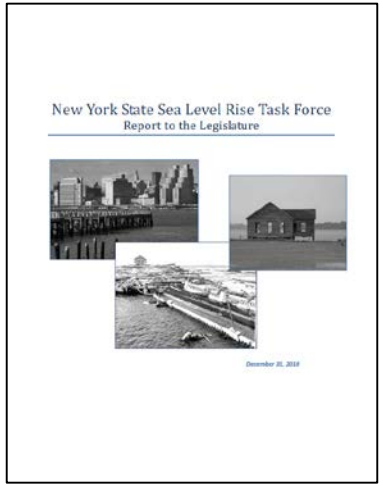
State Sea Level Rise Task Force Findings

- Already affecting New York
- Very high and increasing likelihood of coastal flooding
- Loss of tidal marshes and associated services
- Inundation of shoreline ecosystems, impeded wetland migration
- High-risk coastal development
- Mix of structural and non-structural solutions
- Potential loss of waterfront access


New York State Sea Level Rise Task Force
Report to the Legislature

http://www.dec.ny.gov/energy/45202.html

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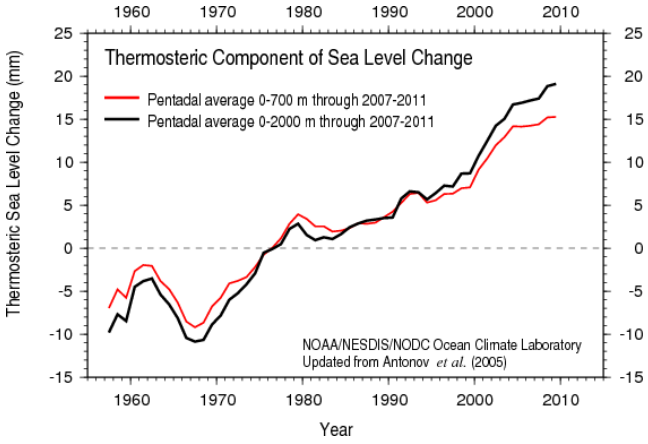
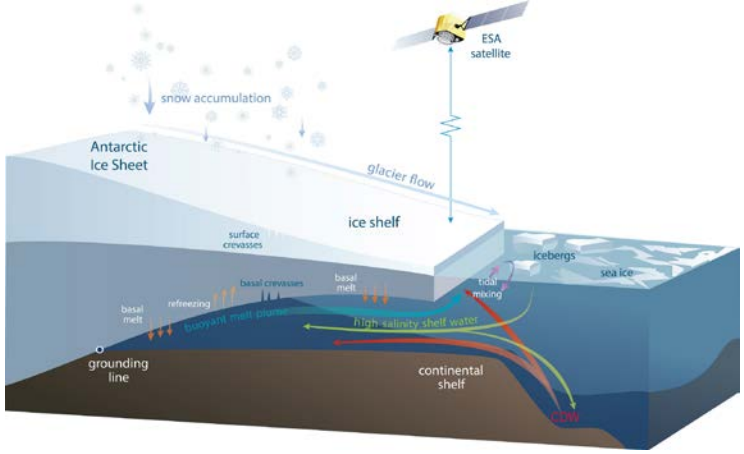
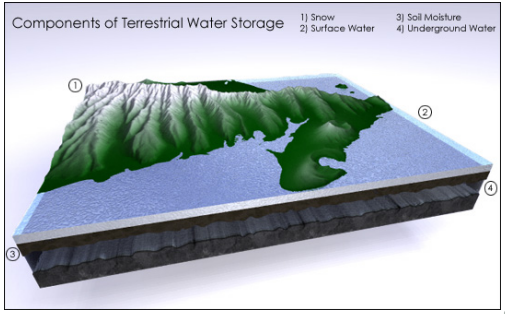
Physical Basis of Global Sea-level Rise

Components

- Steric (thermal expansion)
- Ice sheet melt and dynamics (Greenland, Antarctica)
- Glacier
- Terrestrial water storage







