



Homeland
Security

RESILIENCY ASSESSMENT INTERIM BRIEFING

Casco Bay Region Climate Change Adaptation Planning



WHAT IS THE RRAP?

The Regional Resiliency Assessment Program (RRAP) is a cooperative, non-regulatory assessment program implemented to examine the resilience of critical infrastructure and systems through regional analysis. The program, led by the Department of Homeland Security (DHS) Office of Infrastructure Protection (IP), addresses a range of hazards that could have significant consequences, both regionally and nationally.

Each RRAP typically involves data gathering and analytical effort followed by continued technical assistance to support resilience-building. RRAPs can incorporate various components, including voluntary facility vulnerability assessments, targeted studies and modeling, first responder capability evaluations, subject matter expert workshops, and other valuable information-exchange forums.

The Office of Infrastructure Protection leads the national effort to mitigate risk to, strengthen the protection of, and enhance the all-hazard resilience of the Nation's critical infrastructure.



WHY CLIMATE CHANGE IN MAINE?

Across the globe, changes in the earth's climate have been observed for decades in rising sea levels and temperatures and shrinking polar ice. Climate change in Maine is evident in increasingly frequent intense storm events and in the region's shorter, warmer winters and longer, hotter summers. Regional climate modeling efforts indicate that these changes will continue¹ and will result in significant near- and long-term implications for critical infrastructure, which will ultimately affect the safety, economic prosperity, and quality-of-life of Maine residents.

The foundation of the Casco Bay Region Climate Change Adaptation RRAP is a stakeholder-driven assessment of community and infrastructure vulnerabilities that includes development of adaptation data and methodologies. This process aligns with the Principles for Effective Adaptation identified by the Intergovernmental Panel on Climate Change,² which advocates for place- and context-specific approaches to adaptation that promote coordinated and complementary interagency actions to mitigate risks and foster broader resilience. To achieve these goals, the Casco Bay RRAP process involves the following six steps:

STEP 1 Assess climate-change-related impacts and vulnerabilities to lifeline sector infrastructure systems through preliminary analysis and modeling activities

STEP 2 Identify dependencies, interdependencies, and cascading effects of the loss of regional infrastructure systems through site visits, interviews, and facilitated meetings with a wide range of stakeholders

STEP 3 Identify gaps in our understanding of regional or sector-specific issues related to climate change impacts on critical infrastructure resilience

STEP 4 Assist interagency partners in developing a common analytic baseline for assessing climate change impacts to critical infrastructure

STEP 5 Provide data and develop methodologies to help the region's communities and businesses better understand and manage the risks associated with extreme weather and other impacts of climate change

STEP 6 Coordinate efforts to enhance climate resilience and adaptation by providing technical assistance for the development of climate change adaptation plans and strategies

MAINE RRAP PARTICIPANTS



- ▶ Environmental Protection Agency
- ▶ Federal Emergency Management Agency
- ▶ Department of Homeland Security National Cybersecurity and Communications Integration Center / National Coordinating Center for Communications
- ▶ National Oceanic and Atmospheric Administration



- ▶ Maine Governor's Energy Office
- ▶ Maine Department of Environmental Protection
- ▶ Maine Emergency Management Agency
- ▶ Maine Office of Information Technology
- ▶ Maine Office of Geographic Information Systems
- ▶ Maine Department of Transportation
- ▶ Maine Department of Agriculture, Conservation and Forestry
- ▶ Maine Turnpike Authority
- ▶ Maine Port Authority



- ▶ Greater Portland Council of Government
- ▶ Cumberland County Emergency Management Agency
- ▶ City of South Portland
- ▶ City of Portland
- ▶ Portland Water District
- ▶ Town of Saco Water District
- ▶ Town of Brunswick Sewer District
- ▶ Town of Freeport
- ▶ Casco Bay Estuary Partnership
- ▶ Portland Jetport



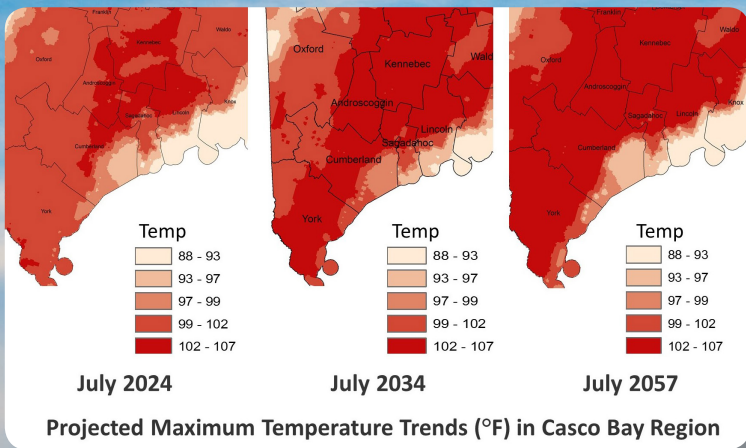
- ▶ University of Maine Climate Change Institute
- ▶ University of Southern Maine
- ▶ Southern Maine Planning and Development Commission
- ▶ University of Maine Extension



