

Puerto Rico Coastal Zone Management Program

Proposal submitted to NOAA Coastal Services Center by Director Ernesto L. Diaz and Kasey R. Jacobs



COASTAL MANAGEMENT FELLOWSHIP 2014

Puerto Rico Coastal Zone Management Program

Development of an Online Self-Assessment & Solutions Tool for Individuals, Communities, and Municipalities of Puerto Rico for Resilient Coastal Communities and Healthy Ecosystems

Proposal submitted to NOAA Coastal Services Center-Coastal Learning Services

Fellowship Mentors: Director Ernesto L. Diaz and Kasey R. Jacobs

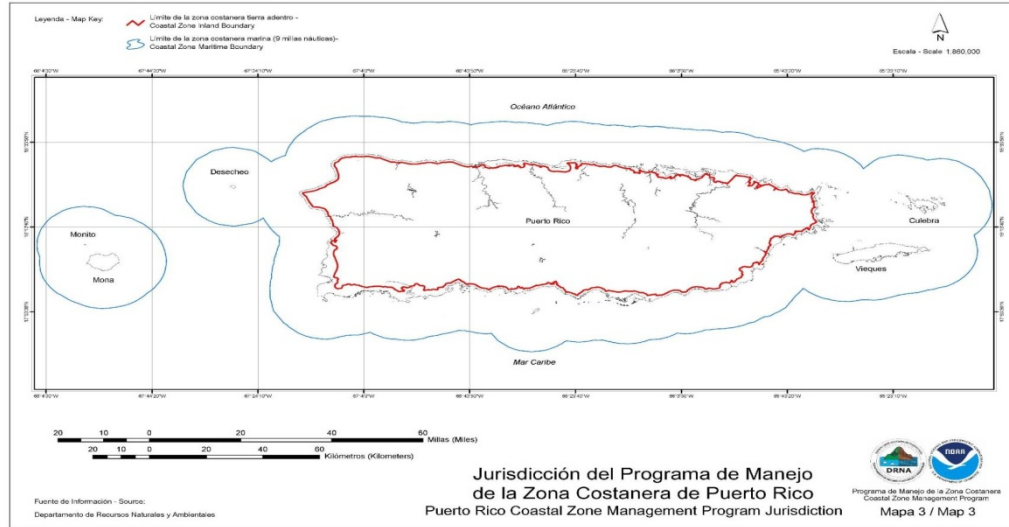
BACKGROUND AND INTRODUCTION

The world is changing and will continue to change at rates unprecedented in recent human history. Both rapid-onset and slow-onset hazards pose substantial risks to many coastal communities of Puerto Rico. Storm surges, winter swells, tsunamis, coral bleaching are examples of rapid-onset events, while sea level rise and ocean acidification are examples of slow-onset events. Risks from these phenomena are projected to increase due to continued development in hazardous locations, changes in the frequency and intensity of inundation events, and acceleration in the rate of change along vulnerable shorelines. Adequate attention must be given to respond to the impacts of coastal hazards that are already occurring and at the same time prepare for future impacts. Strengthening the ability of Puerto Rico to reduce risks will safeguard economic progress and increase the resilience of our ecosystems and our people.

Puerto Rico's Coastal Zone Management Program (PRCZMP) was adopted in 1978 under the authority of the U.S. Coastal Zone Management Act of 1972, as amended. At the time of the PRCZMP adoption, Puerto Rico's coastal areas were subject to increasing pressures resulting in use conflicts. The PRCMP established the basis for the required balance between conservation and the sustainable use of coastal resources. The PRCZMP was also adopted by the Puerto Rico Planning Board (PRPB) as the coastal component of the Island-wide Land Use Plan for Puerto Rico. The Program document was approved by the Governor of Puerto Rico and certified by the National Oceanographic and Atmospheric Administration (NOAA) in September 1978. The Department of Natural and Environmental Resources (DNER) is the lead agency responsible for the overall coordination and implementation of the PRCZMP.

The PRCZMP exerts Commonwealth control over the designated coastal zone which covers a geographic area, defined as follows:

...a 1,000 meter wide belt of coastal lands or additional distances needed to protect key coastal natural systems, the Territorial waters, and submerged lands beneath them extending 9 nautical miles offshore, as well as the Vieques, Culebra, Mona islands, and all keys and islets within the Puerto Rico jurisdiction.



