

**TESTIMONY OF  
DR. BRAXTON C. DAVIS  
CHAIR, CLIMATE CHANGE COMMITTEE  
COASTAL STATES ORGANIZATION  
and  
DIRECTOR, SCIENCE AND POLICY DIVISION  
OFFICE OF OCEAN AND COASTAL RESOURCE MANAGEMENT  
SOUTH CAROLINA DEPT. OF HEALTH AND ENVIRONMENTAL CONTROL**

**BEFORE THE  
UNITED STATES SENATE  
COMMITTEE ON COMMERCE, SCIENCE, AND TRANSPORTATION**

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Mr. Chairman and Members of the Committee: I appreciate the opportunity to offer testimony on the importance of climate change research to state and local resource managers. I serve as Director of the Science and Policy Division of South Carolina's Coastal Zone Management Program. Over the past year, I have also served as chair of a Climate Change committee for the Coastal States Organization (CSO). Since 1970, CSO has represented the interests of the Governors from the thirty-five coastal States, Commonwealths and Territories on federal legislative, administrative, and policy issues relating to sound coastal, Great Lakes, and ocean management.

Your continuing support of climate change research and monitoring activities through the Global Change Research Act is of critical and growing importance to coastal states and communities. My testimony will primarily focus on issues related to the impacts of climate change in the coastal zone. According to the Intergovernmental Panel on Climate Change (IPCC), socioeconomic and environmental impacts of climate change are projected to be most significant in coastal areas of the United States. The U.S. population is concentrated in coastal areas, where communities and natural resource-based economies are especially vulnerable to accelerated sea level rise and lake level changes, shoreline erosion, increased storm frequency or intensity, changes in rainfall, and related flooding. Other impacts may include changes in chemical (ocean acidification) and physical characteristics of marine systems, saltwater intrusion into groundwater aquifers and coastal rivers, increased harmful algal blooms, spread of invasive species, habitat loss (wetlands and coral reefs), species migrations, and changes in population dynamics among marine and coastal species. These impacts will vary regionally, but scientists contend that many are likely to be experienced in the coming decades - even if greenhouse gas emissions are reduced significantly.

## **Focus on Local-Scale Effects of Climate Change**

Our general understanding of climate change and related impacts continues to improve through research supported under the U.S. Global Change Research Program (US GCRP). However, this research must be useful at scales appropriate for actions by state and local planners and decision-makers. In many cases, regional information will be inadequate for individual communities. Each city and town needs to understand the potential impacts of climate change, the associated risks, and the costs and benefits of various management options, as well as the potential costs of inaction. To support the needs of local decision-makers, the Coastal States Organization identified priority information and research needs to address future impacts of climate change in the coastal zone. We ask for federal support of state and local-level research and planning efforts in the following areas:

### *Coastal Topography and Bathymetry Data*

High-resolution coastal elevation data are essential for states to begin assessing the lands and resources most vulnerable to accelerated sea level rise. Today, coastal topography is often limited to coarse 10-20 foot contour intervals, and therefore does not have sufficient detail for impact studies, modeling, or policy and regulatory use. Improved nearshore bathymetry data are also needed to improve our understanding of shoreline changes, since shoreline positions do not accurately convey changes to sand volumes and the steepness of shoreline slopes. In some cases, these data are available for beachfront areas, but do not capture the full extent of estuarine or “sheltered” coastlines. In other cases, funding to support high-resolution coastal mapping has recently been obtained from the Federal Emergency Management Agency (FEMA), U.S. Army Corps of Engineers (USACE), National Oceanic and Atmospheric Administration (NOAA), or through state and local interagency partnerships. However, there is a strong need for more predictable and consistent availability of high-resolution coastal topography and bathymetry data through systematic mapping of all coastal areas of the United States.

