Climate Adaptation Planning in Urban Environments

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Climate Change Adaptation for State and Local Governments: Achieving Buy-In for Adaptation
March 21, 2013
New York City Adaptation Process
2008 - 2011

Leadership

Coordination

Implementation

City Agencies
- Regional Authorities
- Private Stakeholders

Stakeholder Task Force
CCATF

City-wide Sustainability Office
OLTPS

Integration across Sector-specific Working Groups
- Energy (E) - Transportation (T)
- Policy (P) - Water & Waste (WW)
- Communications (C)

Expert Panel
NPCC

University scholars and private sector experts
- Social, biological, and physical scientists
- Legal and insurance experts
- Risk management professionals

Climate Science

Source: NPCC, 2010
NPCC Approach

A risk management issue → Flexible Adaptation Pathways as the response

- Acceptable risk
- Status quo
- Setting inflexible adaptation standard with mitigation
- Flexible Adaptation Pathway without mitigation
- Flexible Adaptation Pathway with mitigation

Monitor & Reassess!

Source: NPCC, 2010
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

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

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

Source: NPCC, 2010
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

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

Hard-hit areas

Sources: CCSR, 2013, MTA, 2012
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
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

Rosenzweig, *Scientific American*, 2011
• 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)

- NYSERDA ClimAID (www.nyserda.ny.gov/climaid)

- New York City Panel on Climate Change report available online at (www.nyas.org)

- Urban Climate Change Research Network (www.uccrn.org)

- ClimateYou (www.climateyou.org)
  – “Learn, Share, Act” about climate change