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Climate Change Adaptation in New York City

Building a Risk Management Response

New York City Panel on Climate Change

Executive Summary of the 2009 Report

December 2, 2009

The New York Academy of Sciences

New York City Panel on Climate Change

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Executive summary: adapting to climate change

Climate change has the potential to impact everyday life in New York City. Environmental conditions as we experience them today will shift, exposing the City and its residents to new hazards and heightened risks. We will be challenged by increasing temperatures, changes in precipitation patterns, rising sea levels, and more intense and frequent extreme events. Historical climate precedents are no longer valid for long-term environmental planning.

Mitigation actions are undertaken to address the long-term risks of climate change through reduction of greenhouse gas emissions, while adaptation is needed to respond to the short-term risks that are unavoidable as well as to long-term risks, such as sea-level rise. While mitigation actions that reduce greenhouse gas emissions will help to decrease the magnitude and impact of future changes, they will not prevent climate change from occurring altogether. Given the impacts of climate change and its high costs and the requirements of effective long-term planning, investments are needed to begin the climate change adaptation process. Both public and private sectors should be allocating funds today, even in times of economic downturn, in order to minimize climate risks that are only projected to grow in the future.

Taking climate change adaptation action now will limit damages and costs through the coming decades and, in many cases, can provide near-term benefits and operational cost savings.

New York City Panel on Climate Change

Climate change mitigation and adaptation are both important elements in New York City's long-term sustainability plan (PlaNYC). As part of these efforts, Mayor Michael Bloomberg convened the New York City Panel on Climate Change (NPCC), a panel of experts to advise on issues related to climate change and adaptation. Funded through a grant from the Rockefeller Foundation and modeled on the Intergovernmental Panel on Climate Change, the NPCC was launched in August 2008. The NPCC has assisted the New York City Climate Change Adaptation Task Force, established by the City to develop a coordinated adaptation plan for the City and consists of over 40 public- and private-sector stakeholders.

The NPCC has prepared a set of climate change projections for the New York City region and has examined how climate change has the potential to both positively and negatively affect the critical infrastructure of New York City. It has suggested approaches to create an effective adaptation program for critical infrastructure, including ways to assess risks, prioritize strategies, and examine how standards and regulations may need to be adjusted in a changing climate.

To carry out these tasks, the NPCC prepared this report to lay the foundation for climate change adaptation in the City and created three workbooks to guide Task Force members in their climate change adaptation planning process:

- The **Climate Risk Information (CRI)** workbook presents climate trends and projections for New York City and identifies potential risks to the City's critical infrastructure posed by climate change (Appendix A).
- The **Adaptation Assessment Guidebook (AAG)** outlines a process through which stakeholders can develop and implement adaptation plans (Appendix B).

• The **Climate Protection Levels (CPL)** workbook evaluates some of the policies, rules, and regulations that govern infrastructure in New York City to determine how they could be affected by climate change (Appendix C).

Key findings

New York City should begin to adapt to climate change today

Investments are needed to begin the climate change adaptation process even in times of economic downturn. Both the public and private sectors should allocate funds today in order to minimize climate risks that are projected to grow in the future. Historical climate precedents are no longer valid for long-term environmental planning.

While uncertainties exist about the exact specification of future climate changes for the City, climate risk information available now clearly indicates that a strategic, proactive adaptation process should begin and continue. *Ad hoc* adaptation responses to extreme climate events are not enough to ensure long-term sustainability.

New York City already faces a number of climate risks even without climate change as a factor

A coordinated planning process will help the City to cope with the risks we currently face from extreme climate events, such as the August 8, 2007 storm that disrupted transportation lines throughout the City, as well as future climate changes.

Temperature increases and sea-level rise are already occurring and, along with other climate changes, will continue to occur and accelerate in the future

Climate change poses serious and challenging risks to New York City, which interacts with the other stresses that the City faces such as population growth and pollution. The critical infrastructure on which the people of the City vitally depend is at risk in multiple and complex as well as direct and indirect ways (e.g., as mediated through climate effects on ecosystems).

Heat and heat waves
Warmer temperatures are extremely likely in New York City. Heat waves are very likely to become more frequent, intense, and longer in duration. Temperature-related impacts may include increased summertime strain on materials, increased peak electricity loads in summer, more frequent blackouts, and reduced heating requirements in winter.

Sea-level rise and storm surge
Climate change poses challenges to planning for coastal waterfront development in New York City, given the uncertain but significant risks of progressive sea-level rise and enhanced flooding of low-lying neighborhoods and infrastructure, threats to consistent delivery of water supplies, increased structural damage, and impaired operations.

Droughts and floods
Brief, intense precipitation events that can cause inland flooding are likely to increase, and droughts are more likely than not to become more severe. Precipitation-related impacts may include increased street, basement, and sewer flooding, and reduction of water quality.

There is a potential for "tipping points" in the climate system, such as a rapid melt of polar ice sheets, which would have a great magnitude of consequence on the City

The potential for crossing thresholds in regard to climate change and its ensuing impacts requires development of an effective indicators and monitoring program, so that tipping points can be identified and prepared for.

