

New York City Panel on Climate Change 2015 Report Introduction

The climate of the New York City metropolitan region is changing—annual temperatures are hotter, heavy downpours are increasingly frequent, and the sea is rising. These trends, which are also occurring in many parts of the world, are projected to continue and even worsen in the coming decades because of higher concentrations of greenhouse gases in the atmosphere caused by burning of fossil fuels and clearing of forests for agriculture. These changing climate hazards increase the risks for the people, economy, and infrastructure of New York City. As was demonstrated by Hurricane Sandy, coastal and low-lying areas, the elderly and very young, and lower-income neighborhoods are highly vulnerable. In response to these climate challenges, New York City is developing a broad range of climate resiliency policies and programs, as well as the knowledge base to support them. The knowledge base includes up-to-date climate, sea level rise, and coastal flooding projections; a Climate Resiliency Indicators and Monitoring System; and resiliency studies. A special attribute of the New York City response to these challenges is the recognition that both the knowledge base and the programs and policies it supports need to evolve through time as climate risks unfold in the coming decades.

In early September 2012, just weeks before Hurricane Sandy hit, the New York City Council passed Local Law 42 that established the New York City Panel on Climate Change (NPCC) as an ongoing body serving the City of New York. The NPCC is required to meet at least twice each calendar year to review recent scientific data on climate change and its potential impacts, and to make recommendations on climate projections for the coming decades to the end of the century. These projections are due within one year of the publication of the Intergovernmental Panel on Climate Change Assessment Reports (<http://www.ipcc.ch>), or at least every three years. The NPCC also advises the Mayor's Office of Sustainability and the Mayor's Office of Recovery and Resiliency (ORR) on the development of a community- or borough-level communications strategy intended to ensure that the public is informed about the findings of the panel, including the creation of a summary of the climate change projections for dissemination to city residents.

Initially formed as a scientific panel in 2008, the first NPCC was comprised of academic and private-sector experts in climate science, infrastructure, social science, and risk management. It established a risk management framework for the city's critical infrastructure throughout the extended metropolitan region under climate change. The first NPCC developed downscaled climate projections and derived new climate risk information, created adaptation assessment guidelines and protocols, and determined how climate protection levels would need to change to respond to evolving climate conditions (NPCC, 2010).

Following Hurricane Sandy, the City convened the Second New York City Panel on Climate Change (NPCC2) in January 2013 to provide up-to-date scientific information and analyses on increasing climate risks for the creation of *A Stronger, More Resilient New York* (City of New York, 2013). In response, the NPCC2 published the Climate Risk Information 2013 Report (CRI; NPCC, 2013) in June 2013 (<http://ccrun.org/NPCC-2013>). The Climate Risk Information 2013 Report presented quantitative and qualitative information about future climate hazards for the 2020s and 2050s, focusing on temperature, precipitation, and sea level, as well as providing future coastal flood risk maps.

This NPCC2 Report (NPCC, 2015) presents the full work of the NPCC2 from January 2013 to January 2015. The aim is to increase current and future resiliency of the communities, citywide systems, and infrastructure of New York City to a range of climate risks. NPCC2 follows the risk management and resilience approach developed by the first NPCC (Yohe & Leichenko, 2010). In this approach, climate hazards are extreme climatic or weather events that cause harm and damage, and climate risk is the product of the likelihood of a climate hazard occurring and the magnitude of consequences should that event occur. The NPCC 2010 Report found that climate risks are spatially varied across the city because different levels of vulnerability are present within and across communities and infrastructure systems, resulting in different outcomes. Recognizing that risk management strategies need to evolve through time in response to continuous climate risk assessment, the NPCC developed a flexible adaptation pathways approach to guide the city in developing greater resiliency (NPCC, 2010). The New York City flexible adaptation framework encompasses both adaptation and mitigation and enables the consideration of long-range goals as well as their translation into short-term objectives.

The NPCC uses the definition of the term *resilience* presented by the Intergovernmental Panel on Climate Change (IPCC) in *Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation* (Lavell *et al.*, 2012), but with emphasis on *improvement* of city systems in contrast to their simple restoration.

“Resilience is the ability of a system and its component parts to anticipate, absorb, accommodate, or recover from the effects of a potentially hazardous event in a timely and efficient manner, including through ensuring the preservation, restoration, or *improvement of its essential basic structures.*”

The information in the NPCC2 Report has been co-generated by scientists, stakeholders, and decision-makers in New York City. The NPCC2 established Work Groups on Climate Science, Sea Level Rise/Coastal Storms and Flooding, Mapping, Health, and Indicators and Monitoring. Scientists and managers of critical city systems met in a series of stakeholder meetings and workshops to discuss climate risks and how they could best be understood and presented to aid in sound decision-making. Some of these diverse contributors are authors of the report’s chapters.

This volume is a continuation of the NPCC assessment process that began in 2008 with some significant advances that reflect the growing sophistication of climate science research and the evolving policy agenda to which it must respond. The report provides the City of New York with projections of its climate to the end of the century, both static and dynamic coastal storm surge modeling, and next steps in the development of an indicators and monitoring system for climate change impacts and adaptation. The assessment process is innovative because it looks beyond critical infrastructure and its vulnerability to climate change (a highlight of the first NPCC), and more directly focuses on what a more dynamic climate will mean for the everyday experience of the city’s residents—for example, regarding health impacts.

The report documents recent observed climate trends and extends the CRI 2013 projections to the 2080s and 2100 for temperature and precipitation (Chapter 1) and sea level rise (Chapter 2). It explains the spatial applicability of the projections to the wider New York metropolitan region and compares the NPCC2 methods to the recently published Fifth Assessment Report of the IPCC (IPCC, 2013). It presents new maps for the flood risks to the 2080s and 2100 for the current 100- and 500-year coastal flood event^a (Chapter 3). The report characterizes future coastal flooding through enhanced dynamic flood inundation (storm surge) modeling that includes the effects of sea level rise (Chapter 4) and provides a review of key issues related to climate change and health relevant to the citizens of New York City (Chapter 5). It then develops a process for establishing an indicators and monitoring system to track data related to climate hazards, risks, impacts, and adaptations, and presents metrics for evaluating the NYC Cool Roofs Program and its effect on the urban heat island (Chapter 6). The report ends with conclusions and recommendations

^aThe 100-year coastal flood event refers to the flood with a 1% annual chance of occurrence. The 500-year coastal flood event refers to the flood with a 0.2% annual chance of occurrence.

with regard to both increasing climate change resiliency for the city and advancing the research required to build it. The report includes two appendices that provide climate risk and projections infographics for stakeholders and technical details for each of the chapters.

Ongoing assessments such as those of the NPCC must be flexible in response to changing science and policy demands, yet also must provide a foundation for inter-assessment comparison and benchmarking through time. The NPCC2 assessment arose from the urgent post-Hurricane Sandy need for forward thinking on extreme events and resiliency. Implicit in its assessment approach is that as the new “normal” of climate non-stationarity^b emerges, so the way forward must be clear for developing a new and better knowledge base for policy (Solecki & Rosenzweig 2014; Rosenzweig & Solecki 2014).

Finally, the NPCC works to improve ways to communicate data and information on climate risks both to citizens and to potential users at multiple levels of government, including city, state, and national. While specific to New York City and its metropolitan region, the approaches developed by the NPCC can contribute to efforts to enhance resiliency as they are undertaken across governmental scales as well as in other locations.

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^b*Stationarity* is defined as having common statistical properties over time (e.g., mean, variance, and other statistics are all constant). Now that the climate system is changing, non-stationarity has become the new normal (Milly *et al.*, 2010).