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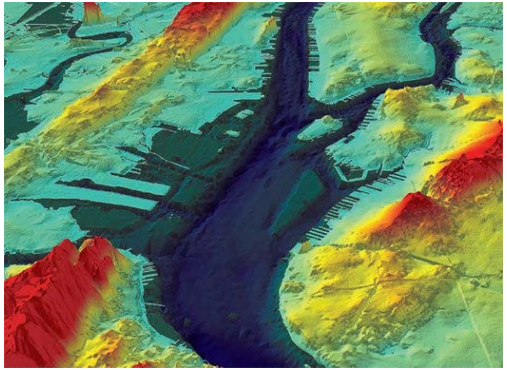
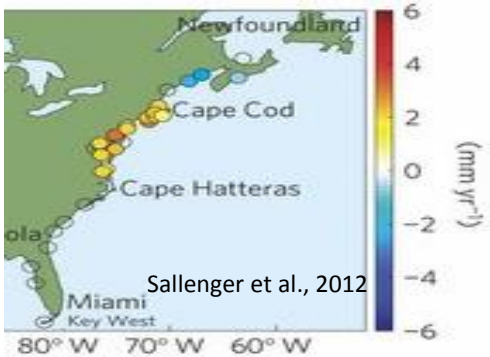
Physical Basis of Relative Sea-level Rise

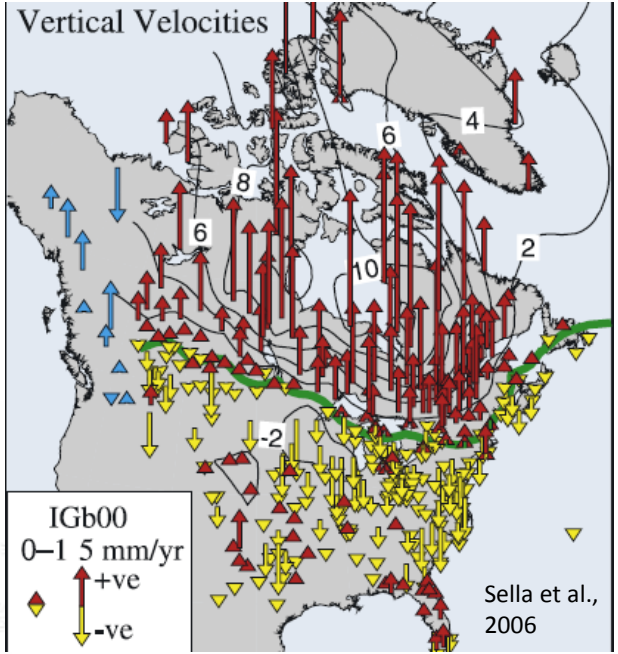
Components

- Glacial isostatic adjustment
- Topography, bathymetry
- Changes in water surface elevation
- Ice loss effects (fingerprinting)
- Sea-level air pressure

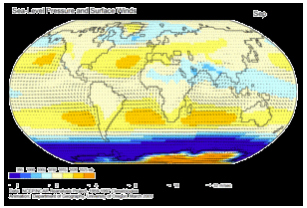


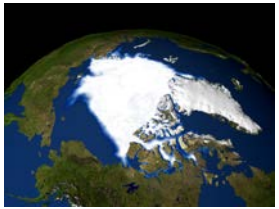


Sallenger et al., 2012



Sella et al., 2006





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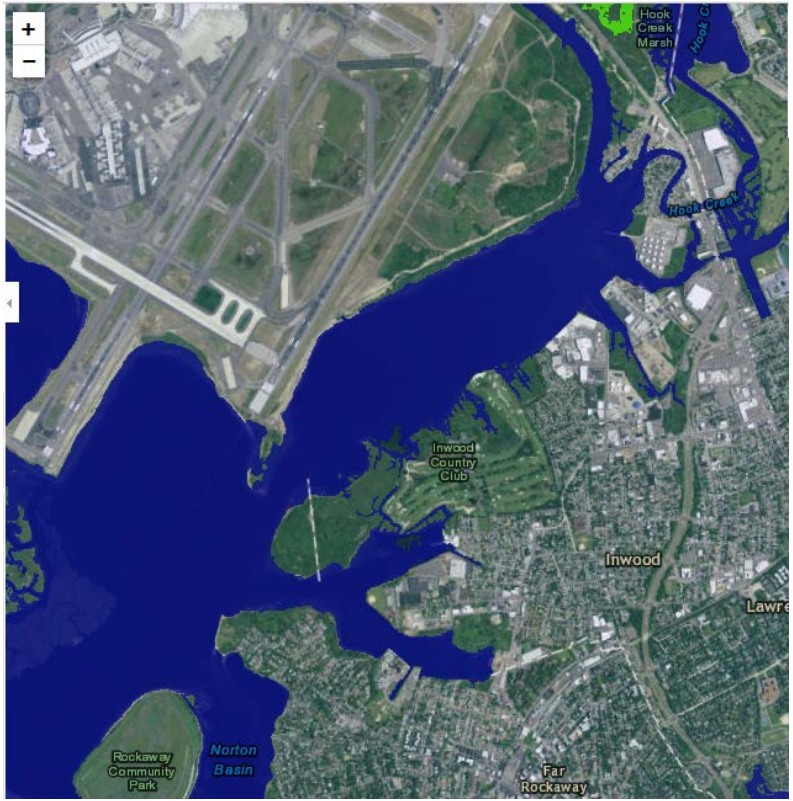
Rockaways

