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CLIMATE READY ESTUARIES 2009 PROGRESS REPORT

Climate Ready Estuaries Partners, 2008-2009





Albemarle-Pamlico National Estuary Program (APNEP)



Barnegat Bay National Estuary Program (BBNEP)



Casco Bay Estuary Partnership (CBEP)



Charlotte Harbor National Estuary Program (CHNEP)



Indian River Lagoon National Estuary Program (IRLNEP)



Massachusetts Bays Program (MBP)





Partnership for the Delaware Estuary (PDE)



Piscataqua Region Estuaries Partnership (PREP)



San Francisco Estuary Partnership (SFEP)



Tampa Bay Estuary Program (TBEP)

Long Island Sound Study (LISS)

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www.epa.gov/cre

This document may be downloaded from the Climate Ready Estuaries Web site at: www.epa.gov/cre/downloads/2009-CRE-Progress-Report.pdf

Introduction



Climate Ready Estuaries (CRE) is a partnership between the U.S. Environmental Protection Agency (EPA) and the National Estuary Programs (NEPs) to build capacity among coastal managers to improve the resilience of coastal areas to the impacts of climate change. CRE provides tools and assistance to help NEPs and coastal communities in their efforts to:

- Assess climate change vulnerabilities
- Develop a better understanding of climate change at local and regional levels
- Engage and educate stakeholders
- Develop and implement adaptation strategies
- Share lessons learned with other coastal managers

This document provides an overview of CRE's accomplishments to date, including activities being managed by the NEP Partners, lessons learned in the adaptation planning process, challenges encountered, and next steps for the program. Estuaries and other coastal systems are particularly vulnerable to many projected effects of climate change, including erosion and land loss from rising seas, altered frequencies and intensities of precipitation, and more-intense storm events. These effects will change our coastlines, affecting the people and species that inhabit them. The likelihood of impacts requires that actions be taken now to help coastal communities adapt.

How can you be "ready" for climate change?

Climate change will continue to affect the planet for many years, and the magnitude and timing of many impacts are uncertain. While we may not be able to completely protect ourselves from these changes, individuals, communities, and societies can prepare for what we expect will come our way.

EPA chose the term "Climate Ready Estuaries" to recognize NEPs, and eventually other coastal communities, that have engaged in learning about climate vulnerabilities, developed adaptation strategies, and taken steps to improve resilience. Climate change will be the underlying context for most planning, development, and conservation decisions in these climate-ready communities. CRE will bring together communities that are ready to adapt as the impacts of climate change continue to occur.

Program Accomplishments

Since its inception in 2008, CRE and its NEP Partners have made significant strides to improve the "climate readiness" of estuaries and their surrounding communities. Highlights of these accomplishments are described below.

Adaptation and Coastal Climate Change Awareness

CRE has promoted the development and implementation of adaptation plans. Through targeted grants and technical support, these estuary programs are developing adaptation strategies and plans that are a first step toward preparing for climate change. CRE has also begun raising awareness of the means for coastal adaptation to climate change through the Coastal Toolkit, the CRE Web site, publications, and workshops.

The efforts of CRE staff and Partners have promoted great interest in climate change adaptation and estuaries among other federal and state agencies, public and private land managers, NEPs, and coastal communities outside of the NEPs. CRE has also been showcased at local, national, and international workshops on coastal protection and response to climate change.

CRE Partner Network

CRE works with each estuary program to pursue that NEP's own ecosystem- and community-specific goals related to climate change adaptation. CRE provided grants and/or direct technical assistance



to 11 NEPs in 2008 and 2009, responding to their unique needs and spurring a growing number of on-the-ground accomplishments. Further details about these accomplishments can be found in the section on CRE Partner Activities 2008–2009.

CRE also provides a network for NEPs to communicate and share information, including challenges, lessons learned, adaptation strategies, and data. In turn, CRE Partners are developing region-specific capacity to become leaders in climate change adaptation for neighboring coastal communities.

