

**Testimony
of
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Before the

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Subcommittee on Ocean, Atmosphere, Fisheries, and Coast Guard
U.S. Senate

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10:00 a.m.**

Madame Chair, Senator Snowe and members of the Subcommittee: Thank you for the invitation to testify at today's hearing. I appear before you today representing the interests of the U.S. Commission on Ocean Policy as well as the Joint Ocean Commission Initiative, which I co-chair with Leon Panetta. The Joint Initiative is a collaborative effort of members of the U.S. Commission on Ocean Policy and the Pew Oceans Commission. The purpose of the Joint Initiative is to advance the pace of change for meaningful ocean policy reform.

Leon and I believe that this is an important hearing and hopefully is the first of many hearings that will examine the fundamental role oceans play in global climate change, as well as the impact climate change is having on our oceans and coasts. We trust that the Members of the Committee will work closely with the multitude of other congressional committees that share jurisdiction over climate change related issues and will champion the need for greater attention to governance needs and the commitment of resources to support ocean-related science, management, and education.

Multi-jurisdictional problems, such as climate change, are becoming more common. In the work of our commissions, we found almost the identical problem in the effort to deal with the many problems facing our oceans, coasts, and Great Lakes. The lack of governance regimes capable of reaching across the diversity of congressional committees and federal agencies is severely hampering our capacity to deal with these issues. Thus, while I understand that today's hearing is focused on the issue of the increasing acidification of the oceans and the impact on living marine resources, I appreciate the opportunity to speak to the broader issue of the role of oceans in climate change and the importance of pursuing strategies *now* to help coastal communities adapt to the inevitable changes that will occur in the coming years.

Oceans Role in Climate Change

As public awareness of climate change and its potential economic and environmental consequences has increased, so has the level of urgency to take action to mitigate the causes of this change and to make preparations to adapt to its impacts. Unfortunately, few people fully appreciate the fundamental role oceans play in regulating climate through their capacity to store and distribute heat and their role in the carbon cycle. As a nation, we are even less knowledgeable about the ramifications of this change on the health of coastal and pelagic ecosystems and their capacity to provide the services upon which we've come to rely. This lapse has resulted in limited understanding of the complexity of ocean-related physical, geochemical, and biological/ecological processes that are influencing and being influenced by the ongoing change. The consequences of this lack of knowledge are significant. Policy makers struggle to evaluate alternatives to address climate change because the levels of uncertainty associated with the short- and long-term impacts of proposed options are relatively high and the science underpinning these decisions is inadequate. Clearly, a more coherent strategy is needed to address climate change, and a core element of such a strategy must include increased attention to the role of the oceans.

Oceans are key drivers in the Earth's heat and carbon budgets, storing one thousand times the heat of the atmosphere and absorbing a third of all anthropogenic carbon dioxide generated over the last few centuries. Furthermore, oceans not only store heat, but transport it around the globe, as well as vertically through the water column in ocean basins, making it a driving force of climate change. While our knowledge of physical oceanographic processes is further advanced than that of geochemical and biological processes, it is still rudimentary due to the lack of a comprehensive monitoring regime. As a result, we have ocean circulation and heat flux models that clearly indicate major changes are in progress. However, we still lack a clear understanding of these processes on a global scale, and are even less knowledgeable about activities occurring along the highly dynamic coastal margins, where ecological and economic health are of the greatest importance to humans and many of the impacts of climate change—such as sea level rise and coastal storms—will be directly felt.

Further complicating the situation is the lack of understanding of the interrelationship among the physical, geochemical, and biological processes. As today's hearing clearly demonstrates, we need to know the implications of ocean acidification on marine ecosystems—such as phytoplankton communities, coral reefs, and fish larva. We also need to know the rate of ice sheet melt and its impact on coastal communities, polar ecosystems, and regional weather patterns.

The complex relationship between oceans and climate change, as we currently understand it, cries out for reform in two core areas, governance and science. Congress must respond to the chorus of criticism directed at the lack of a coherent strategy and framework for addressing the challenges facing our oceans and coasts. This strategy, in turn, must be integrated into a broader national initiative to deal with climate change. It is incumbent upon Congress to take this opportunity to look beyond parochial interests and issue-specific legislation, and work toward a governance regime and management policies that place greater emphasis on cooperation and collaboration within the federal government,

while capitalizing on the wealth of scientific expertise and resources that reside outside the federal system.