Current mhhw



1 foot sea-level rise

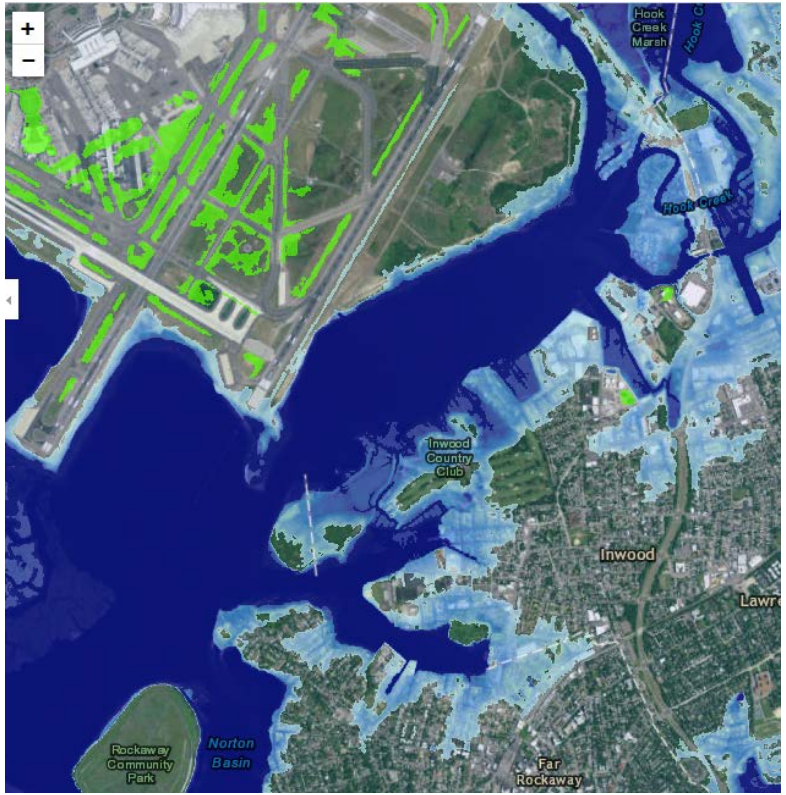
Rockaways

Inundated

Disconnected wet zones

4 feet sea-level rise

6 feet sea-level rise



Mastic Beach

Inundated

Disconnected wet zones

Current mhhw

3 feet sea-level rise

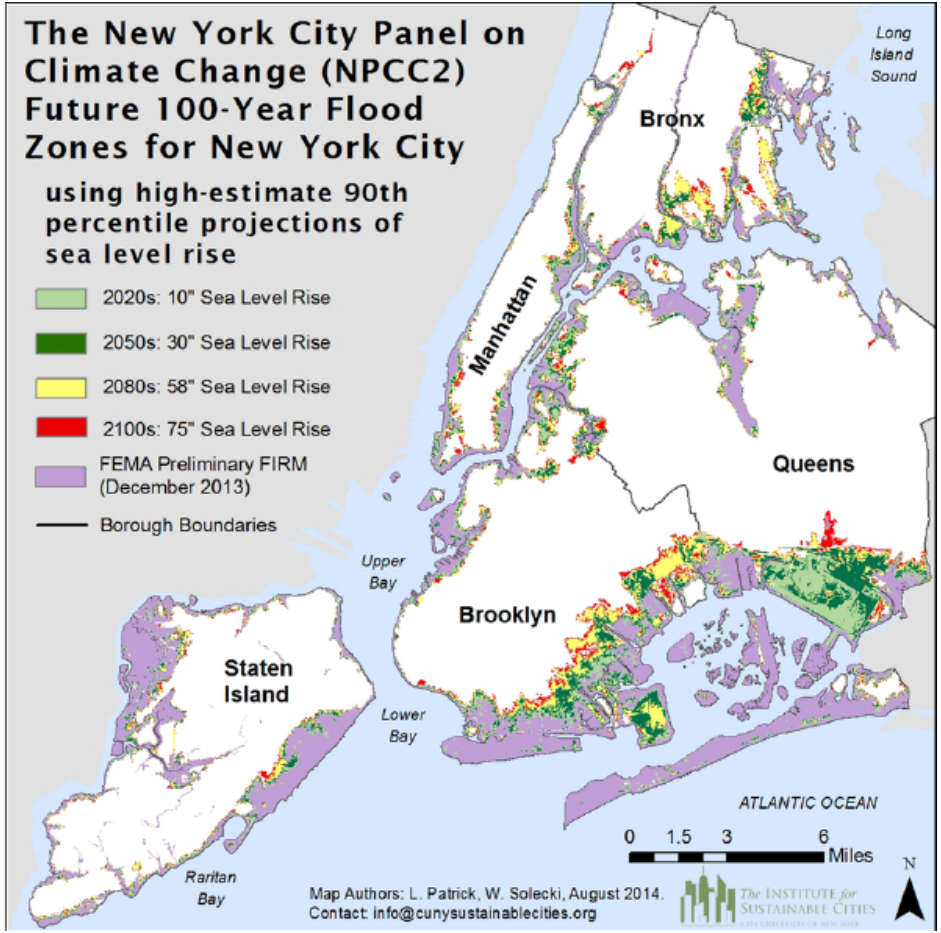
Mastic Beach

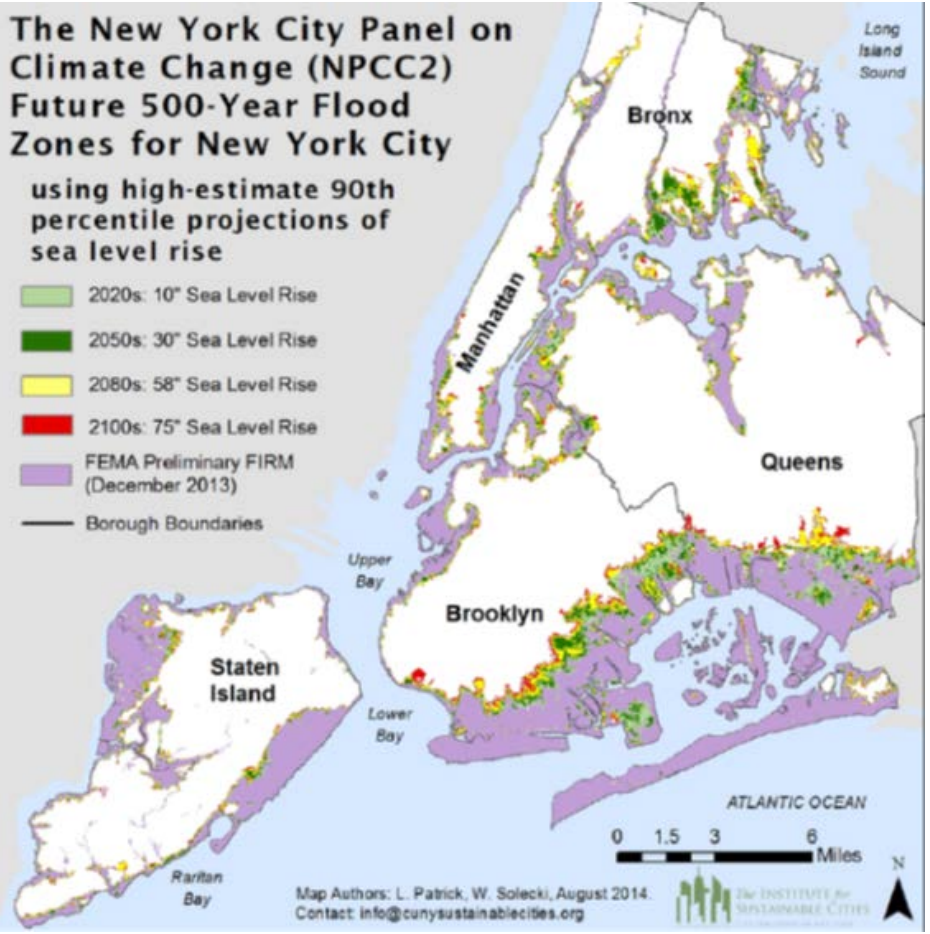
Inundated

Disconnected wet zones

