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NJ Climate Adaptation Alliance

Integrating Climate Science into Coastal Resilience Planning and Decision Making in New Jersey

A summary of two reports prepared for the New Jersey Climate Adaptation Alliance

October 2016

Introduction

State, local and Federal decision makers throughout New Jersey are working to enhance the resilience of coastal communities and resources to hazards – including flooding driven by sea-level rise and coastal storms – that are increasing as a result of climate change. The New Jersey Climate Adaptation Alliance, a network of policymakers, public and private sector practitioners, academics, nongovernmental organizations, and business leaders, has joined together to enhance New Jersey's climate change preparedness. During an extensive stakeholder engagement process hosted by the Alliance, decision makers communicated a need for more science-informed guidance to support resilience planning and implementation. The Alliance's Advisory Committee requested that Rutgers University convene a Science and Technical Advisory Panel (STAP) to synthesize for practitioners the most recent climate science needed to inform efforts to increase the resilience of New Jersey's people, places, and assets (including infrastructure, communities and natural resources) to regional sea-level rise (SLR), changing coastal storms and the resulting flood risk.

The outputs of the STAP effort are two reports, issued in October 2016, for which this document provides a combined, high-level overview. The first report, ***Assessing New Jersey's Exposure to Sea-Level Rise and Coastal Storms: Report of the New Jersey Climate Adaptation Alliance Science and Technical Advisory Panel,*** summarizes the deliberations of the scientists who participated in the STAP. The second report, ***Assessing New Jersey's Exposure to Sea-Level Rise and Coastal Storms: A Companion Report to the New Jersey Climate Adaptation Alliance Science and Technical Advisory Panel Report,*** describes how coastal hazard data and coastal climate change impacts are currently being addressed in New Jersey.

Approach and Purpose

The STAP efforts provide science-informed guidance and planning options for practitioners and decision makers. With guidance from the Alliance's Advisory Committee, Rutgers staff undertook three efforts:

- **STAP Convening** –To inform planning and decision making, Rutgers staff consulted with scientists to assess the state of knowledge regarding sea-level rise, coastal storms and flood hazards in New Jersey. Rutgers staff and faculty convened experts in climate change, sea-level rise, coastal hazards, and coastal resilience to deliberate on a set of charge questions and summarize current science with regard to sea-level rise, coastal storms, and flood hazards.
- **Engagement of coastal decision makers** – Rutgers staff analyzed the information needs of coastal planners and decision makers to support their resilience efforts. Rutgers staff elicited feedback from practitioners on the initial STAP insights and Rutgers staff also reached out to coastal community planners, decision makers and practitioners about their needs with regard to science and data that can support coastal resilience efforts.
- **Review of basis for current planning and decision making** – Rutgers staff summarized how science and data about coastal hazards and climate change are currently being used to inform planning and

decision making that affects coastal communities and assets. They consulted with practitioners to understand the science and data that are currently being used to inform local coastal resilience decision making. Rutgers staff also reviewed current Federal, State, and local authoritative documents and conducted interviews with State decision makers to assess the state of current use of science and data as the basis for planning and decision making in New Jersey.

Outcomes

The two full reports provide a more comprehensive and detailed descriptions of important issues summarized below.

Sea-Level Rise Magnitude - The STAP report identifies a range of projected sea-level rise estimates for New Jersey, along with the likelihood of those estimates occurring. The table below summarizes the STAP's outcomes regarding projected sea level rise estimates for New Jersey, measured in feet. All values are based on a baseline of the midpoint between 1991-2009. Each column represents a different probability for a sea level rise projection. For example, the "Likely Range" column represents a range between the 17th and 83rd percentile with 67% being used to show probability. Each row represents a year; two rows are provided for the year 2100 so as to include a low emissions scenario and a high emissions scenario.