Toolkit and Supporting Resources

The Coastal Toolkit (www.epa.gov/cre/toolkit. html), launched in August 2008, provides useful resources for estuary and coastal program managers and stakeholders who are interested in learning about climate change

Accomplishments at a Glance

- Enrolled 11 CRE Partners
- Published the Synthesis of Adaptation Options for Coastal Areas
- Published the Coastal Toolkit, an online information resource for estuaries and coastal communities
- Distributed more than \$300,000 to the Partners through start-up grants, which have been matched 1:1
- Provided more than \$700,000 in direct technical assistance to the Partners
- Completed an adaptation plan with the City of Punta Gorda, Florida
- Currently conducting six vulnerability assessments
- Developed climate change indicators for coastal monitoring plans
- Involved all Partners in public outreach and stakeholder engagement activities
- Held Partner workshop in June 2009



impacts and adaptation. The Toolkit provides information and links to other resources related to the following areas:

- Adaptation Planning
- Coastal Vulnerability and Adaptation Tools
- Communications and Outreach Materials
- Monitoring Climate Change in Coastal Areas
- Smart Growth in the Context of Climate Change
- Sustainable Financing Options
- Where to Find Data

CRE has developed several additional resources for the Toolkit, including the following:

- Synthesis of Adaptation Options for Coastal Areas—Published in print and on the Web, the synthesis document brings together information on climate change effects and adaptation in coastal areas. It has been highlighted by agencies such as the National Oceanic and Atmospheric Administration (NOAA) and the U.S. Agency for International Development (USAID). (www.epa.gov/cre/downloads/CRE_Synthesis_1.09.pdf)
- Adaptation Planning for the National Estuary Program—This Web-based resource tailored for NEPs describes five critical elements of adaptation planning, provides examples of these elements, and suggests additional resources. This guide has proven useful to the NEPs, and has potential wide



applicability to a number of other coastal management programs. (www.epa.gov/cre/downloads/ CREAdaptationPlanning-Final.pdf)

- *"READY" Newsletter*—CRE has published three issues of this electronic newsletter to date. The newsletter explains program developments and news from CRE Partners, highlights relevant resources, and announces key meetings and workshops.
- Program Brochure and Fact Sheet—These materials provide an overview of the CRE program. They are available on the CRE Web site and are also distributed at conferences as well as outreach events.

Targeted Support to NEPs

In 2008 and 2009, CRE provided its Partners with support to catalyze efforts to identify climate change vulnerabilities, explore adaptation strategies, develop adaptation plans, implement selected actions by these plans, and share lessons learned with other coastal managers. The section "CRE Partner Activities 2008–2009" presents activities of the 11 NEPs that have received start-up grants and/or direct technical assistance.

 Start-Up Grant—A start-up grant provides financial and resource assistance to NEPs that have committed to a timeline to develop and implement a climate change adaptation strategy for their estuary. In many cases, these efforts build on pre-existing work by the NEP and its stakeholders. Each CRE Partner can use its start-up grant to pursue adaptation solutions that best fit the needs of its communities.



- Direct Technical Assistance—Direct technical assistance, first offered in 2009, is individually tailored support provided by EPA staff and contractors. Direct technical assistance is available to both CRE Partner candidates and current CRE Partners. Examples include:
 - Climate change vulnerability assessment
 - Habitat and ecosystem services loss modeling
 - Climate change indicators and monitoring plan development
 - Stakeholder engagement and communication
 - Design of model ordinances



CRE Partner Workshop

The first CRE Partner Workshop was held in June 2009, in Washington, DC. Attendees included representatives from all CRE Partners, as well as EPA regional and program office staff. The workshop was an opportunity for 2008 pilot Partners to share their experiences and discuss lessons learned with 2009 Partners. Each NEP representative presented their ongoing CRE activities and participated in

focused discussions and strategy sessions. This report includes a summary of key lessons learned and challenges discussed at that workshop.

Lessons Learned from CRE Partners

The June 2009 CRE Partner Workshop and subsequent conversations with Partners revealed many common themes, approaches, and hurdles to NEPs' efforts to address climate change. The summary below presents the major lessons learned from those experiences.

Start Small

One common challenge identified by NEPs was deciding where to start and how to cope with the magnitude of work involved in climate vulnerability assessment and adaptation. Several NEPs discovered that focusing adaptation efforts on a particular issue or area proved effective. For example, some CRE Partners have gained a footing through efforts specifically targeted on one local priority, such as salt marshes or storm culverts, or one community within the larger study area. Starting small gives the programs a chance to take on a project that meets time and funding constraints but still yields useful conclusions and

outcomes. Once one issue or strategy proves successful, the Partner can build on that momentum to take on additional priorities or communities and attract more resources and public support.