To effectively respond to climate change, the City should develop flexible adaptation pathways

Effective response to climate change for critical infrastructure involves development of a risk-management approach that encourages the implementation of flexible adaptation pathways, that is, strategies that can evolve through time as climate risk assessment, evaluation of adaptation strategies, and monitoring continue. The development of flexible adaptation pathways should be embedded in the operations and planning of the agencies and organizations that manage the critical infrastructure of the City. This requires ongoing coordination among the City of New York and other levels of government, public agencies, private organizations, and experts, with overall leadership such as currently provided by the Mayor's Office of Long-Term Planning and Sustainability.

Meeting the challenges to climate change adaptation in New York City

The City has many tools in place that can be used to facilitate climate change adaptation

Significant attention has been focused on the potential for climate change mitigation to promote easily accessible win–win opportunities for city managers, because they are perceived as providing greenhouse gas emission reduction benefits and economic cost savings. The results of the NPCC process show that there are numerous ways that climate change adaptation can also be effectively incorporated into the current management of the City's critical infrastructure:

- Existing **risk and hazard management strategies** can be adjusted to meet the challenges of our changing climate—today and in the future.
- **Design standards** can be recalibrated to include climate change projections, so that long-lasting infrastructure will be prepared to withstand future threats.
- The **legal framework** governing the design and operation of infrastructure can be expanded to include the impacts of climate change.
- The **insurance industry** and other risk-burden sharing mechanisms (e.g., co-operatives) can contribute to adaptation through products that respond to long-term risks, as well as by sharing its expertise on risk in climate change discussions with a wide range of stakeholders.
- Within and across agencies and organizations that manage infrastructure, adaptation strategies can draw from a broad range of responses, including **adjustments in operations and management, capital investments in infrastructure, and development of policies that promote flexibility**.

The City has developed an effective approach to climate change adaptation

New York City's adaptation program encompasses a number of best practices, including:

- **High-level proactive leadership** to initiate and coordinate the adaptation process for the critical infrastructure of the City, as well as of the broader metropolitan region.
- **Links to larger sustainability activities**, that is, PlaNYC, so that climate change is considered as part of a broad range of future trends, rather than in isolation.
- **Involvement of multiple layers of government and a wide range of public and private sector stakeholders and experts.**

- **Incorporation of climate change risks into stakeholder agency and organization operations, management, and planning.**
- **Tools by a recognized body of experts** that can help guide a wide group of stakeholders in "how to" address climate change.
- **Development of an evolving dynamic process** among City government, public and private stakeholders, and experts to develop a risk-management approach to climate change and to begin to implement Flexible Adaptation Pathways for the City.

Recommendations for action

Recommendations arising from the NPCC work include a broad range of policy-relevant suggestions, some focused on critical infrastructure and some focused on broader-scale actions. In addition, the NPCC identified several key areas for further study that are needed to help the City develop a comprehensive, risk- and science-based adaptation program.

1. Adopt a risk-based approach to develop Flexible Adaptation Pathways, which includes regular reviews of the City's adaptation program.
2. Create a mandate for an ongoing body of experts that provides advice and prepares tools related to climate change adaptation for the City of New York. Areas that could be addressed by this body include regular updates to climate change projections, improved mapping and geographic data, and periodic assessments of climate change impacts and adaptation for New York City to inform a broad spectrum of climate change adaptation policies and programs.
3. Establish a climate change monitoring program to track and analyze key climate change factors, impacts, and adaptation indicators in New York City, as well as to study relevant advances in research on related topics. This involves creating a network of monitoring systems and organizations and a region-wide indicator database for analysis.
4. Include multiple layers of government and a wide range of public and private stakeholder experts to build buy-in, and crucial partnerships for coordinated adaptation strategies. Include the private sector in these interactions.
5. Conduct a review of standards and codes to evaluate their revision to meet climate challenges, or the development of new codes and regulations that increase the City's resilience to climate change. Develop design standards, specifications, and regulations that take climate change into account, and hence are prospective in nature rather than retrospective. New York City should work with FEMA and NOAA to update the FIRMs and SLOSH maps to include climate change projections.
6. Work with the insurance industry to facilitate the use of risk-sharing mechanisms to address climate change impacts.
7. Focus on strategies for responding to near- and mid-term incremental changes (e.g., temperature and precipitation changes) as well as long-term low-probability, high-impact events (e.g., catastrophic storm surges).
8. Pay particular attention to early win–win adaptation strategies such as those that have near-term benefits or meet multiple goals (greenhouse gas mitigation, emergency planning, etc).

Needed studies to facilitate flexible adaptation pathways

1. **Identify, characterize, and understand nonlinear tipping points, triggers, and decision pathways** to help to determine when and how to adopt different types of adaptation measures to facilitate Flexible Adaptation Pathways.
2. **Analyze the economics and financing of adaptation**, including multicriteria and cost-benefit studies.
3. **Conduct feasibility study of nonstructural and structural citywide protective measures,** as appropriate over future time periods.

4. **Do sensitivity tests of critical infrastructure facilities and operations** to understand the impacts of changes in mean annual temperature and precipitation and extreme events.
5. **Study the interdependencies between and within infrastructure sectors and systems.** As part of such studies, consider the activities that affect them, such as commuting patterns.

Putting adaptation in place

The goal of the NPCC is to contribute to an effective, ongoing, and beneficial process for responding to the risks that climate change poses on New York City in the coming decades. This is a challenging task, but as this report demonstrates, the City of New York is well on its way to implementing a comprehensive climate change adaptation strategy and institutionalizing ongoing adaptation planning.