Subcommittee on Fisheries Conservation, Wildlife and Oceans
House Committee on Resources

Oversight Hearing on the
Status of Ocean Observing Systems in the United States

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Testimony of

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Chairman Gilchrest and Members of the Subcommittee, thank you for the opportunity to speak with you concerning our nation's present capabilities and future opportunities for ocean observing systems, particularly coastal observing systems.

I am Donald Boesch and serve as President of the University of Maryland Center for Environmental Science. My institution was in the first wave of those initiating a coastal observing system, the Chesapeake Bay Observing System, more than a decade ago. In addition I have been involved in considerations of the development of a national ocean observing system through involvement in activities of the National Research Council, Consortium on Ocean Research and Education, Southeastern Universities Research Association, and U.S. Commission on Ocean Policy.

I know it has proven difficult for Members of Congress to see a single compelling national objective for a national, integrated and sustained network of coastal ocean observing systems for several reasons. Is this for science or for some operational requirement? What is the primary purpose and which agency should be responsible for its management and funding? How will it support, replace, or improve what we are already doing in science and operations?

As the U.S. Commission on Ocean Policy argued in its preliminary report the ocean observing systems offer numerous benefits and should therefore serve multiple masters. These systems can help: detect and forecast climate variability, facilitate safe and efficient marine operations, ensure national and homeland security, manage resources for sustainable use, preserve and restore healthy marine ecosystems, reduce risks from natural hazards, support safe development and transportation of energy sources, and ensure public health and safety. This requires a national, interagency program for the efficient integration and service of these user needs.

Coastal Observing Systems

The rapid development of numerous coastal ocean observing systems is testament not only to the entrepreneurial efforts of research institutions like mine, but also to an energetic but often turbulent confluence of a significant push from emerging technologies in sensors, telecommunications, data management and computation and a growing pull for real-time and nearly continuous information about the ocean.

Depending on how the existing systems are defined, there are between 40 to 60 coastal ocean observing systems in existence in our nation today. Some are operational, such as the NOAA NDBC buoys, C-MAN stations, National Water Level Observing Network and PORTS systems, to name a few. Many others have been built for scientific purposes, as opposed to functioning as operational systems for monitoring and prediction. But, many of these are also attempting to serve operational requirements as well. By and large, these systems have different sets of protocols and standards, and collect physical, chemical, and biological data based on different calibrations. Coastal observing systems are operated by a variety of federal and state agencies, regional authorities, universities and research institutions and they do not share data or provide information through a single access point. Because of the differences among these systems, generally speaking, there is no standardized interoperability. Coastal observing systems are generally chronically under-funded, difficult to sustain, and compete—typically through the political process—for very limited funding. Although wonderful technical developments are proceeding, clearly the present situation is inefficient, less effective than it should be, and unsustainable.

These concerns have naturally led to the call for organization of the national coastal observing system as a network of Regional Associations in the plans for the Integrated Ocean Observing System by Ocean.US. Both the environmental characteristics and the user information needs of the nation's coastal ocean vary enormously. Geography, climate, ocean circulation, and ecosystem characteristics act to create a complex variety of local waves, tides, currents, fisheries, and water quality. Extending only 30 to 120 miles offshore from the shallow bays, estuaries and inner continental shelf to the deep ocean, coastal waters can show marked changes, from the cold, rough waters of the Gulf of Maine, to the South Atlantic Bight with its close proximity to the Gulf Stream, to the warm expanses of the continental shelf from west Florida to Texas, to the big waves of the cold California surf. Resources and uses also vary, from the historically abundant fisheries of Georges Bank, to the busy ports of the Middle Atlantic Bight, to the tourism of the Florida peninsula, to oil production in the Gulf of Mexico, to the fisheries of the Gulf of Alaska and Bering Sea.