4 feet sea-level rise

6 feet sea-level rise


The New York City Panel on Climate Change (NPCC2) Future 100-Year Flood Zones for New York City
using high-estimate 90th percentile projections of sea level rise
2020s: 10" Sea Level Rise
2050s: 30" Sea Level Rise
2080s: 58" Sea Level Rise
2100s: 75" Sea Level Rise
FEMA Preliminary FIRM (December 2013)
Borough Boundaries
Long Island Sound
Bronx
Manhattan
Queens
Upper Bay
Brooklyn
Staten Island
Lower Bay
ATLANTIC OCEAN
0 1.5 3 6 Miles
N
Raritan Bay
Map Authors: L. Patrick, W. Solecki, August 2014.
Contact: info@cunysustainablecities.org
The Institute for Sustainable Cities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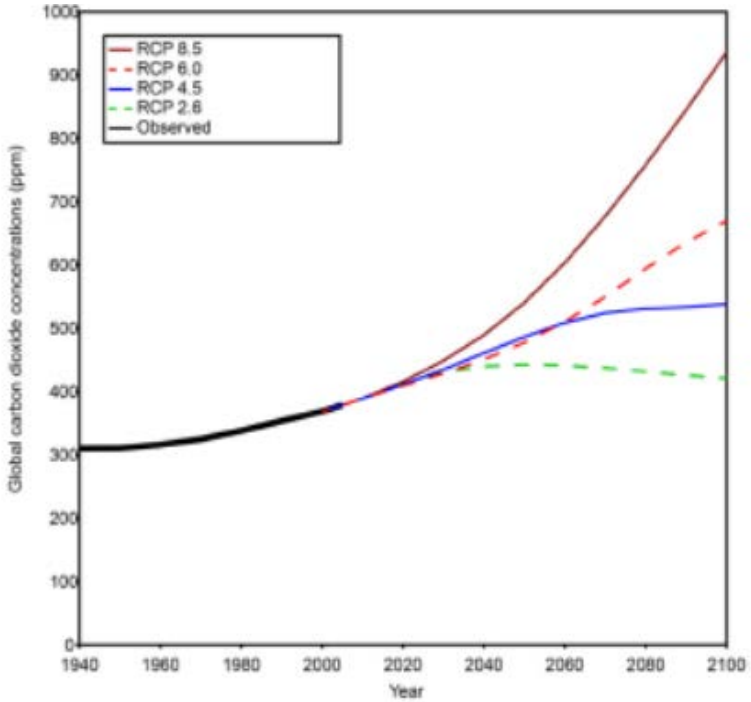
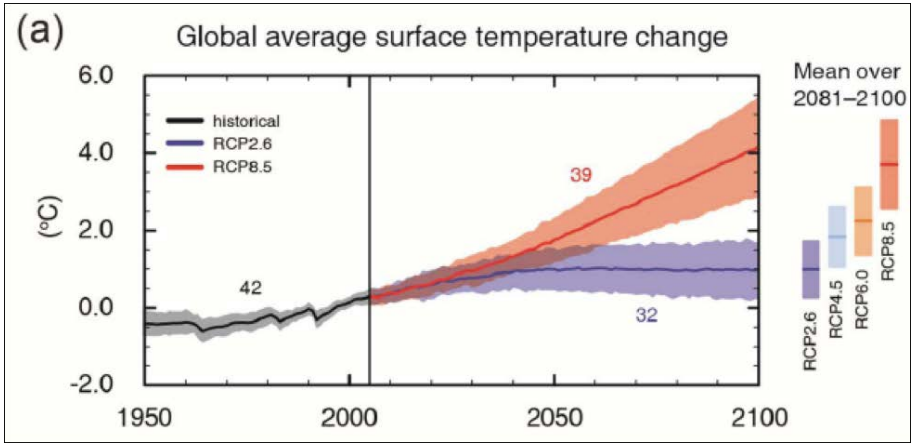
Projecting Future Sea-level Rise