- ▶ Conservation Law Foundation
- ▶ Casco Bay Lines



- ▶ Trans-Canada/Portland Natural Gas Transmission System
- ▶ Central Maine Power
- ▶ AT&T Wireless
- ▶ Verizon Wireless
- ▶ St. Lawrence & Atlantic Railroad
- ▶ Global Petroleum



99%
of the
world's
oceans

The Gulf of Maine is warming faster than 99% of the world's oceans, which could increase the intensity of hurricanes and coastal storms in the near term³

INTERIM FINDINGS

ENERGY



Increasing temperatures affect seasonal electricity demands (e.g., increased cooling demand in the summer) and power plant output and transmission line capacity, which could cause rolling brown outs if electric infrastructure does not adapt

Coastal electric infrastructure assets are vulnerable to sea-level rise and storm surge, which could lead to local power outages that impact dependent infrastructure systems

The greater prevalence of invasive species in Maine increases the risk to transmission infrastructure during storms

Increased flooding in certain areas has already necessitated the relocation of transmission lines and other electrical power infrastructure

WATER AND WASTEWATER



Surface runoff into lakes will increase as extreme precipitation events become more common

Adaptive actions taken without consideration of interdependencies could lead to unintended systemic consequences

Rising sea levels will increase the salinity of coastal aquifers, which will significantly impact drinking water supply

TRANSPORTATION



Storm surge could affect low-lying roads and causeways, rail lines, and marine infrastructure, including South Portland marine oil terminals, the International Marine terminal, and ferry terminals

Locally relevant guidance from the State on what climate impacts to plan for is lacking

Coordinated regional planning is difficult when individual communities engage in their own local planning (i.e., home-rule)

TELECOMMUNICATION



Higher temperatures require greater cooling of wireless and cell tower equipment

Facilities are susceptible to ice damage, which could affect communications within the region

Telecommunication infrastructure is frequently co-located on transportation infrastructure

Heavy precipitation or ice storms could prevent access to sites that are damaged or require fuel for backup power sources

PATH FORWARD



CLIMATE MODELING

Conduct region-specific, dynamically downscaled climate modeling and develop tutorials

Analyze high-resolution, region-specific historical precipitation data

Develop regionalized hydrological models of future climate

Refine coastal storm surge modeling



INFRASTRUCTURE

Continue electric infrastructure climate change resiliency assessments

Evaluate renewable energy roadmap for Maine

Assess coastal aquifer saltwater intrusion

“By 2055, electrical transmission line **capacity will decrease by as much as 8%** under the projected 9°F temperature increase in Maine, while **demand will increase by as much as 10%** as more residents demand air conditioning.”

THE CASCO BAY REGION CLIMATE CHANGE ADAPTATION RRAP IS LINKED TO SEVERAL CURRENT MAINE AND DHS ACTIVITIES:

- ▶ University of Maine Climate Change Institute's framework and platform for Climate Adaptation and Sustainability (CLAS) planning for Maine communities
- ▶ May 2014 Waterfronts of Portland and South Portland Maine Urban Land Institute Resilience Panel Report, which recommends further evaluation of lifeline infrastructure climate change risks (e.g., energy and water assets vulnerable to sea level rise and increasing storm surge)
- ▶ Maine Department of Transportation participation in a Federal Highway Administration-sponsored climate resilience pilot project for integrating vulnerability and criticality assessments into asset management
- ▶ University of Maine Cooperative Extension Service culvert vulnerability and adaptation project to inform decision-making, maintenance, and management
- ▶ Detailed DHS pilot studies of infrastructure dependencies and interdependencies throughout the Nation (the Casco Bay region is one of the pilot locations)
- ▶ DHS-facilitated Maine Climate Change Adaptation Planning Exercise, scheduled for Spring 2015



For more information about the Casco Bay Region Climate Change Adaptation RRAP, contact

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RESOURCES

1. Research conducted as part of the Strategic Environmental Research and Development Program, under Contract number RC—2242. (This research used resources of the National Energy Research Scientific Computing Center, which is supported by the U.S. Department of Energy's [DOE's] Office of Science under Contract No. DE-AC02-05CH11231 and employed the resources of the Argonne Leadership Computing Facility at Argonne National Laboratory, which is supported by DOE's Office of Science under contract DE-AC02-06CH11357.)
2. IPCC, 2014, "Summary for Policymakers," in *Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects*, contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Field, C.B., V.R. Barros, D.J. Dokken, K.J. Mach, M.D. Mastrandrea, T.E. Bilir, M. Chatterjee, K.L. Ebi, Y.O. Estrada, R.C. Genova, B. Girma, E.S. Kissel, A.N. Levy, S. MacCracken, P.R. Mastrandrea, and L.L. White (eds.)], Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, pp. 1–32.
3. Whittle, P., 2014, "Gulf of Maine Warming Faster than Most Bodies of Saltwater, Research Finds," *Portland Press Herald*, September 3, <http://www.pressherald.com/2014/09/03/gulf-of-maine-is-warming-faster-than-99-of-worlds-oceans-say-scientists/>, accessed November 19, 2014

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For more information visit: www.dhs.gov/criticalinfrastructure