Organization based on Regional Associations also resonates well with the call by the U.S. Commission on Ocean Policy for stronger regional governance of the nation's ocean resources based on principles of ecosystem-based management. Regional Associations can provide the backbone of observations required for national needs, while at the same time, cater to the varying needs of individual regions. Effective regional organization and management allows implementation at a scale sufficiently large to attain the critical mass necessary for successful delivery of useful products, but sufficiently small to focus on the most important scale of management and operations. The time has arrived when observing systems can produce real-time information on the coastal ocean that is valued by a variety of constituencies. With the advent of IOOS, the new Regional Associations will not only accelerate the development of these systems, but also accelerate the production and delivery of relevant information to the end users. The Regional Associations promises an organizational and governance structure that ensures not only that the interests of the participants will be served, but also that observational information, forecasts, and analysis products will be delivered.

The Chesapeake Bay Example

Observing systems to serve needs on subregional scales will, however, be the essential building blocks for the Regional Associations. As an instructive example I will briefly summarize our experience in the Chesapeake Bay and Middle Atlantic region.

For almost a decade and half efforts have been underway to develop an observing system for the Chesapeake Bay and adjacent continental shelf. The Chesapeake Bay Observing System (CBOS) was started by the University of Maryland, with a few Virginia partners, by placing two radio-telemetry buoys in the northern Bay. Soon after these buoys were launched, a program of monthly aircraft remote sensing flights commenced. As CBOS expanded, other systems began to come online. The National Oceanic and Atmospheric Administration's National Ocean Service (NOS) Physical Oceanographic Real-Time System (PORTS) was initiated to help guide shipping to the ports of Baltimore, Hampton, and Norfolk. Recently, Maryland's Department of Natural Resources "Eyes on the Bay" program began to instrument docks and piers in Bay tributaries to track water quality in shallow waters. Similar efforts are underway in Virginia. In addition, there has been a 20-year long effort to monitor the water quality conditions and living resources in the Chesapeake Bay through periodic (weekly to monthly) sampling of the Bay from boats.

Although these systems have achieved some success and longevity, they have not yet been established with an adequate level of funding to ensure continuous, sustained observations. Continuous, multiyear records have been obtained, but the struggle to provide this information has come through comparatively small amounts of funding from multiple sources. This hand-to-mouth operation has not only prevented full spatial and temporal coverage, but has also limited the development of information products tailored to users needs. These products demonstrate the value of the system, and thereby help the search for funding.

Over the past two years, a Chesapeake Bay Observing System Association has formed from academic, governmental, and private-sector partners. This new, larger CBOS structure includes academic participants (University of Maryland Center for Environmental Science, Virginia Institute of Marine Science, and Old Dominion University), state agencies (Maryland Department of Natural Resources, the Maryland Department of the Environment, Maryland Emergency Management Agency, and the Virginia Department of Environmental Protection), federal agencies (National Weather Service, National Ocean Service, National Aeronautic and Space Administration, the U.S. Geological Survey, and the Environmental Protection Agency), the military (Aberdeen Proving Ground, Patuxent River Naval Air Station, Navair Atlantic Range, Fleet Base Norfolk, Fleet Base Little Creek, and Navy Meteorological and

Oceanographic Forecasting), and a host of private-sector partners, including the Chesapeake Bay Foundation, the region's primary environmental advocacy group.

For the Chesapeake Bay region, forecasts of conditions in the Bay and over the adjacent continental shelf would greatly aid the effort to restore its water quality and productive fisheries, would support an ecosystems-based management for these resources, and also facilitate safe marine operations in the Bay and its ports of Baltimore, Norfolk, and Hampton, provide warnings for natural hazards, and increase the enjoyment and safety of marine recreation. The recent experience of Hurricane Isabel, which took the less-traveled route to the west of Chesapeake Bay, indicates that the timely delivery of detailed forecasts of storm surges would greatly improve the ability to diminish loss of life and property from such storms. Presently, the accuracy of marine forecasts over the Chesapeake Bay region is hampered by the lack of data of winds and the marine boundary layer over the water. Both short-term and long-term forecasts have been shown to be of significant value to the insurance industry. Real-time information is valuable for energy production such as Calvert Cliffs Nuclear Power Plant, which depends on Chesapeake Bay water for cooling its reactors. Safe operation of the nearby Liquid Natural Gas terminal also depends on accurate forecasts and nowcasts of currents and marine weather. Even port security would be aided by a real-time observing system over the Bay. The same high-frequency radars that are employed to measure surface currents are now being modified to provide a ship-tracking capability for vessels as small as 30 feet.