Move Forward with the Data You Have

Place-based data that show recent trends in climate change and its associated impacts can help bridge the gap between abstract projections of impacts and observed local changes. Unfortunately, these data often either do not exist or are not available with sufficient resolution. Moreover, there may be limited resources to analyze and present existing data. The task of integrating—and decoupling the effects of climate change with other stressors, such as increasing development pressure in a watershed, is a common challenge faced by NEPs.

Efforts to obtain and analyze better data should be an element in any strategy. However, limited data are not necessarily a barrier; in fact, some CRE Partners have benefited from projects developed with limited data, including the creation of conservation strategies for threatened habitats to address expected climate change impacts. Even without complete sea level rise projections and precise elevation data, some NEPs have begun to protect upland areas to ensure that coastal marshes have open space to move into as these habitats are inundated by sea level rise.

Involve the Community

Adapting to climate change cannot be accomplished by NEPs alone; it requires ownership and involvement from coastal and watershed residents and officials. Preparing for increasing and uncertain change will require significant support from communities, since they have historically managed their own growth and supported habitat protection, and will also have to implement climate change adaptation. A number of NEPs have used innovative approaches to engage stakeholders and the public:

- Use iconic, popular resources to gain support for broader initiatives. The public may be more
 receptive to campaigns framed in terms of wildlife and landscapes they are emotionally attached
 to. For example, residents of the Delaware Bay may be more supportive of a campaign to protect
 critical breeding grounds of horseshoe crabs if sea level rise threatens to inundate these habitats.
- Be ready to benefit from the shift in public opinion that often comes from direct experience of coastal disasters (e.g., hurricanes, flooding). It may be easier to attract support for adaptation while the topics of coastal resilience and adaptation are pressing political issues.
- Use locally relevant facts and information when discussing vulnerability. The Casco Bay Estuary Partnership found that it had more success in delivering its message when it referred to local observations (e.g., ice-out date, the date after which no ice is present, is now three weeks earlier on Sebago Lake than it used to be).

 Talk about impacts rather than causes. In general, audiences will still support actions that address local concerns: for example, "dangerous weather is more frequent," "sea level is rising," or "mangrove habitats have

"Estuaries are ready, people are not."

– Bill Crowell, Albemarle-Pamlico NEP director, explaining the need to educate coastal residents and policy makers on the risks of climate change, the changes that are already occurring in estuaries, and the need to address those risks and changes through adaptation planning.

moved 30 miles north over the past 40 years." Find a clear impact that people can agree is occurring, is supported by the science, and move forward from there.

- Develop effective public involvement activities such as listening sessions to learn what community
 members have seen on the ground, gauge their interest in adaptation, and solicit their
 recommendations for responses. Albemarle-Pamlico NEP and Charlotte Harbor NEP, for example,
 have successfully used this extremely effective approach.
- Support a local or regional climate change working group consisting of local scientists/academics, public officials, planners, and interested members of the public. For example, the Partnership for the Delaware Estuary has formed a climate change working group with three subcommittees to address priority issues in the estuary.

Coordinate with Government Entities

A common challenge encountered among CRE Partners is that key stakeholders are often absent from the table. In addition, coordinating with municipalities and states can be difficult, as their budget and staffing challenges limit the resources available for adaptation planning in collaboration with NEPs. In other situations, coordination is necessary because multiple organizations may be undertaking adaptation planning, each according to its own mission and project goals.

NEPs that made it a priority to set up or use an existing advisory committee from the beginning of their efforts have seen great benefits, including reduced duplication of efforts, enhanced access to resources, and increased support for adaptation plan development.

Any adaptation effort needs to ensure awareness and involvement of the NEP Management Conferences, government agencies at all levels (e.g., U.S. Department of Transportation (DOT), U.S. Geologic Survey (USGS), NOAA, Fish and Wildlife Service (FWS), Army Corps of Engineers (ACE)), local planning boards, mayors and governors), and other key stakeholders. Engaging all of these parties will help keep them informed and involved in projects and program development and, if possible, implementation.

Use No Regrets Strategies and Adaptive Management to Deal with Uncertainty

While there have been significant advances in the science and scientific consensus on likely climate change scenarios, the projected effects of climate change still vary. Many NEPs recognize that the complexity of climate change and the uncertainty in the timing and magnitude of impacts may present barriers to gaining public support for adaptation planning within their estuary.

