

New Jersey Coastal Management Program

APPLICATION

For

NOAA Coastal Management Fellowship 2009

New Jersey Coastal Vulnerability Analyst

Introduction

In September, 2006, New Jersey's Governor, Jon Corzine, convened a Summit Confronting Climate Change in New Jersey. Scientists, insurers, and government leaders gathered to discuss how New Jersey can best respond to the serious and urgent challenges posed by the effects of climate change. Concurrently the New Jersey Coastal Management Program (NJCMP) developed and submitted to NOAA its section 309 Assessment and Enhancement Strategy for fiscal years 2006 – 2010. In accordance with Section 309 of the Coastal Zone Management Act, the NJCMP proposed to address recommendations emerging from the Governor's Summit. One of the recommendations is that the State should develop hazards vulnerability indices for coastal communities. While vulnerability to hazards is a necessary component of resiliency, it also involves the concepts of risk avoidance, minimization of hazard impacts, and recovery from the effects of hazard events, changing coastal landscapes and land use.

Background

At the axis of oceans and continents, coastal areas are one of the most dynamic environments on Earth. Characteristic of their ever-changing morphology, coastal zones are susceptible to a broad range of large-scale processes that effect hazardous conditions for its inhabitants. Much of New Jersey's densely populated coast is highly vulnerable to the effects of flooding, storm surge, episodic and chronic erosion, subsidence and sea level rise.

In response to the above statement excerpted from New Jersey's 2006 approved section 309 *Strategy*, New Jersey's Coastal Management Office (CMO) is proposing to engage the fellow in meeting the long term goals and objectives of our strategy. The section 309 strategy addressing Coastal Hazards issues will incorporate substantial changes to the State's program over the remaining term. Proposed changes include implementation of new policies, amendments to or new regulations, research and delivery of products and services to coastal communities. In addition, New Jersey has made a substantial investment in statewide LiDAR mapping and in developing a Natural Capital Valuation of our natural resources, products that will be instrumental in successfully meeting the coastal strategy. The CMO intends to apply such tools to make science-based policy and management decisions and to apply the resilience index developed for the Delaware Bayshore to land use planning and infrastructure financing decisions in tidal river and urban waterfront areas as a local decision-support mechanism.

The 309 *Strategy* addresses the potential impact of coastal hazards on the state's economy and natural and built environments. The following excerpts from the 309 *Strategy* frame the basis for the development of program goals, objectives and deliverables:

“Manifestations of these (coastal hazard) phenomena occur at broadly different rates. Their expression ranges from the gradual such as sea level rise and chronic erosion that

can be measured on a decadal time-scale, to catastrophic events such as hurricanes/typhoons, extra-tropical storms and storm surges that can be measured in terms of days or even hours. Just as their rates of occurrence differ, so are their effects expressed in profoundly different ways.

Catastrophic events alter the natural features of the shoreline such as beaches, dunes and wetlands, and threaten people and property. In New Jersey, both reconstruction of residential development and the conversion of single family dwellings into multi-unit dwellings continue in hazardous areas. Although application of more stringent construction standards and techniques results in more storm-resistant structures, the value of property at risk is appreciably increasing. With anticipated accelerating sea level rise and increasing storm frequency and intensity, vulnerability to the risks of coastal hazards will be exacerbated and the costs of damages and losses resulting from the events will only increase. Catastrophic events require anticipatory preparations for the inevitability of an event, the capacity for rapid response to an imminent threat of an event, and preparation for addressing the aftermath of an event.

The effects of gradually occurring phenomena are more predictable and allow for long-range planning and measured preparation. Accelerating sea level rise places coastal wetlands at risk. From the perspective of coastal hazards, coastal wetlands function to buffer uplands from chronic and episodic erosion caused by wave action. In New Jersey, data is needed to identify and clearly define the geomorphological, biological, and hydrological factors that are conducive to the landward migration of coastal wetlands, the development of pioneering coastal wetlands along open water areas, and the transformation of freshwater wetlands to tidal wetlands.”

The Coastal Management Fellowship project will address the potential physical impact of sea level rise and exacerbated coastal hazards on the developed coastal area of the tidal portion of the Delaware River and its major tributaries. This region has a history of heavy industry (petrochemical, pharmaceutical, and manufacturing), port and shipping infrastructure and residential settlement. The region has suffered severe wetland buffer loss over many decades, yielding a high surface area of infrastructure and concomitant exposure of assets to potential damages from storm and flood hazards. The consequence of this exposure is evidenced as an increasing disparity between the effectiveness of natural buffers where they exist and the siting of infrastructure and land development. Current policies address buffers as a static resource that provides natural ecosystem services but is not promoted as a preventative mechanism to mitigate the impacts of flooding and sea level rise on infrastructure and development.