In Puerto Rico, approximately 419,000 people live within the coastal zone, and 2.3 million live within the 44 coastal municipalities of the Commonwealth. These populations are exposed to specific hazards such as coastal and riverine flooding, tsunamis, hurricanes, landslides, earthquakes and droughts. Hazard events and related social consequences are described in historical documents dating back before and after the Spanish-American War, specifically hurricanes, and some have been described and passed on through oral history, pottery, and petroglyphs since the Taino Indians. Vulnerabilities to these recurring hazards are widespread in Puerto Rico and a result of multiple factors, such as continuing development in high hazards areas, poor maintenance of existing shoreline stabilization structures and stormwater management systems, poor maintenance and dredging of rivers, canals and reservoirs, lack of soil management practices on land and in watersheds, and from the elimination of dunes, reefs, mangroves, and other naturally protective features that reduce the negative effects of hazard events. While these problems persist, some corrective measures have been implemented since the 1970s, such as water quality and flood control initiatives, habitat restoration and other enhancement projects.

A new threat has the potential to exacerbate these already existing vulnerabilities and may even create new ones – climate change. Many decisions made on a daily, weekly, annual, and decadal basis in Puerto Rico come with a long-term commitment and can be very sensitive to climate conditions. Examples of these types of decisions include land-use plans, risk management strategies, infrastructure development for water management or transportation, coastline and flood defenses (e.g., dikes, shoreline stabilization structures, flood control and storm-water management infrastructure design), urbanism (e.g., urban density, parks), energy production, and building design and norms. These decisions have consequences over periods of

50-200 years and perhaps longer. Decisions, as well as investments, are potentially vulnerable to changes in climate conditions such as changes in precipitation and temperature patterns, sea level rise, greater intensity of storms, etc. In the past, these climate-driven parameters could be observed and measured. Today, engineers and public works officers use statistical analyses and optimization algorithms to determine the “best” designs as a function of known climate conditions and planners often lay out coastal communities with a historical view of the shoreline. In the future, there will be substantial climate uncertainty making these methods more difficult to apply. Additionally, decisions and actions on how to adapt to changes in climate by people and institutions within or managing the coastal zone are shaped and constrained by a range of factors, including the resources available to decision-makers and the social, economic, and political context in which decisions are made.

To guide decision making processes in Puerto Rico around coastal development and natural resource management the PRCZMP partnered with over 150 researchers, planners, architects, practitioners, agency representatives and communications experts (the group now called the Puerto Rico Climate Change Council or PRCCC) to develop a comprehensive climate change vulnerability assessment for Puerto Rico, *Puerto Rico’s State of the Climate 2010-2013: Assessing Puerto Rico’s Social-Ecological Vulnerabilities in a Changing Climate*. Using this report and hundreds of adaptation strategies collected from 2010 to 2013, the PRCZMP is now completing a second report with guidance on a variety of adaptation options at a number of different scales: the Commonwealth or Island-wide scale, the municipal scale (Puerto Rico has 44 coastal municipalities or towns), and the communities. Both reports will be used to provide guidance to infrastructure agencies and local communities on capital investment projects, new developments, natural protected areas, hazard mitigation plans, post disaster redevelopment plans, and overall land use planning.

The PRCCC is comprised of four working groups: (WG1) Geophysical and Chemical Scientific Knowledge; (WG2) Ecology and Biodiversity; (WG3) Society and Economy; and (WG4) Communicating Climate Change and Coastal Hazards. Based on the results of PRCCC’s WG1, WG2 and WG3 as well as the results of coastal hazards risk assessment workshops conducted with thirty of the forty-four coastal municipalities, the PRCCC concludes that Puerto Rico’s climate is changing and coastal communities of Puerto Rico, critical infrastructure, wildlife and ecosystems are all vulnerable to various impacts associated with changes in global, regional, and island weather and oceanographic conditions. The PRCCC has found that climate change will impact the social, economic, and ecological fabric of life in Puerto Rico, affecting key sectors such as economic development, tourism, services, natural resources and biodiversity, cultural and historic resources, security, and critical infrastructure. The size, history, and relative isolation of the islands of Puerto Rico will make them feel the effects of climate change differently than other U.S. coastal zones. For years this picture was incomplete due to lack of a coordinated effort to compile the best available scientific and local knowledge.

Pursuant to Section 309 of the Coastal Zone Management Act (CZMA) the PRCZMP completed its Assessment and Strategy for the period FY2011-2015. This strategy identified the need for local mitigation strategies to address sea level rise (SLR), a need to advance SLR adaptation and vulnerability analyses through action at the Commonwealth and local level, a model for simulating future SLR and coastal hazard impacts will be identified and guidance will

be developed for all levels of government and PR society to incorporate hazard data into local plans, regulations, projects, policies, special area management plans, and post-disaster hazard mitigation plans.