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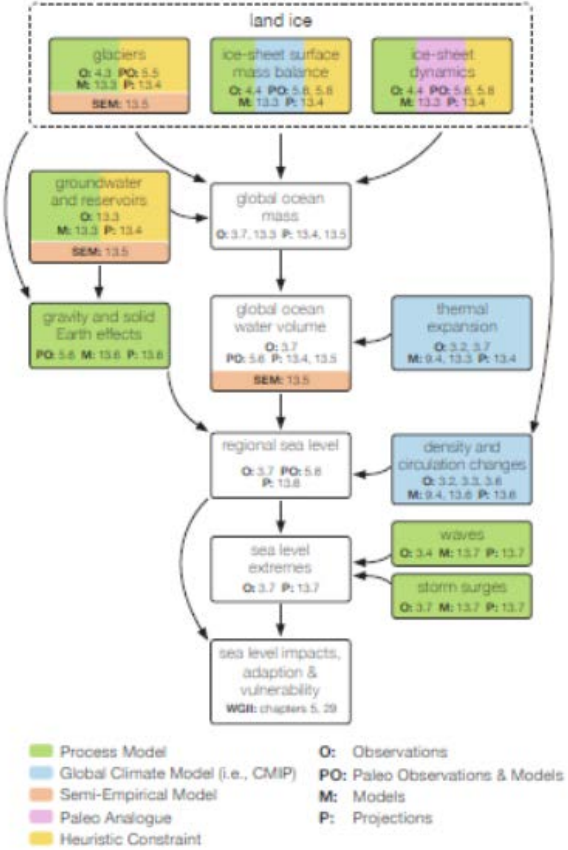
Projecting Future Sea-level Rise



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Projection sources:

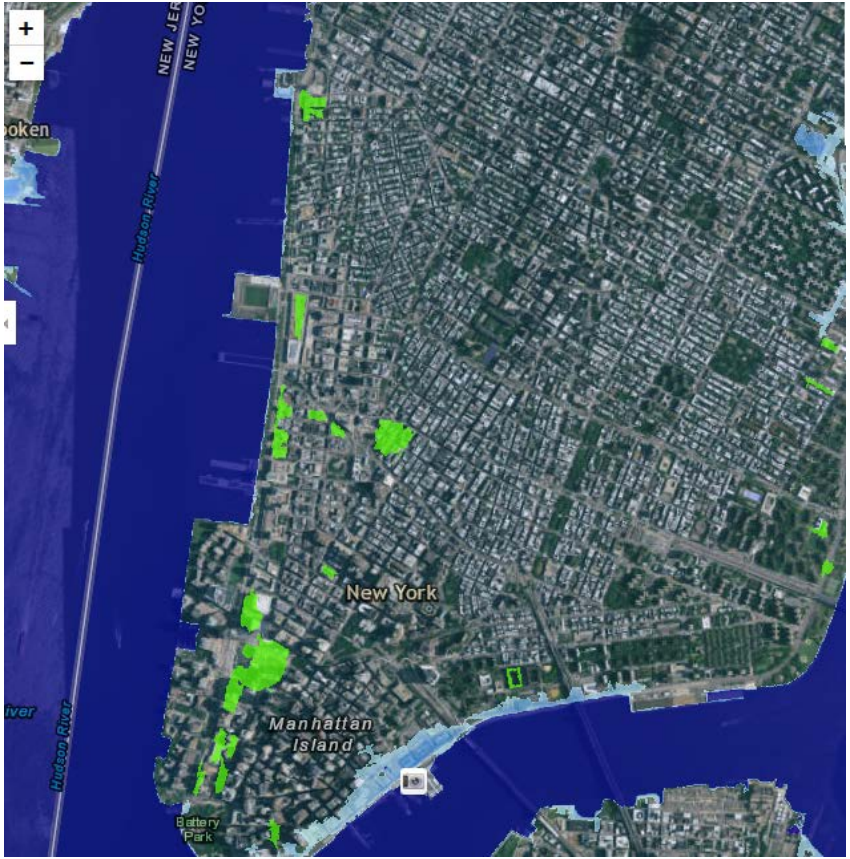
- Church, J.A., P.U. Clark, A. Cazenave, J.M. Gregory, S. Jevrejeva, A. Levermann, M.A. Merrifield, G.A. Milne, R.S. Nerem, P.D. Nunn, A.J. Payne, W.T. Pfeffer, D. Stammer and A.S. Unnikrishnan, 2013: Sea Level Change. *In* Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Stocker, T.F., D. Qin, G.-K. Plattner, M. Tignor, S.K. Allen, J. Boschung, A. Nauels, Y. Xia, V. Bex and P.M. Midgley (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.
- Parris, A., P. Bromirski, V. Burkett, D. Cayan, M. Culver, J. Hall, R. Horton, K. Knuuti, R. Moss, J. Obeysekera, A. Sallenger, and J. Weiss. 2012. Global Sea Level Rise Scenarios for the US National Climate Assessment. NOAA Tech Memo OAR CPO-1. 37 pp.