In response to this uncertainty, NEPs have used possible ranges of effects to examine most likely outcomes and willingness to proceed to protect local priorities. For example, NEPs can use a range of climate change projections (e.g., precipitation increases of 5, 10, and 15 percent or sea level rise of 1, 3, and 5 feet) to identify actions that lead to beneficial outcomes under all or most predicted futures.

NEPs are also exploring "no regrets" actions as a first step to respond to projected effects. These strategies—such as adopting rolling easements, creating new waterfront parkland that serves as a buffer to built-up areas, and strengthening building codes in storm surge areas—can provide immediate local or regional benefits, as well as reduce future impacts under a range of climate change effects.

Furthermore, uncertainties can serve as an opportunity to employ more adaptive and open planning approaches that are easier to update in response to new information and changing events. Timeintensive revisions to comprehensive or master plans should be replaced by more nimble, iterative approaches for community planning and decision making. Under this approach, strategies should incorporate "no regrets" or "low regrets" actions with an emphasis on monitoring the changing climate and evaluating the effectiveness of initial adaptation actions. By continuously learning from and incorporating new information into adaptation plans, coastal managers can, over time, make more informed decisions that reflect a greater understanding of the changing climate and ensure public support for additional action.

Maintain the Attention of Elected Officials

Many decisions and issues rest in the hands of locally elected officials, who may hold term appointments and are thus compelled to focus on issues of immediate concern to their constituents. With such turnover and focus on issues in the near term, some NEPs have had difficulties convincing elected officials to act on the long-term issue of climate change adaptation. One possible solution is a two-fold approach to focus directly on constituents through outreach campaigns and listening sessions, while preparing direct and effective information to quickly educate new officials on significant constituent concerns early in transitions. CRE Partners play a crucial role in bringing the general public's interest and concern about this issue to the attention of policy makers.

CRE Partner Activities 2008–2009

The following section provides brief highlights of the activities that CRE Partners have undertaken using the start-up grants and direct technical assistance provided by CRE. While all CRE Partners are working to develop an adaptation plan, each program is involved in specific activities to progress toward this goal. Please note that this section describes just a few of the ongoing activities among the 11 Partners. For more detailed information on CRE Partner activities, please visit the CRE Web site (www.epa.gov/cre).

Communication and Outreach—Public

Albemarle-Pamlico National Estuary Program partnered with the Albemarle-Pamlico Conservation and Communities Collaborative to host a series of seven public listening sessions throughout the



estuary region. Residents from a variety of backgrounds attended these sessions to voice their concerns about the combined impacts of sea level rise and population growth, and to discuss potential solutions. The estuary program plans to continue improving public outreach and education efforts to respond to the community's evolving needs.

Barnegat Bay National Estuary Program is

gauging public interest in—and soliciting input on—climate change impacts and adaptation through a series of facilitated listening sessions, planned for the Spring of 2010. To seek further dialogue on this topic, a technical workshop on climate change adaptation, "Preparing Your Communities in the Face of a Changing Climate: Starting the Dialogue," will be held. The workshop will bring together coastal decision makers, resource managers, and the science community to exchange information

and views regarding the impacts of climate change on the Barnegat Bay estuary and to set the stage for future regional discussions that will advance the development of a climate change adaptation strategy. Ultimately, these products will enable BBNEP to produce a climate change adaptation plan sensitive to regional vulnerabilities and including input from affected constituencies.



Communication and Outreach—Stakeholders/Policy Makers

APNEP is also engaging directly with policy makers. The program is working with the Nicholas Institute for Environmental Policy Solutions at Duke University to interview local and state elected officials. The interviews will gauge officials' understanding of climate change issues and the actions they are taking to address challenges. Findings will be used to develop a needs analysis and underpin a climate change and adaptation communication strategy for local policy makers.

During the summer of 2009, BBNEP established a Climate Change Work Group under its existing Science and Technical Advisory Committee to provide critical technical support and peer review for all BBNEP's climate change adaptation activities. With guidance from the work group, BBNEP will conduct a needs assessment to identify gaps in data, potential challenges in adaptation, and opportunities to tie BBNEP's work in with existing county and state level hazard mitigation planning. The Work Group will also guide the technical conference in February 2010. In addition, two municipal level case studies will be carried out to develop local adaptation strategies and decision making tools.