Numerous efforts have been made since the last S309 assessment to improve hazards education and outreach; however, more initiatives are needed, especially now that the PRCCC has so many findings to communicate. In September 2009, a 309-funded study was released through the work of Dr. Walter Diaz of *el Centro de Investigación Social Asociada del Recinto de Mayagüez*. The study was titled (in English), “Coastal Hazards and Climate Change Perception in the Western Area of Puerto Rico”. The most important results of this study showed that a substantial majority of respondents perceive threats like storm surge flooding, sea level rise, and global warming, to be a real risk to themselves and their homes. Additionally, with the exception of landslides and river floods, the people interviewed, on average, believe the threats are probably or very likely to occur with the next ten years (20 years for rising sea levels and coastal erosion). People were asked to rank six public issues in order of importance to them. The top three were public health, education and crime. Interestingly, global warming was listed more important than government corruption and political status. In addition to this study, the CMO has released several publications that highlight research needs for sea level rise and climate change, such as the 25th Anniversary of the Coastal Zone Management Program that was released in 2005, and the CMO is frequently invited to speak at events across the island on these subjects. Non-PRCZMP efforts for hazards education and outreach have started being conducted on an on-going basis since the last assessment. These include efforts by the Puerto Rico Seismic Network, specifically educating residents and municipal planners and emergency managers about earthquakes and tsunamis; Sea Grant Puerto Rico is educating on numerous hazards such as climate change, tsunamis, rip currents (in terms of beach safety), storm surges, and erosion.

PROJECT DESCRIPTION

Goals and Objectives

In order to address the need for greater education and outreach on coastal hazards in Puerto Rico and to better communicate the findings of the PRCCC, the PRCZMP is envisioning the development of an *Online Self-Assessment & Solutions Tool* for Individuals, Communities, and Municipalities of Puerto Rico. The 2014-2016 NOAA Coastal Management Fellow would research existing English and Spanish self-assessment, risk assessment and adaptation tools and design and program an online tool that is most appropriate for Puerto Rico. Existing tools that the fellow would either pull from or work to develop formal collaborations with would be the NOAA Roadmap for Adapting to Coastal Risk, the Caribbean Climate Online Risk and Adaptation Tool (CCORAL), the Gulf of Mexico Alliance’s Coastal Resilience Index, the Homeowners Guide to Preparing for Hazard Events, the Vulnerability-Consequence Adaptation Planning Scenarios (VCAPS) process, and other FEMA approved tools. The tool development would also include showcasing and testing the tool at community workshops as part of the current PRCZMP efforts to establish eight coastal community climate adaptation pilot projects.

The online tool would provide coastal communities a way to better understand the risk and impacts associated with coastal hazards, including climate changes based on the information from

the PRCZMP and PRCCC. Once the users are walked through a risk assessment process to identify their qualitative risk level (high, medium, and low) and the sectors that are most vulnerable, the tool would provide them an inventory of existing capabilities, options, and resources in Puerto Rico to address the coastal hazards in their area. Based on the scale the user is concerned with and the answers they provide in the risk assessment, the tool would provide them with adaptation strategy options for consideration. Moreover, the tool would direct the users to the appropriate resource providers for technical guidance or potential funding opportunities. The adaptation options would range from infrastructure-based to ecosystem-based, including capacity building and education.

The selected fellow would also work closely with the mentors and collaborators on on-going hazards education and outreach projects. Key objectives for the PRCZMP are to:

- Provide technical assistance to local governments. Outreach related to coastal hazards is a key and continuing activity, especially in providing advice and technical support to coastal municipalities in integrating hazard mitigation into their plans (i.e. hazard mitigation plans, land use plans, evacuation routes, emergency management plans, etc).
- Prepare GIS based maps and other educational information dealing with (1) risk and vulnerability findings; (2) new FEMA maps and building guidelines; (3) sources for assistance in retrofitting; etc
- Support the development of regional meetings to exchange information with NGOs, academia, research institutions, the media, and local officials on coastal flooding problems and implications for planning and regulatory measures. Emphasis should be on opening up avenues of communication between local representatives and citizen groups, and central government agencies. Such meetings, convened by DNER, could be co-hosted with the Planning Board and/or FEMA.
- Support the development of media workshops and meetings. Raise awareness of coastal hazards, climate variability and change, among the media. A main objective of the outreach strategy will be to effectively communicate hazard science, local impacts, and strategies with media outlets throughout the island and the mainland so as to support accurate reporting and communication to local officials and the public.
- The fellow will serve as co-lead in the preparation process of the report: "The Puerto Rico State of the Climate 2014-2017-Assessing Socio-ecological vulnerabilities in a changing climate" in coordination with members of the Puerto Rico Climate Change Council. (More information can be found at: <http://pr-ccc.org>)

Expected education and outreach outcomes:

- Outreach and educational material related to coastal hazards
- Strengthened partnerships to promote climate change adaptation and coastal hazards resiliency.
- Workshops for media representatives, reporters and journalists to learn more about climate change and coastal hazards.
- Media dissemination of climate change and coastal hazards preparedness and adaptation.