### *Improved Models of Shoreline Changes under Varying Sea Level Rise Scenarios*

Where high-resolution coastal elevation data are available, state and local studies are beginning to use basic inundation models to consider the potential impacts of accelerated sea level rise. These models can identify the lands most vulnerable to sea level rise, and similar maps have been produced by federal agencies on a regional (multi-state) scale, including the Environmental Protection Agency (EPA) and the U.S. Geological Survey (USGS). However, sea level rise, erosion, circulation patterns, wave climates, sediment budgets, and other shoreline features are interrelated. Coastal states and communities will need more detailed and complex models that incorporate local changes in coastal geomorphology, hydrological conditions, and human alterations and responses (seawalls, sand replenishment, etc.) in order to more adequately assess social, environmental, and economic vulnerabilities. Coastal states and communities would benefit from the development of uniform methods for modeling local-scale shoreline changes associated with varying sea level rise projections.

### *Impacts of Accelerated Sea Level Rise on Social and Economic Resources*

Building on improved models of sea level rise at the local-scale, federal support is needed in assessing related social and economic vulnerabilities. Insufficient attention has been given to this important area of research. To make fully informed decisions, states and local communities need to be able to determine risks and the costs associated with mitigating those risks. The potential for significant losses of economic and cultural resources, such as public infrastructure (wastewater treatment systems, roads, ports, public facilities, river flood protection levees and bridge clearances for shipping interests), historic and cultural sites, shoreline property values, and coastal tourism activities, among other losses, are difficult to quantify, but need to be anticipated and planned for in light of sea level rise projections. Federal programs should seek to provide best practices, case studies, trainings/workshops, and accessible, intuitive software tools to support community-level and statewide vulnerability assessments and planning activities.

### *Impacts of Accelerated Sea Level Rise on Coastal Habitats*

Several coastal states have begun focusing on the impacts of accelerated sea level rise on coastal wetlands, as well as potential conservation, mitigation, and restoration strategies. However, further research is needed to better understand natural erosion and deposition cycles in tidal marshes, and to improve our ability to predict the effects of accelerated rates of sea level rise. Natural sediment sources, the movement of sediment within the system, and the locations and rates of sediment deposition need to be quantified for discreet shoreline reaches in order for predictive capabilities to be developed. Similarly, beaches respond to the background sea level rise rate through the accumulation of sand on the berm and dune from wave and wind forces. The ability of sand supplies in coastal systems to keep pace with an accelerated rate of sea level rise is not well understood. There continues to be a need for improved models that predict the migration and/or vertical accretion of coastal wetlands and beaches in response to accelerated sea level rise, information on the costs of response options, and the consequences of taking no action. There is also a need for research on the anticipated role of sea level rise in beach nourishment frequency and volumetric requirements; as well as the potential use of artificial sediment supplies to “nourish” coastal wetlands.

Other habitats at risk include submerged aquatic vegetation, coral reefs, oyster reefs, and fringing maritime forests. Thermal and chemical changes in coastal waters may affect marine species survival and distributions. Further research is needed to understand the potential for latitudinal habitat changes as northern climates begin to resemble today’s southern climates.

### *Research Concerning Other Climate Change Impacts*

As I mentioned earlier, coastal zones are subject to a wide variety of climate change impacts beyond the threat of sea level rise - many of which are not well understood.

Coastal states need further information, research, and guidance on issues like invasive species introductions, ocean acidification, ecosystem migration, freshwater resources, and improved storm surge models. We anticipate that coastal and ocean observing systems within the U.S. Integrated Ocean Observing System (IOOS) will generate useful information products related to real-time and projected climate, storm surge, and physical, chemical, and biological changes in ocean and coastal systems. Guidance is also needed for modeling local-scale effects of storm events coupled with rainfall, river flooding, and sea level rise projections.

I would like to emphasize that all of this information must either be tailored to individual community needs or easily transferable. No single model can fit all of the diverse local environmental and socioeconomic settings around the country.

### *Avoid Duplication of Efforts*

Some coastal states have already begun to support local-scale research on the potential effects of accelerated sea level rise on communities and resources, including models and maps of shoreline changes, community vulnerability analyses and socio-economic studies; and projected environmental changes. A common concern of state coastal managers is that their research efforts and those conducted by the federal government be well coordinated and not duplicative. Federally-conducted or supported research examining climate change impacts at the local scale should be carried out in close cooperation with state and local governments to ensure that their information needs are met, and that local conditions and data are appropriately considered. Input from state and local managers should be sought in the earliest planning phases.