Casco Bay Estuary Partnership is developing a comprehensive approach to sharing information with local leaders to encourage effective planning for climate change. CBEP is conducting a series of surveys and focus groups to better understand specific information needs and potential barriers to incorporating climaterelated information into current decisions. After identifying those needs and barriers, CBEP

will prepare an outreach plan detailing cost-effective, locally relevant means of communicating with target audiences. Ultimately, CBEP will develop outreach materials and templates to implement its plan. CBEP's efforts will develop capacity that enables local decision makers to incorporate climate change considerations into all aspects of land use planning.

Tampa Bay Estuary Program is developing a Gulf Coast Community Handbook with specific recommendations, best management practices, and options for incorporating resilience into habitat restoration and protection strategies for coastal communities throughout the Gulf of Mexico. The handbook will complement a larger effort



by TBEP and the Coastal Bend Bays and Estuaries Program to build and test locally developed and implemented restoration and protection efforts with resilience built in. Ultimately, the handbook will assist communities throughout the Gulf Coast in using the best available science and information when thinking about climate change in the context of habitat protection and restoration.



Vulnerability Assessments

Charlotte Harbor National Estuary Program and its host agency, the Southwest Florida Regional Planning Council, are conducting a climate change vulnerability assessment for southwest Florida, including the CHNEP study area. The vulnerability assessment incorporates Sea Lake and Overland Surges from Hurricanes (SLOSH) modeling to assess storm surge and

improve land use decisions, infrastructure investment, and conservation management.

The **Partnership for the Delaware Estuary** is conducting vulnerability assessments and will develop adaptation plans for three case study resources: drinking water, tidal wetlands, and shellfish. The assessments will consider how these resources may be affected by increases in temperature, salinity, precipitation, heat waves, and storms. PDE has also created a team to estimate the value of losses in natural capital from climate change and determine how these losses might be reversed or improved through



restoration. Through the three case studies, the team plans to demonstrate how ecosystem services valuation can be used in adaptation planning.



The **Piscataqua Region Estuaries Partnership** launched a project to identify road culverts in the Oyster River watershed that are vulnerable to increasingly severe storms and hydrological modifications related to development in the watershed. PREP began the assessment by completing a comprehensive inventory of significant culverts in collaboration with the town of Durham and the Strafford Regional Planning Commission. A key finding that PREP plans to convey to decision makers is that all future precipitation projections for the area point toward additional strain on the existing culverts. PREP plans to communicate these findings to decision makers and the public by using maps to show each culvert's ability to handle projected precipitation events. Project findings will be used to inform decisions about culvert maintenance and upgrade options.



Massachusetts Bays Program is conducting a climate change vulnerability assessment in partnership with EPA's Global Change Research Program. The assessment concentrates primarily on the sensitivity of salt marsh ecosystems to projected impacts of climate change. The MBP will share its enhanced understanding of salt marsh vulnerability and related management implications with partners at the community,

state, regional, and federal levels. This ecosystem-focused study will complement work being done by the Massachusetts Office of Coastal Zone Management's StormSmart Coasts Program, which addresses the impacts of climate change on infrastructure and coastal property.

San Francisco Estuary Partnership has also assessed climate change vulnerability in partnership with EPA's Global Change Research Program. As with the MBP project, SFEP's assessment focuses on the sensitivity of salt marsh ecosystems to projected climate change effects. SFEP and the San Francisco Bay Conservation and Development Commission have brought together Bay Area scientists and resource managers to discuss ecosystem



vulnerability and to share ongoing research. This helps policy makers and scientists consider how changes in climate drivers such as temperature, precipitation and storms may affect salt marsh ecosystems.

Development of Adaptation Plans

While all CRE Partners are working to develop adaptation plans, several efforts are highlighted here.

In December 2008, the City Council of Punta Gorda, Florida, voted unanimously to partner with **CHNEP's** 2009 pilot adaptation planning effort. This initiative has greatly benefited from the



support of the citizens of Punta Gorda, including a grassroots volunteer group that helped rebuild the city after the

devastation of Hurricane Charley. Adaptation planning included three successful public workshops. These workshops built upon a pre-meeting survey and include interactive exercises to engage the

public in helping to consider and prioritize vulnerabilities and adaptation strategies. CHNEP has already provided the city with resources such as diagrams showing alternative adaptation strategies to help pursue grants. The plan was approved by the City Council in November 2009. Thus, CHNEP is the first Partner to have an approved adaptation plan.