	Central Estimate	**Likely Range**	**1-in-20 Chance**	**1-in-200 Chance**	**1-in-1000 Chance**
Year	*50% probability SLR meets or exceeds…*	*67% probability SLR is between…*	*5% probability SLR meets or exceeds…*	*0.5% probability SLR meets or exceeds…*	*0.1% probability SLR meets or exceeds…*
2030	0.8 ft	0.6 – 1.0 ft	1.1 ft	1.3 ft	1.5 ft
2050	1.4 ft	1.0 – 1.8 ft	2.0 ft	2.4 ft	2.8 ft
2100 Low emissions	2.3 ft	1.7 – 3.1 ft	3.8 ft	5.9 ft	8.3 ft
2100 High emissions	3.4 ft	2.4 – 4.5 ft	5.3 ft	7.2 ft	10 ft

The STAP "likely range" of sea-level rise estimates is consistent with recent guidance proposed by New York State and the Federal government's sea-level rise estimates for New Jersey developed by an interagency working group, as well as with the assessment of the Intergovernmental Panel on Climate Change's Fifth Assessment Report.

The STAP encourages practitioners to consider the nature of the decision at hand when determining which sea-level rise estimate(s) to incorporate. Practitioners are encouraged to use several sea-level rise estimates in order to capture a variety of possible future outcomes. A focus on the "likely" range may be appropriate when considering decisions where flooding exposures or anticipated damages are limited, such as installation of recreational amenities. For decisions where potential exposures and damages may be significant (such as those related to energy, water or transportation infrastructure projects), or where a population is already vulnerable to stressors that will be further exacerbated by climate change (such as residential neighborhoods juxtaposed with facilities that store hazardous materials or have contaminated soil, either of which could become further mobilized with heavy flooding), the STAP encourages practitioners to consider at least two different likelihood levels - one

within the likely range, and one reflecting a lower-probability but higher consequence. Additionally, for decisions with impacts lasting beyond 2050, the STAP advises practitioners to consider both low and high greenhouse gas emissions futures.

Sea-Level Rise Rates – For some decisions, the rate of sea-level rise is as critical a consideration as the magnitude of sea-level rise. For example, rates of sea-level rise have an important impact on the extent to which natural systems, such as marshes, can adapt to changing sea levels. The STAP found that the rate by which sea level rises in coastal New Jersey over the period of 2010-2030 is likely to be 2–4 inches per decade. The STAP also concluded that, after 2030, changes in the rate of sea level rise depend on future greenhouse gas emissions. The full STAP report provides full probability distributions of post-2030 rates of sea-level rise under two greenhouse gas emissions scenarios.

Coastal Storms - By increasing the baseline for flooding, higher sea levels will increase the impact of coastal storms on New Jersey. Changes in the frequency, intensity and tracks of coastal storms may also affect the impact of coastal storms in New Jersey. This is an area of active research. The STAP concluded that, for now, planning and decision making in New Jersey should be guided by the Intergovernmental Panel on Climate Change (IPCC)'s conclusions regarding changes in future storms, including:

- The global frequency of tropical cyclones (i.e., hurricanes) is not likely to increase, while maximum wind speeds are likely to increase;
- Precipitation intensity during tropical cyclones is likely to increase; and
- The global frequency of extratropical cyclones (i.e., nor'easters) is not likely to change substantially; however precipitation associated with winter storms is likely to increase.

Exposure Assessments – As mentioned earlier, Rutgers staff convened a set of coastal resilience practitioners to evaluate the practicality of applying the STAP outcomes. Among their many insights, they indicated that, in addition to considering extreme coastal flooding and permanent inundation, exposure assessments should take into account projections that point to areas that are affected by tidal (sometimes referred to as "nuisance" flooding). Based on input from the practitioners, as well as input on the needs of coastal planners and decision makers received by Rutgers staff, the STAP report outlines example methods that practitioners may use to integrate the STAP science outcomes into different planning horizons and risk preferences.