The natural capital value and economic contribution of this study area necessitates the development of local decision-support tools that mitigate the impacts of sea level rise and associated coastal hazards and encourage a framework for sustainable coastal development practices. The State has an opportunity to develop and implement policies and regulations that foster prudent and effective planning for sea level rise. One of this initiative’s goals is to be proactive in identifying the cumulative potential impacts of climate change-phenomena and to develop strategies to protect these exposed environments.

Goals and Objectives

In the wake of Hurricanes Katrina, Rita and Ike, concerns of coastal resiliency and sustainability have become prominent in discussions of hazard planning and coastal management. Given recent assessments of anticipated sea level rise, increased storm intensity, subsiding coastal landscapes, and increasingly at-risk populations and physical assets, waterfront communities, including those not previously at risk, are in need of comprehensive vulnerability planning to deal with the potential for future damages. However, despite this increased focus, an agreed-upon definition of what aspects comprise a “resilient” coastal community has not been established. Furthermore, such an assessment must define how the components of “resiliency” or “vulnerability” are quantified to be easily adapted for use in differing coastal regions.

This project seeks to build on current efforts to establish a comprehensive coastal resilience index for New Jersey’s Delaware Bayshore. This index will assess environmental, physical, social and economic factors that contribute to a quantifiable measure of community resilience. Presently, Coastal Management Office staff is actively engaged in reviewing scientific literature on wetland functional ecology, environmental resilience dynamics, and the economic impacts of inundation and surge hazards on coastal infrastructure. The fellow will apply this work, and forthcoming land use/land cover, infrastructure, Census, FEMA, natural capital and sea level rise data, to analyze urban waterfront vulnerability. Each community in the area of interest will have unique local regulations and ordinances that will strongly affect its related index and resulting community planning toolkit. It is also important that the index and toolkit be appropriate and adaptable to communities along New Jersey’s coastal waterfront that may have different landscape and population characteristics. The scope of this project will also be to examine local and state policy with regards to resilience planning and implementation

Project Description

Scientific research has been conducted assessing various scenarios of climate change, associated sea level rise and the potential impacts of both processes on the New Jersey landscape. In 2005, researchers at Princeton University¹ modeled those areas of the state likely to become permanently inundated by sea level rise as well as areas that will be subject to 100-year flooding levels, given average and high-end projections of present rates rise. Joint work between the American Littoral Society and the Center for Remote Sensing and Spatial Analysis at Rutgers University in 2006 built on Princeton’s work to characterize New Jersey’s coastal landscape based on the adequacy of available wetland migration area or its impedance by built infrastructure such as roads and buildings. The New Jersey Natural Capital Project, funded with a grant from the Geraldine R. Dodge Foundation and performed by researchers at the New Jersey Department of Environmental Protection & University of Vermont - Gund Institute for Ecological Economics, offered a set of mechanisms that derive a net value of the state’s ecosystem services and natural capital based on the most available land use/land cover data.

Beach-dune vulnerability assessments have been conducted more regionally by Richard Stockton College’s Coastal Research Center for the state Department of Coastal Engineering, seeking to apply limited LiDAR imagery in assessing 3-dimensional sediment gaps. In the state’s northern coastal reaches, researchers at the Stevens Institute of Technology have sought to address combined overland and coastal inundation vulnerability concerns and concomitant impact on shipping infrastructure throughout New York Bay and the Port Authority of New York and New Jersey region. Monmouth University’s Urban Coast Institute is seeking to develop a baseline resilience index for Atlantic coastal communities in suburban Monmouth County

¹ Cooper, Beveers, & Oppenheimer, 2005

The previously noted research has begun to frame the likely impacts of climate change and sea level rise on New Jersey's landscape. Under the current section 309 Strategy, the New Jersey Coastal Management Office has begun to integrate the aforementioned research and establish contacts with local governments and community groups to apply the result of these scientific assessments. A void exists for accessible tools for local, regional, and state planners of urban coastlines that will mitigate future damages to their communities and environs. The fellow will be charged with applying existing information on the impacts of climate change and coastal hazards and developing recommendations for policies and amended regulations that will address these impacts in urban waterfront areas. The fellow will work with local government officials, state coastal management professionals and academic researchers to develop the products of this initiative.


Milestones and Outcomes

The NJCMP has identified specific outcomes for the Coastal Management Fellowship Project. Each task will result in outcomes implementing the policy measures articulated in the *309 Strategy* for Coastal Hazards and the goals of the NJCMP. The specific task areas and measures the Fellowship Project will employ are described below. The 'outcomes' are noted by the '•' symbol.