Indian River Lagoon National Estuary Program is working with the City of Satellite Beach, Florida, to include goals and policies addressing sea level rise in the city's Comprehensive Growth Management Plan. By proactively preparing for sea level rise and communicating key lessons learned, the city can reduce its vulnerability, protect the Indian River Lagoon ecosystem, and help neighboring communities and other NEPs prepare effectively for sea level rise impacts.

The project has three components: assessment, policy development, and public outreach.

The Connecticut Department of Environmental Protection, a partner of the **Long Island Sound Study**, has joined forces with ICLEI-Local Governments for Sustainability to prepare a coastal adaptation plan for the town of Groton, Connecticut. Preparing a coastal adaptation plan for this northeastern municipality will serve as a model for other local and regional initiatives. The main focus of this effort will be facilitating workshops to engage representatives from federal, state, and municipal governments to explore their roles in adaptation efforts and define strategies for maximum benefit. To this end, LISS and ICLEI are convening three workshops to 1) orient appropriate stakeholders to adaptation planning

and regional climate change impacts, 2) identify vulnerabilities and appropriate adaptation efforts, and 3) create a plan for implementation. The final product of this work will be a local climate change adaptation plan, to be presented to local officials and to serve as a model for other communities beyond Connecticut.



Climate Change Indicators and Monitoring

Building on a region-wide vulnerability assessment and an adaptation plan developed over the past year for the City of Punta Gorda, Florida, **CHNEP's** primary objective is to develop a set of climate change indicators relevant to coastal resources and a climate change monitoring plan. In concert with similar work already underway by the Southwest Florida Regional Planning Council and informed by CHNEP's Comprehensive Conservation and Management Plan, these products will help federal, state, regional, and local agencies plan for future climate change impacts to coastal resources and communities. The project's main goals are to 1) identify potential climate change indicators; 2) assess, select, and prioritize indicators; and 3) develop a draft climate change monitoring plan based on the indicators.

LISS and partners are developing a bi-state sentinel monitoring strategy to monitor and predict climate change impacts in Long Island Sound. This includes researching and cataloguing the drivers, predicted indicators, and responses from climate change applicable to this estuary. Focus topics will include what monitoring is occurring, what new monitoring and synthesis is necessary, and what prioritization of indicators will make for an effective overarching monitoring strategy. The LISS work team will use current research, including lessons learned from assessing climate change monitoring in other coastal systems. Finally, the work team will facilitate communication between state-level work groups to reach consensus on an adaptive monitoring strategy for the entire estuary. This strategic plan, which is the output of this grant award, will lay the groundwork for a Sound-wide climate change monitoring program on both a pilot and a comprehensive basis.

Model Ordinances

Recognizing that most land use decisions are made at the local level, and that it will be increasingly important to factor climate change into these decisions, **CHNEP** is developing model ordinances for use by counties and municipalities in land use planning. These ordinances will serve as a template on which local planners can build when directing land use and infrastructure decisions in the future.

Challenges and Next Steps: Where Is CRE Headed?

Based on guidance from the CRE Partners and other coastal managers on challenges they have faced in developing and implementing adaptation strategies, CRE plans to explore options to respond to the challenges presented below.

The Need for Direct Assistance Initiatives

Challenge: Some CRE Partners have requested technical teams to assist them with adaptation and related work. For example, mapping, modeling, monitoring, and economic data are often very hard to find, fund, or translate for local circumstances.

Next Steps: Expand Place-Based Support

- Provide additional CRE support to NEPs for development of an adaptation strategy, or direct technical assistance to test tools and other innovative ideas to promote coastal climate change adaptation.
- Explore the feasibility of short-term technical field teams to assist coastal communities.

Interpreting Climate Change Information and the Need for Resources

Challenge: Some CRE Partners have mentioned the difficulty of keeping up with the enormous amount of climate change information and scientific research on coastal impacts. Similarly, promoting adaptation efforts and pursuing funding opportunities can be complex tasks. Partners also mentioned the need for adaptation-planning templates and model ordinances, which could be met through technical transfer from other communities and institutions. Finally, there is no ongoing forum to facilitate communication and coordination among Partners, or a way for them to tap into broader networks of information.