Recently, a CBOS Demonstration Project was funded through NOAA to produce real-time information products of winds and waves over the Chesapeake Bay. The majority of CBOS partners will be involved in this effort, which is expected to provide the seed for a fully sustainable operational system. Winds and waves are key inputs to the developing Chesapeake Bay Community Model, which will serve as the primary forecast tool, assimilating real-time data from CBOS to ensure high-accuracy predictions.

On the larger regional scale, the span of coastal ocean between Cape Cod and Cape Hatteras contains a dynamic and productive ecosystem, crossed by a web of busy shipping lanes and scoured by both midwater and groundfish trawlers. Many of the important resources and threatened ecosystems are located, not over the outer continental shelf, but along the shore and within the large and increasingly urbanized estuaries—Chesapeake Bay, Delaware Bay, Hudson-Raritan River, Long Island Sound, and Narragansett Bay. Into these estuaries, the Susquehanna, Potomac, James, Delaware, Hudson, and Connecticut Rivers drain a significant portion of the eastern United States, where about 23% of the nation's population lives. These nearshore waters contain tier-one ports, military bases, and important inshore shellfish and finfish grounds. It is here that economically valuable uses such as recreation, tourism, and fisheries readily conflict with other valuable uses, chief among which is the discharge of nutrients from watersheds and from municipal sewers. The regional ocean observing system for the Middle Atlantic must meet the challenge of incorporating these important nearshore environments as well as the continental shelf.

For the Chesapeake Bay, the new Mid-Atlantic Regional Association promises significant advantages, the most important being providing the observing system for the continental shelf with which the Bay communicates. Approximately half the water in the Bay at any one time originated from the shelf. Our forecast models will not be sufficiently accurate without accurate observing and modeling of the Middle Atlantic Bight. Furthermore, regionalization will provide an effective means for sharing of comparative information within the region and linkage with the national IOOS and cost efficiencies regarding data management and telecommunications.

Sustainability is a key challenge in the Middle Atlantic region as it is elsewhere. Through engaging users of these systems at the outset, they will produce information products that the users may deem sufficiently valuable to provide financial support. However, realistic assessments from demonstration efforts indicate that this business model is unlikely to succeed without base funding support from the federal government. The Weather Observing Network has been justified as being funded by the federal government because it serves a common good, common to the entire nation. In Chesapeake Bay, a successful Coastal Marine Demonstration Project produced valued products operationally for a variety of users, yet the development of the system and the size of the user base did not reach the stage where the threshold of self-sustainability was reached. Even the most mature Regional Observing System, the Gulf of Maine Ocean Observing System, has not yet reached that threshold. However, with the planned structure for both subregional and Regional Associations built around having users at the table as full partners, we can expect at least a portion of the financial support accruing from the user community.

Science Requirements

Additional investments in science will be necessary to fully reap the benefits of coastal observing systems. We must move beyond the basic set of measurements of temperature, salinity, winds and currents in order to take full advantage of the substantial investments in platforms. The explosions of new technologies that allow more miniaturization, lower power requirements, and ensure robust performance in the environment allow the reliable measurement of chemical and biological properties and processes. With support from NOAA's Coastal Services Center we have developed the Alliance for Coastal Technologies (ACT), a partnership of research institutions, state and regional resource managers, and private sector companies working together to develop, improve, and apply standardized sensor technologies for studying and monitoring our coastal environments. ACT provides an unbiased, third-party testbed for evaluating new and developing coastal sensor technology and sensor platform technologies, a comprehensive data and information clearinghouse on coastal technologies, and a forum for capacity building through workshops and seminars on specific technologies. Our partners represent all the key geographic areas and environmental conditions along our coasts. These include my own University of Maryland Center for Environmental Science for the Mid-Atlantic region; the Gulf of Maine Ocean Observing System for the New England region; Moss Landing Marine Laboratory and Monterey Bay Aquarium Research Institute for the Pacific coast; Skidaway Institute of Oceanography for the