1. Adapt the multidisciplinary hazards **Resilience Indicators** produced by the New Jersey Coastal Management Office. These resilience indicators presently characterize the biophysical and socio-economic conditions of coastal communities throughout the Delaware Bayshore. Adaptation of these indicators should reflect the diverse characteristics of tidal river, suburban and urban waterfront communities including data collection techniques, communication systems, information access, public health provisions, long-term benefit-cost projections, and structural improvements. For the development of resilience indicators, the fellow will employ innovative technologies and data including recently acquired LiDAR imagery and natural capital data.
 - Characterization of the coastal landscape and communities in the study area.
 - Characterization of the intensity of impacts to which the natural environment and built communities of the tidal Delaware River and its suburban and urban waterfront areas may be exposed.
2. Adapt a synthesized **Resilience Index** for use in communities in the AOI that incorporates the selected indicators.
 - Resilience index for the AOI.
 - Recommendations for translation of the Resilience Index to other New Jersey suburban and urban waterfront areas.
3. Review state, regional, and local regulatory polices and programs that pertain to the AOI to identify opportunities to strengthen management policies. The Community Resilience Index will provide an accessible means by which to assess present strengths while prioritizing areas for improvement.
 - Summary of state, regional, and local programs, policies, and regulations that contribute to the resiliency of communities in the AOI.
 - Recommendations for changes in state, regional, and local programs, policies, and/or regulations that would serve to strengthen community resilience.

- Draft revisions and amendments to rules or policies to incorporate adaptive management strategies to address climate changes, sea level rise, coastal hazards and/or prioritization of capital investments.
 - Draft new policy recommendations that consider ecosystem-based management and strategic conservation planning as well as sea level rise as an infrastructure siting component.
4. Employ the resilience index to develop tools for state, regional, and local decision-makers; non-governmental organizations involved in land acquisition and protection; and individuals inhabiting areas vulnerable to the impacts of sea level rise and coastal hazards.
- Planning tools for state, regional, and local decision makers and the public.
 - Interactive educational tools accessible to
 - a. Local government decision-makers to assist with planning, zoning, and infrastructure siting and financing;
 - b. Non-government land trust and environmental advocacy organizations for prioritizing acquisition and preservation investments;
 - c. State government decision-makers for prioritizing infrastructure investment, restoration and mitigation policy, and land acquisition and preservation.

FELLOWSHIP PROJECT TIMELINE

	A 2009	S	O	N	D	J	F	M	A	M	J	J	A 2010	S	O	N	D	J	F	M	A	M	J	J 2011
1																								
2																								
3																								
4																								
5																								

Fellow Mentoring

The fellow will be directly supervised by the Coastal Program Manager but will function on a daily basis as part of a planning team of professionals within the CMO. The planning team consists of:

Ruth Ehinger, Coastal Program Manager
Dorina Frizzera, Environmental Scientist I, AICP
Kim Springer, Supervising Environmental Specialists
John D'Agostino, Research Scientist
Tali Engoltz, Research Scientist
Kevin Hassell, Senior Environmental Specialist
Annmarie Hoagland, support staff

This team has many years of experience in coastal resource management and program administration. The fellow will be integrally involved in all aspects of the CMO's activities, interacting on a regular basis with staff throughout the Department, including individuals representing the regulatory, enforcement, shore protection, and science and research programs. Interactions with the NOAA Office of Ocean and Coastal Resource Management program staff, staff from the Jacques Cousteau National Estuarine Research Reserve, New Jersey Marine Sciences Consortium (Sea Grant), local government and representatives of other State agencies is also proposed.

The NOAA fellow will be based in Trenton, NJ, although fieldwork will be necessary for the initiative's full implementation. The CMO is located within the Department's Office of Policy, Planning and Science, reporting directly to the Commissioner. The fellow will be assimilated as a member of the CMO and be provided with administrative, clerical and technical support. The Department offers a variety of technical, administrative and professional advancement training courses which will be available should the fellow wish to participate. Opportunities for attendance at workshops, meetings and training sessions (facilitation, dispute resolution) will be provided as personal /professional development in addition to the training opportunities provided by CSC as part of the fellowship.

This project will provide the fellow with the opportunity to work with professionals in the planning, regulatory and natural resource management field of a State agency closely linked with federal, State and local partners. The fellow will have the unique experience of being involved with developing a process that will impact public policy at the State level.

Research and Project Partners

The State of New Jersey has made a formal commitment at all levels to address the impacts of sea level rise, inundation, coastal hazards and community resiliency. Continued cooperation and coordination among partner organizations and agencies such as the NJCMP, the Federal Emergency Management Agency (FEMA), New Jersey's Office of Emergency Management (NJOEM) and the Jacques Cousteau National Estuarine Research Reserve will be important for coordination of hazard mitigation activities. Through the Division of Land Use Regulation permitting program, the NJCMP will continue to promote the hazard mitigation benefits of natural coastal systems such as beaches, dunes, wetlands, and floodplains.