Next Steps: Enhance Coastal Toolkit

- Create graphics for use in presentations by coastal partners. Graphics would explain vulnerabilities to climate change faced by coasts, and highlight solutions others have employed.
- Develop a broad-based needs assessment methodology.
- Provide examples of local and international communities that exemplify coastal resilience, including model ordinances, assessment and adaptation techniques, and other innovative approaches.
- Assemble a series of fact sheets and case studies to highlight lessons learned and allow for the transfer of techniques and approaches that worked in one NEP to other interested partners.
- Create a portion of the Web site dedicated to information on funding opportunities.

Next Steps: Communication Forum among NEPs/CRE

- Provide a broadly accessible and user-friendly means to exchange ideas, knowledge, resources, and technical expertise. This will likely take the form of an interactive online web forum moderated by CRE staff where documents can be posted and discussion groups can be formed and supported.
- Facilitate communications among the NEPs and CRE Partners through newsletters, listservs, workshops, and outreach materials.

Next Steps: Data for Assessment and Monitoring

- Coordinate with the NEPs to develop a consistent approach for monitoring climate change, perhaps in cooperation with NOAA, USGS, and other agencies. An initial step could include developing a white paper on how a consistent set of indicators shared by all the NEPs could be used to track climate change trends in coastal areas.
- Facilitate the sharing of data sources, sets, and/or methodologies; this effort could involve a wide set of other agencies and organizations.

Next Steps: Workshops

- Convene a "mini-workshop," as part of the annual NEP meeting in February 2010 or as a separate event, as a forum for NEPs to discuss the state of knowledge on climate change impacts in various NEP estuaries. Opportunities for coalition-building and technology transfer could also be a part of this discussion.
- Hold another CRE Partner Workshop in 2010, possibly with an expanded scope to include other NEPs and the National Estuarine Research Reserve System (NERRS), related to monitoring for key climate change parameters.

Federal Collaboration

Challenge: Many of the CRE Partners have identified challenges in working with federal agencies. Some feel that CRE, as an EPA initiative, may have greater leverage in dealing with these issues at the national level. CRE has started to engage in collaboration with NOAA, and will likely expand this effort to include USGS, Federal Emergency Management Agency (FEMA), DOT, ACE, FWS, and others. CRE plans to work with Partners to expand on their successful agency insights and contacts, and share this information with other partners. Coordinating with other federal agencies could ensure that those agencies' efforts and policies support adaptation planning as much as possible, and do not hinder effective coastal adaptation activities.

Next Steps: Improve Interagency Coordination

- Develop and implement a strategy for marketing CRE/NEP principles and approaches to other agencies and help get the CRE Partners plugged into other agency initiatives.
- Participate in federal interagency interest groups to exchange ideas, tools, and resources, including with NOAA, USGS, DOT, and FEMA.
- Explore holding a joint NEP/NERRS climate adaptation workshop.

Public Awareness/Outreach

Challenge: CRE Partners recognize that effective adaptation will require the interest and support of all levels of stakeholders and government. CRE could identify opportunities and tools for improving understanding of coastal adaptation to climate change. This could include tools that expand public awareness and foster public buy-in about the risks of climate change and benefits of adaptive actions.

Next Steps: Develop Communication Resources

- Develop outreach materials or templates, including graphic materials, white papers, and information products, for CRE Partners to use to expand public awareness on climate change and coastal adaptation.
- Provide technical assistance to Partners in developing outreach and communication strategies and materials appropriate for their audiences.



CRE Partner Web Sites

Albemarle-Pamlico National Estuary Program Barnegat Bay National Estuary Program Casco Bay Estuary Partnership Charlotte Harbor National Estuary Program Indian River Lagoon National Estuary Program Long Island Sound Study Massachusetts Bays Program Partnership for the Delaware Estuary Piscataqua Region Estuaries Partnership San Francisco Estuary Partnership Tampa Bay Estuary Program www.apnep.org www.bbep.org www.cascobay.usm.maine.edu www.chnep.org www.sjrwmd.com/itsyourlagoon/index.html www.longislandsoundstudy.net www.massbays.org www.delawareestuary.org www.delawareestuary.org www.prep.unh.edu sfep.abag.ca.gov www.tbep.org

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