South Atlantic region; the University of South Florida for the Gulf region; the University of Hawaii for the western Pacific, and the University of Alaska for the northern Pacific.

NOAA's Coastal Services Center is also supporting a wide variety of efforts linking research to products and services for the coastal community by funding 16 organizations through its Coastal Observation Technology System (COTS). These grants are designed to further the development of an integrated regional coastal ocean observing system.

The U.S. Commission on Ocean Policy calls for a new era of ecosystem-based management of the nation's ocean environments that is supported by the best-available science. Ocean observing systems will make a contribution in that regard, but alone are insufficient in meeting the scientific and information and knowledge requirements for ecosystem-based management. Research on the causes and effects underlying the observations and integration of science that advances improved understanding and supports robust prediction are also required. The Commission recommends a substantial increase in investment in ocean science, strategically directed by an improved interagency process, to accomplish these objectives.

Legislation

In order to establish a nation-wide, integrated ocean observing system, legislation is called for that provides the proper authority to the responsible agencies to work together, takes advantage of and builds on the existing infrastructure that has already been developed on a regional and sub-regional basis, and relies on a regionalized operating structure.

The Senate passed S.1400 in November of 2003. Congressman Curt Weldon (R-PA) has prepared legislation that update S.1400 by incorporating the recommendations from the U.S. Ocean Commission and addresses concerns of many Members of the House. This bill has had the input of numerous constituencies and I believe that it provides a viable mechanism for the federal agencies to work together, taking advantage of and building on our existing observation infrastructure, and utilizing a regional approach for operations.

One of our great concerns regarding any legislation of this kind, however, is the jurisdictional situation. Any bill of this kind, like S.1400, will be referred to more than one committee. In the instance of S.1400, the bill has been referred in the House to your Committee, as well as to the Science Committee, Armed Services Committee, and the Transportation and Infrastructure Committee. With so many committees having jurisdiction, it is of critical importance that the Resources Committee, which has primary jurisdiction under the House Rules, provide the leadership necessary to move the legislation. In addition, we would urge you to work with the other committees sharing jurisdiction to promote hearings and markups so that legislation establishing an Integrated Ocean Observing System can be passed and signed into law as soon as possible.

Estimates of what the costs would be to fund such a nation-wide system may appear to be extremely large. However, when one considers the benefits to the large ocean and coastal constituencies, including supporting the national security mission of the Federal government, the costs are not high at all. The bottom line is that everyone of us within the United States is highly dependent upon our coastal and ocean waters; hence the costs, when analyzed properly and spread to the actual beneficiaries, are very reasonable. The recently updated, initial year estimate, spread among all the primary federal agencies, is about $140 million. With the necessary coordination and infrastructure development over the next five years, the number ramps up to about $500 million. These numbers were developed by Ocean.US and represent a more realistic cost outlook.

Although these sums seem quite large, an initial economic analysis by independent economists under contract to NOAA estimated a return of $5 to $6 for every $1 invested in ocean observing and predictions. This is an excellent return on the investment, and benefits all user communities of our oceans and coasts, including industry, government and the public. We hope you will bear this in mind when you consider legislation to establish an integrated ocean observing system.

Conclusion

All of us in the research community appreciate the interest you have shown in this issue, Mr. Chairman. Thank you for the opportunity to comment on it and support your subcommittee in its deliberations. I would be happy to answer any questions you may have.