In response to the pressing issues identified and the level of government commitment a number of institutions and organizations have engaged in various climate change and sea level rise research specific

to New Jersey. These institutions and organizations will serve as partners to the proposed project by contributing baseline data, being available on a consultation basis, sharing information delivery mechanisms and helping to frame policy. These institutions and organizations include:

- American Littoral Society,
 - Joint research by the American Littoral Society & Center for Remote Sensing and Spatial Analysis at Rutgers University alternatively analyzed state areas where adequate land is available for wetland retreat or where such land is impeded by physical infrastructure such as roads and buildings, based on present future projections of sea level rise.
- Monmouth University, Urban Coast Institute
- Partnership for the Delaware Estuary
 - Implementation of a demonstration project to rebuild and stabilize an eroded marsh edge with an intertidal, mussel-dominated community in a brackish region of the Delaware Estuary. An expected outcome of the project is that dense beds of marsh mussels will significantly contribute to vertical marsh accretion by filtering suspended matter and depositing it on the marsh surface, facilitating overall plant productivity, and stabilizing the marsh surface.
- Princeton University
 - Research by Princeton University² has assessed the extent of New Jersey coastal areas projected to be permanently inundated and subject to expanded 100-year flooding, given medium and high-end projections of present rates of sea level rise.
- Richard Stockton College, Coastal Research Center
 - The NJDEP's Bureau of Coastal Engineering contracted the Coastal Research Center to provide an assessment of the physical susceptibility of dune networks to inundation overwash given various flooding scenarios along the northern extent of Ocean County barrier island communities.
 - More localized vulnerability work has been performed by researchers at Richard Stockton Coastal Research Center and the Jacques Cousteau National Estuarine Research Reserve, focusing on mitigation priorities for small coastal communities.
- Union of Concerned Scientists
 - Has expanded on Princeton's work in gauging the vulnerability of shoreline reaches in the state and (in consultation with county planning officials) the likelihood that specific areas will be the focus of erosion mitigation or protection efforts in the future.
- The Jacques Cousteau National Estuarine Research Reserve
 - As a follow-up to a joint NJCMP, JCNERR and NJOEM Coastal Decision Maker Workshop, the JCNERR implemented an outreach program to communities along Barnegat Bay to instruct regional planners in the use of LiDAR data for community hazard mitigation.
- The Nature Conservancy- Global Marine Initiative
 - The Nature Conservancy has two specific projects with applicability to the proposed initiative: (1) the Ecosystem Based Management Decision Support Tool Kit; and, (2) the south shore of Long Island initiative to prepare an interactive tool kit for local government on sea-level rise. The Nature Conservancy has agreed to work with the CMO to share their experience and to help us develop a mechanism that will deliver the findings of this project to user groups for implementation.
- The University of Vermont
 - The New Jersey Natural Capital Project, produced by the New Jersey Department of Environmental Protection & University of Vermont - Gund Institute for Ecological

Cost Share Description

As noted, the fellow will be a member of the CMO staff and project team. The fellow will be provided with administrative, technical and clerical support. The fellow will be provided with a current Department-standard computer, standard and technical software, and communications equipment. Access to the Department's library, GIS data, and training opportunities will also be provided. While the NJCMP receives federal funding through the federal CZM Grant for personnel and operating expenses, a non-federal match is required. This match is provided through State appropriations and through the Corporate Business Tax. These funds are directed to implementation of the Department's watershed initiative and to implementation of coastal programming and land use management. The level of State funding far exceeds the required match for federal CZM awards. These non-federal State funds will also be directed to meet the cost share match in support of the fellow.

Thematic Area

The New Jersey Coastal Management Office proposes that the Fellowship Project address several of the thematic areas focusing on coastal resilience. Such areas include the development of multi-disciplinary adaptive management tools, local-decision support, alternative land use and strategic conservation planning, and shoreline change adaptation. The fellow's work products will serve as a primary reference for coastal managers' and local decision makers' knowledge of New Jersey-specific resilience-related policies. It is anticipated that through this project, the fellow will develop a working knowledge of ecosystem-based management principles involved in addressing environmental, social, and economic resilience management strategies. By incorporating assessments of New Jersey's natural capital, wetland migration potential, and high-resolution topography, the fellow will have strong resources with which to identify hazard resilience indicators and develop decision/support toolkits for local and State officials. This project will provide valuable outreach and communication between State and local officials, enhancing the knowledge of resilience concepts and implementing adaptive management strategies. The fellow will work with the Coastal Management Office to build on current efforts to address the need for regulatory and policy changes that recognize adaptive management strategies; the adaptation of resilience indicators; and the production of a community decision-support toolkit, the sum of which will promote implementation of sea level rise readiness in New Jersey's tidal suburban and urban coastal areas.

Submitted By:

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