



# **MOVING SCIENCE INTO ACTION FOR CLIMATE RESILIENCE**



# INTRODUCTION



With a changing climate, we can no longer rely on past trends to predict the future. Businesses and communities must build resilience in the face of uncertainty and learn to adapt. Our lives will be impacted by the decisions we make now, which must be informed by the best available information. RPS believes in the power of data to drive science-based decision-making and underpin innovative solutions to improve climate resilience and adaptation

Our scientists apply state-of-the-art numerical models to predict future conditions and quantify exposure and vulnerability to extreme weather events and chronic climate stressors like sea level rise, increased flood risks, and stronger storms. By helping clients understand the trajectories of change, RPS goes beyond vulnerability assessments to aid businesses and communities in preparing for future conditions.

Our inundation modeling provides planners, engineers, emergency management officials, insurers, and property owners with the power to assess potential impacts of flooding events and take action to reduce vulnerability. RPS experts provide guidance for addressing climate change uncertainty in long-term planning by predicting future site conditions under varying climate change scenarios. Our experts analyze climate change scenarios that may impact an infrastructure asset over its useful life to ensure a facility is well-protected without being over-engineered.

## Our Expertise

We are data collectors, integrators, analysts, and modelers skilled at translating data into actionable knowledge for narrowing uncertainties and confidently planning for an ever-changing world. We provide detailed assessments at the federal, regional, state, and local levels with our environmental expertise. Our assessments include predictions of flooding and inundation as well as shoreline and habitat responses to changing conditions, sea levels, temperatures, and wave action. Our services include:

- Coastal process modeling and analysis (including inundation, storm surge, winds, waves, currents, water levels, sediment transport, and shoreline change)
- Exposure analysis and vulnerability assessment
- Climate change scenario planning
- Metocean data collection and measurements
- High-quality environmental data management and communication
- Online mapping applications, GIS analyses, and custom visualizations
- Environmental Impact Statements and Environmental Assessments (NEPA)
- Habitat equivalency analysis and restoration scaling

**SCIENTIFIC  
NEUTRALITY IS THE  
CORNERSTONE OF  
OUR WORK**

# OUR SERVICES



## Measurements

Detailed and accurate measurements of the complex coastal environment are an integral part of cost-effective design of coastal structures. RPS has provided 40 years of meteorological measurement services to government and industry clients, including coastal and offshore instrumentation, system design, and program development and implementation. We deploy instruments to collect measurements of key drivers of coastal processes for evaluation of sea level, wind, and wave conditions along the shoreline. These data inform modeling assessments of erosion, shoreline stabilization, storm protection, and beach nourishment to support coastal management.

## Modeling and Analysis

Numerical models are critical tools with which to predict, prepare for, and mitigate effects of climate change on multiple timescales. We help our clients achieve climate resilience through modeling coastal processes, including currents, waves, flooding and inundation, and sediment transport. Predictions range from specific events (e.g., flooding from individual storms) to long-term processes (e.g., changes in shoreline configuration due to rising sea levels). Accordingly, we work closely with our clients to define the time and spatial scales that are most relevant for their needs. We also provide our clients with analyses to understand the statistical extremes and uncertainty, sensitivity, and limitations of model-based predictions.

## Data Management

RPS operates sophisticated systems for the acquisition, processing, archiving, and distribution of data. Our systems collect a wide variety of oceanographic and meteorological data in disparate formats and make it available to users in standard formats via web services. This approach to data management facilitates support of environmental modeling and analysis projects by ensuring availability of high quality environmental data. We understand the strengths, weaknesses, and applicability of each potential source of information and can determine whether existing information is sufficient for a climate assessment or whether new modeling and analysis is necessary.

## GIS/Data Visualization

RPS provides easily-accessible and interpretable data products and state-of-the art visualizations of geospatial vulnerability to future sea level rise and storm surge. We create interactive, online mapping applications to display relevant data and model results as well as identify at-risk property and critical infrastructure. These tools can help identify priority adaptation strategies and guide municipalities in defining infrastructure maintenance plans and reduce long-term climate vulnerabilities. We are adept at communicating complex scientific information to a broad range of audiences through advanced data management and visualization techniques.

# CASE STUDIES

- 1. Storm surge analysis, National Parks Service (NPS):** RPS, in collaboration with the University of Rhode Island, used the Advanced CIRCulation (ADCIRC) computer model to model storm surge under current and future conditions. This analysis helped identify at-risk infrastructure, enabling park staff and managers to prioritize resources during pre-storm planning.
- 2. Bayside Adapts, City of Portland, ME:** In partnership with Woodard & Curran and Jordan Environmental, RPS worked with the City to prioritize management concerns as well as define the low probability, but high consequence, scenarios to monitor using their planning horizons, risk tolerance, and best available data on sea level rise, storm surge, and precipitation.
- 3. Vulnerability assessment, Rhode Island Department of Environmental Management (RIDEM):** RPS conducted a vulnerability assessment of the potential effects of climate change on Rhode Island wastewater collection and treatment infrastructure. Our series of model- and map-based assessments of storm surge, sea level rise, waves, coastal erosion, and inland flooding impacts, informed a comprehensive risk assessment, performed by Woodard & Curran, and associated adaptive strategies for each facility.
- 4. Buoy deployment, Norfolk, VA:** RPS addressed a wave modeling information gap by deploying a wave buoy to evaluate the wave climate offshore Norfolk, VA (which highlighted previously missed wave energy sources) and provide input for numerical modeling. The buoy, which continues to be maintained after 5+ years, helped assess observed erosion, and support shore stabilization, storm protection, and beach nourishment decisions, through informed design.
- 5. Field Research Facility Data Portal, U.S. Army Corps of Engineers (USACE):** RPS worked with the USACE to make a 35-year archive of coastal and nearshore monitoring data easily available to the public through the Field Research Facility Data Portal web application. The compilation of continuous measurements of the current field and wave climate, in combination with regular beach surveys, provided important insights into how coastlines respond to changes in the coastal and nearshore environments.
- 6. Data management and distribution, Northeast Regional Ocean Council (NROC):** RPS developed a data management and distribution system (database, API, and web services) that allows public users to access a library of new, high-resolution, model-based storm surge predictions for the northeastern US. The system integrates modeling results from the recent USACE North Atlantic Comprehensive Coastal Study (NACCS) into existing websites and data viewers managed by the NROC member states. It also provides spatial data users with access to model output via web services and allows for bulk download of the NACCS database.
- 7. Galveston Bay Storm Surge Barrier Biological Effects Analysis:** RPS conducted a biological effects analysis for the Storm Surge Suppression Study in six counties around Galveston Bay, TX. RPS compared the potential effects of two barriers comprised of floating sector gates of different sizes and multiple vertical lift gates that would cross the Houston Shipping Channel. RPS described the ecology of the estuarine and marine habitats in the region; identified key species and summarized their life history, migration, and habitat use; described the physical effects of gate construction and operation based on existing oceanographic modeling; and evaluated the potential impacts and mitigation of different scenarios on the biological resources of the area.
- 8. Risk Reduction for Small Businesses in Rhode Island:** RPS led a project for the Rhode Island Division of Statewide Planning to create business-specific Risk Reduction Guides to help small businesses become more resilient to extreme weather events. RPS conducted an Exposure Analysis to determine what areas of the state are most vulnerable to flooding events and power outages. In order to gauge the vulnerabilities and the lessons learned from past events, the Project Team performed over 100 vulnerability assessments with small business owners in four Pilot Areas identified through the Exposure Analysis. Input collected from these assessments and other outreach events was used to inform the creation of useful Risk Reduction Guides to benefit small businesses statewide.