While the U.S. GCRP provides important synthesis products related to climate change, state and local agencies would benefit from a “clearinghouse” mechanism for federal, state, and local programs, research activities, and other information related to climate change in their region. It would also be helpful if the GCRP could spur improved collaboration between federal agencies. State and local officials need to be aware of research that the USACE, FEMA, USGS, EPA, NOAA, National Science Foundation, and others are conducting (or have conducted) in their state or region, and of management activities and lessons learned by neighboring states and communities. There is also a need for up-to-date sea level rise and climate projections and information at the regional level, including documented coastal and ocean changes that have occurred or are occurring due to climate change. Beyond a single inventory of existing research programs and activities, states are interested in establishing sustained mechanisms for regional collaboration on climate change issues because states in the same region will likely face similar potential impacts and policy considerations.

### **Need for Adaptation Planning and Implementation**

While ongoing federal research activities will prove critical in future decisionmaking, state and local governments have immediate responsibilities for managing many of the resources and communities that are likely to be impacted by climate change. Preparing

for and coping with these impacts has been termed “adaptation” by the research and management community. Many of the projected impacts will require adaptation solutions that cross federal, state, regional, and local agencies, programs, policies, and jurisdictions. For example, new policies are being developed to address sea level rise scenarios in the siting of public infrastructure, wetland conservation and restoration projects, and increased shoreline building setbacks and elevations. States and local communities need to act now, and cannot wait for perfect information.

Because a wide variety of federal agencies and programs influence coastal developments, alterations, and responses to coastal hazards, there is a need for a clear federal strategy for intergovernmental coordination on coastal adaptation to climate change. The strategy should clearly define the roles of the various federal agencies, and the specific mechanisms by which federal programs will coordinate with state partners on adaptation planning and implementation. Again, because the impacts of climate change will vary regionally, and because regional coastal/ocean partnerships are already in development around the nation, an opportunity exists to establish a regional framework for federal-state coordination on climate change adaptation activities.

### **Existing Mechanisms**

We urge Congress to take advantage of existing programs and mechanisms to disseminate climate change research and information in support of state and local resource management. Many programs exist where partnerships between federal, state and local governments are already in place. For example, the federal Coastal Zone Management Act (CZMA) should be recognized by Congress and the Administration as one of the primary statutes that can foster adaptation to climate change at the state and local levels. State coastal programs often directly manage shoreline development, and work closely with local governments on land use planning, habitat acquisition, and a variety of other activities. States coastal programs also play a key role in coordinating federal, state and local agencies, and have the authority to review and condition federal permits in the coastal zone. As state and local governments consider future climate change policies and strategies, coastal zone management programs will play an important role in identifying local-scale impacts, vulnerabilities, and opportunities for adaptation; and in fostering interagency collaboration on climate change issues.

State coastal programs are interested in amending the CZMA to strengthen their climate change authorities and to allow states and territories to develop specific coastal climate change plans or strategies. States also support increased funding for climate change activities and support legislation that would encourage NOAA and other agencies to assist the states via technical assistance, mapping, modeling, data, and forecasting products, and intergovernmental coordination. Federal activities related to coastal adaptation should be coordinated closely with states by involving coastal zone management programs early in the planning process.

## **Conclusion**

State and local resource managers are striving to leverage existing funds, programs, and research to address projected climate change impacts, but have considerable and ongoing responsibilities beyond those described here. Therefore, federal agencies and programs should be encouraged to engage state and local officials early in planning and research efforts related to climate change. Through close collaboration with state and local partners, the science and technical support provided by the U.S. Global Change Research Program will inform critical decisions at the local level in light of the uncertainty and considerable risks associated with climate change. If we collect all of this research and data but fail to get it into the hands of the decision-makers at the appropriate scale, then we may become very knowledgeable but ill-prepared to meet the challenges facing us in the coming decades.

Thank you again for the opportunity to help inform the Committee on the importance of climate change research to state and local resource managers. I would be happy to respond to any questions that you may have.