State and local projection sources:

- Horton, R., C. Little, V. Gornitz, D. Bader, and M. Oppenheimer. 2015. Chap. 2: Sea Level Rise and Coastal Storms *in* Building the Knowledge Base for Climate Resiliency. Ann. N.Y. Acad. Sci. 1336:36-44. (NPCC II)
- New York State Sea Level Rise Task Force: Report to the Legislature. 2010. New York State Department of Environmental Conservation. 101pp.
- Horton, R., D. Bader, C. Rosenzweig, A. DeGaetano, and W.Solecki. 2014. Climate Change in New York State: Updating the 2011 ClimAID Climate Risk Information. New York State Energy Research and Development Authority (NYSERDA), Albany, New York. (http://www.nyserda.ny.gov/climaid)
- Zhang, Minghua, Henry Bokuniewicz, Wuyin Lin, Sung-Gheel Jang, and Ping Liu, 2014: Climate Risk Report for Nassau and Suffolk, New York State Resilience Institute for Storms and Emergencies (NYS RISE), NYS RISE Technical Report TR-0-14-01, 49 pp. (http://www.nysrise.org)

Lower Manhattan

4 feet sea-level rise



6 feet sea-level rise

Inundated

Disconnected wet zones

•24 global climate models
•2 Representative Concentration Pathways: 4.5, 8.5
•2020s, 2050s, 2080s, 2100

- Local ocean height
- Thermal expansion
- Vertical land movements
- Melt from glaciers, ice caps and land-based ice sheets
- Gravitational, isostatic and rotational effect of ice loss
- Land water storage

NYS ClimAID

www.nyserda.ny.gov/climaid

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ClimAID Sea-level Rise Projections

Inches of rise relative to 2000-2004 baseline

Station	Montauk Point				The Battery				Troy			
Time Interval	Percentile											
	10th	25th	75th	90th	10th	25th	75th	90th	10th	25th	75th	90th
2020s	2	4	8	10	2	4	8	10	1	3	7	9
2050s	8	11	21	30	8	11	21	30	5	9	19	27
2080s	13	18	39	58	13	18	39	58	10	14	36	54
2100	15	21	47	72	15	22	50	75	11	18	46	71

- NPCC/ClimAID projections and methodologies-peer reviewed and published
- In use by federal agencies (ACOE, NOAA)
- Consistency with New York City NPCC projections
- Projections for the entire tidal coast of the state.

NYS ClimAID

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- Projection range suitable for risk-based planning and review of projects of varying projected life times and criticality
- Benchmark for evaluation of critical infrastructure and land-use change
- SLR of six feet within the next 150 years
- Current global SLR commitment: 6.2 feet

NYS ClimAID

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Rapid Sea-level Rise ?

- Ice shelf disintegration
- Accelerating lateral ice movement
- Accelerated surface melt

Tell us -

- How do you factor uncertainty in your current planning work?
- In developing a sea-level rise projection regulation how should DEC incorporate or consider uncertainty?
- How should DEC account for uncertainty regarding the rate of ice melt and timing of reaching high sea levels?
- Who would use official sea-level rise projections in decision making? How?

Sea-level Rise Projection Stakeholder Input

June 23-25: Public information and listening meetings

July 1: Informal public input due

August: DEC releases proposed regulation, 45-day comment period commences

January 1: Rulemaking complete

Mark Lowery

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6 NYCRR Part 490 Public Meeting Schedule

	Location	Date	Time
Suffolk County	Wertheim National Wildlife Refuge Visitor Center 340 Smith Road, Shirley	June 23	1:00 pm
Nassau County	Operation Splash 202 Woodcleft Ave., Freeport	June 23	7:00 pm
New York City	Hunter College, West Building, Room 511, 67th St. and Lexington Ave., Manhattan	June 24	10:00 am
	Jamaica Wildlife Refuge Visitor Center Broad Channel, Queens	June 24	4:00 pm
Albany	NYSDEC, PA-129AB 625 Broadway, Albany/WebEx	June 25	2:30 pm

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