Current Use of Climate Data and Science –In addition to engagement of municipal officials and practitioners, Rutgers staff interviewed State agency officials and conducted a literature review to ascertain how sea-level rise and anticipated changes in coastal storms are addressed in practice in coastal regions of New Jersey. Rutgers staff found that there is no uniform approach in New Jersey for addressing coastal climate change impacts at the current time. Local governments can exceed New Jersey building code elevation requirements or the requirements under the National Flood Insurance Program for structures in floodplains; it is estimated by the State of New Jersey that 20 municipalities do have more stringent building elevation ordinances than Federal or State requirements. The Rutgers research found that these more restrictive requirements are motivated by the desire for increased flood protection from current conditions; discounts on insurance rates through the Federal Community Rating System (CRS) program; and in one case, Rutgers staff identified a municipality that did cite sea-level rise as a concern in establishing its local ordinance. At the State level, New Jersey programs generally follow Federal requirements or incorporate national guidance developed by professional societies that establish design standards for structures in floodplains but to date, New Jersey regulatory programs

have not been developed to address sea-level rise. The State of New Jersey is addressing impacts from sea-level rise and changes in coastal storms when the Federal government has required these considerations as a condition of Federally-funded projects and programs (e.g., under Federal Hurricane Sandy appropriations or grants tied to Federally-approved State Hazard Mitigation Planning). Federal agencies are currently developing plans to implement the Federal Flood Risk Management Standard (FFRMS) which expressly considers increases in flood risk expected to result from climate change for Federally-funded projects. As Federal agencies implement the standard for Federally-funded projects in New Jersey, the STAP approach could be helpful. The STAP approach can also be helpful for New Jersey entities wishing to plan for coastal climate change impacts. Finally, it is important to note that the current suite of regulatory approaches focus on new construction or substantial improvement to existing structures; existing structures in coastal areas that have not been elevated to account for coastal climate change impacts or are located in communities that have not implemented other flood damage reduction actions to account for coastal climate change impacts (such as those incentivized through the CRS) may continue to be vulnerable to such impacts.

Needs of Coastal Communities - Rutgers staff engaged coastal professionals and decision makers to better understand their needs with regard to climate data and science to inform decision making. In general, Rutgers staff heard a need for clear and consistent and science-based standards and/or guidance to inform local coastal resilience planning. The outcomes of the STAP effort can be informative in addressing some of those needs, including:

- Coastal decision makers and practitioners agreed that, since Superstorm Sandy, there has been widespread increased awareness of flooding and coastal hazards and a greater recognition of the contribution of sea-level rise to those hazards. Among coastal municipalities, there is greater support for regulatory measures to inform and support coastal community planning and recognition of a need for a more holistic approach to resilience guided by a statewide vision for planning and implementation in New Jersey.
- Coastal municipalities pointed to inconsistent and sometimes conflicting guidance from multiple State and Federal agencies on standards and regulatory practices that are meant to be implemented at the local level. More specifically, the municipal practitioners indicated a need for clear and consistent guidance on sea-level rise projections between and within State agencies. In addition to having climate data that are consistent, local officials indicated a need to integrate sea-level rise projections with local knowledge about historic floods to better inform decision making.
- Coastal municipalities need technical assistance to, among other things, apply climate data and science to efforts to plan for resilience. They also indicate a need for additional training on disaster response and preparedness.
- Coastal practitioners also expressed concern that, with a post-Sandy emphasis on home elevations, residents who have elevated their homes will avoid evacuation feeling secure in their homes not realizing that roadways, infrastructure and critical facilities remain exposed and non-resilient.

Rutgers staff will continue to work with communities, coastal planners, and decision makers, and intend to further develop and deploy guidance for using the methods outlined in the two reports.

For more information

Both full reports can be found at http://njadapt.rutgers.edu/. Questions regarding the reports can be directed to Dr. Marjorie Kaplan at kaplan@envsci.rutgers.edu or Jeanne Herb at jherb@ejb.rutgers.edu.