Governance

The complexity and breadth of issues associated with efforts to understand, mitigate, and adapt to climate change make it essential that the nation have a coherent and comprehensive strategy to guide this work. This is a daunting challenge given the multitude of governmental and nongovernmental entities that have a vested interest in this issue and its long-term impact on the health and viability of the nation's economy and environment. The ocean community has been struggling with this same problem, albeit on a slightly smaller scale. But the challenge remains the same, we need for a new federal governance regime that moves away from the stove-piped, command and control organization in which individual departments and agencies formulate policies and budgets that are reviewed by the Office of Management and Budget and then sent to Congress for a similar review by the appropriate committee of jurisdiction. While there is a continuing effort to integrate programs and activities, it is the exception not the rule. In addition, the budget process often discourages interagency cooperation as funding for multi-agency programs is subject to cuts or reductions during internal agencies budget negotiations, compromising the integrity of the broader strategy and promoting further competition among federal and nongovernmental players.

But don't take my word for it. There are a number of credible entities that have recognized that governance problems are impeding the nation's capacity to respond to some of its most pressing challenges and have recommended solutions. Earlier this spring the National Research Council (NRC) responded to a request from the White House Climate Change Science Program to identify lessons learned from past global change assessments. In its report, the NRC cited the lack of a long-term strategic framework for meeting the climate change research mandate as an outstanding weakness of the current system.¹

Testimony by former administration officials who oversaw the climate change research program reiterated these concerns last Thursday in a hearing before a House Energy and Commerce Subcommittee, where recommendations were made to establish a program office with a sense of permanence, the political power to make decisions across agencies, and the authority over budgets.² These recommendations closely track those made by the two ocean commissions, which advocated for a new management regime, based in the Executive Office of the President that would have the authority to coordinate efforts and guide the distribution of resources throughout the federal government in an integrated system that reached across jurisdictional boundaries of individual agencies.

¹ Analysis of Global change Assessments: Lesson Learned. National Research Council 2007

² Hearing before the House Science and Technology Committee, Subcommittee on Energy and the Environment; Reorienting the U.S. Global Change Research Program Toward a User-Driven Research Endeavor. http://science.house.gov/publications/hearings_markups_details.aspx?NewsID=1798 May 3, 2007.

Such a vision was partially implemented in the ocean community when the President established the Committee on Ocean Policy (COP). However, the COP's charge is limited to coordination. It lacks institutional independence and a leader charged with resolving interagency disputes and representing the interest of individual agency ocean programs in the budget process. Consequently, efforts to move a new national ocean policy forward have languished and the ocean community's capacity to contribute toward the scientific and management needs to address climate change have been compromised.

Similar problems exist in Congress, where cross-cutting issues such as oceans and climate fall under the jurisdiction of multiple committees and subcommittees. Take the case of ocean acidification. The Commerce Committee clearly has jurisdiction; however, the Environment and Public Works Committee has authority over water pollution and water quality issues, the Energy and Natural Resources Committee has a role regarding emissions from energy facilities, which are a major source of CO₂, and the Committee on Appropriations funds authorized activities. The same diversity of oversight authority exists in the House, significantly complicating efforts to develop a comprehensive strategy to address climate change. In the 108th Congress, the U.S. Commission on Ocean Policy identified a total of 58 standing committees and subcommittees having jurisdiction over ocean-related issues in the House and Senate.³ An early assessment of the 110th Congress shows little change or consolidation.

Further evidence of support for a more coherent approach to science-related policy issues is reflected in the growing interest in reestablishing an Office of Technology Assessment (OTA). OTA was a congressional office charged with providing nonpartisan research on technical and scientific issues pending before Congress, but was closed in 1995. As Congress struggles with increasingly sophisticated and complex technical issues such as biomedical research and climate change, an entity such as OTA can provide timely and issue specific guidance that would complement the more exhaustive, costly and time consuming review process performed by the National Academies. Congress relies on credible and readily available information to make informed policy decisions. Right now, the lack of information on oceans and coasts, or a clear strategy for collecting and translating this information into products and services useful to decision makers and managers, is hobbling Congress' ability to perform its role.