Milestones and Outcomes

Timeframe	Product/Deliverable	Collaborators
Months 1-6	Compilation of research on existing tools and draft design for the Puerto Rico tool with list of comments or endorsements from PRCCC members and national/international reviewers	PRCCC Caribbean Community Climate Change Center
Months 6-12 (by end of Yr 1)	Coding and programming to develop preliminary tool to be tested	DNER-PRCZMP website developers
Months 12-18	Present and test the tool through focus groups, community workshops, and PRCCC annual summit	PRCCC Targeted coastal communities Professional associations and universities PRPB, FEMA, Sea Grant, etc.
Months 18-24 (by end of Yr 2)	Peer review process and revising tool to be ready for public use	PRCCC DNER-PRCZMP website developers

Professional Skill Development

For successful completion of this project, the NOAA Coastal Management Fellow would employ and sharpen the following skill set: (1) coding and programming; (2) data and information quality assurance and quality control; (3) website design; (4) decision theory; (5) risk assessment and adaptation strategy development; (6) facilitation and event planning; (7) public speaking; (8) communications and marketing; and (9) Spanish language proficiency in writing and speaking.

Collaborators that the fellow will have continuous interaction would be PRCCC members from universities and professional associations (planning, engineers, etc), DNER, local emergency management offices and FEMA, NOAA, Caribbean Community Climate Change Center, community-based organizations, the Caribbean Landscape Conservation Cooperative and the Caribbean Regional Ocean Partnership (for data management, presenting at their events and activities, and possible web hosting), and potentially the International Climate Services Partnership and the Southeast & Caribbean Climate Community of Practice.

FELLOW MENTORING

The selected fellow will be housed within DNER. Office resources (telephone, computer, staff support, software) will be provided by DNER. The fellow will be working closely with the Coastal Zone Management office in San Juan under the direction of Ernesto L. Diaz. The fellow will have direct opportunities to speak with DNER, Puerto Rico Planning Board officials, Sea Grant and University of Puerto Rico (UPR) scientists, and local community organizations. PRCZMP-CMO will provide the baseline information and GIS data, software, assistance, aerial

photography, and literature needed to achieve the objectives of the fellowship project. Ernesto L. Diaz (PRCZMP Director and PRCCC), Kasey R. Jacobs (PRCCC) will serve as mentors to the selected candidate.

COST SHARE

DNER will provide two lump sum payments, \$7,500 the first year and \$7,500 the second year, from Commonwealth's matching funds.

STRATEGIC FOCUS AREA

The theme of the fellowship – climate change adaptation – and of the project – building an innovative product for strengthening decision making – address all three strategic focus areas for 2014: healthy coastal ecosystems, resilient coastal communities, and vibrant and sustainable coastal economies. However, we see the main focus for us to be protecting life and property on the coasts of Puerto Rico and thus resilient coastal communities as the primary focal area. In order to achieve that goal, healthy coastal ecosystems are a requirement and vibrant and sustainable coastal economies a beneficial outcome. Specifically, the tool would be used to build capacity for communities and municipalities to pursue strategies such as hazard preparedness, mitigation, and post-hazard redevelopment planning. To do so the fellow would build an innovative natural and social science research product and application that reflect user-driven science, and synthesize, visualize, communicate and transfer research results to strengthen policies and decisions, and effectively manage coastal resources. The tool could also be used as an educational tool in classrooms around the island. A number of PRCCC members work with the public and private schools on climate literacy projects and this online tool would be available for their review and use once completed. Because the tool would cover infrastructure and ecosystem adaptation, and the nature of the PRCZMP collaborations with the Ecology and Biodiversity working group of the PRCCC and the Caribbean Landscape Conservation Cooperative, the tool would also be used to enable conservation and restoration of critical coastal ecosystems and habitat by integrating priorities and interests across agencies and partner organizations using geospatial applications to align interests and communicate priorities.

CONTACT INFORMATION

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