Thus, the focus must turn to improving our capacity to more accurately assess the processes and phenomena influencing climate change and society's impact on such processes and phenomena. This will require much greater attention and support being devoted to the broader problem of designing and implementing a strategy that balances resources among basic and applied research, monitoring and analysis, and modeling. This strategy must also be expanded to incorporate support for translating and utilizing this information to evaluate the effectiveness of mitigation, adaptation, and other management actions aimed at meeting the goals of increasing the resiliency of coastal communities and ecosystems.

Given the complexity and interdisciplinary nature of the issues surrounding climate change, progress toward these goals will require changes in the operation and coordination of federal agencies and the federal budget process. The National Oceanic

³ U.S. Commission on Ocean Policy, Appendix F. 2004

and Atmospheric Administration (NOAA) is the logical lead federal agency to oversee the climate change science program; however, public and private confidence in the agency is lacking. This is due, in great part, to the outdated organizational structure of the agency and the lack of resources that have been provided to fulfill its expanding mandate. The opportunity is ripe to reevaluate and realign NOAA's programs along its core functions, which include: assessment, prediction and operations; scientific research and education; and marine resource and area management. This step, taken in combination with an effort to enhance the oversight role of the President's Committee on Ocean Policy, would lay the foundation for a major transition in the ocean and atmospheric policy that would be of enormous long-term benefit to Congress and the public.

Congress should also take advantage of this opportunity to address science agency mission and funding inconsistencies that are hampering the collection and synthesis of long-term data measurements. While NASA and NSF are charged with developing new approaches to collecting, analyzing, and integrating data, NOAA has the charge—but lacks the technical expertise and fiscal resources—to maintain increasingly important remote and *in situ* observation platforms capable of sustained data collection (the compilation of long-term data sets). These long-term data sets are crucial to understanding the rate of change over an extended period. Further exacerbating the situation is a disjointed data management system that is preventing scientists from fully utilizing data that are currently being collected. Given the consolidation of science agencies (NOAA, NASA, and NSF) responsible for ocean and atmospheric research under the jurisdiction of the Commerce Committee and its sister appropriations subcommittee, the opportunity exists to more closely link their complementary programs through both the authorization and appropriations processes. While this proposal may disturb many of those in the community who have a vested interest in programs associated with the individual agencies, in the long-term their collaboration is essential if our nation is to succeed in making progress toward understanding and responding to climate change while also restoring the health of our oceans and coasts.

Clearly, a careful reevaluation of the governance regime guiding climate and ocean-related science and management programs is needed to overcome the obstacles that are currently hampering efforts to develop a comprehensive response to climate change. Whatever action Congress takes, it should look beyond the current models and existing organizational structure to ensure that both ocean and climate change programs are broad-based and charged with developing a balanced strategy that incorporates science, management and outreach. Anything less will perpetuate an approach that has proven to be ineffective and is now jeopardizing the health and welfare of current and future generations.

Science

Credible scientific information is essential as the nation begins the process of developing a new regime to mitigate and adapt to climate change. Better science, when linked with improved risk management and adaptive management strategies will help guide a process that must deal with the relatively high levels of uncertainty surrounding mitigation

alternatives and the range of impacts associated with climate change. A much more comprehensive and robust science enterprise—one that incorporates a better understanding of the oceans’ role in climate change—is required to more accurately predict the rate and implications of change at the global-through-local level, as well as to enable more thorough evaluation of options for mitigating and accommodating this change.

While the United States is making a significant financial commitment to understanding climate change, the inadequacy of the current strategy has become clear and reform is urgently needed. Research that has been primarily focused on physical science and validation of climate change must expand to incorporate greater attention to the role and contributions of biogeochemical and ecological processes, as well as interactions among these three processes. This will require a significant commitment of new resources and will increase the complexity of the science strategy to understand and respond to climate change. However, these actions cannot be avoided if the science community is going to be responsive to Congress’ need for credible scientific information to guide its decision making process.

One of the first steps should be a commitment to building a comprehensive environmental monitoring system. We are supposedly well on our way to fulfilling our international commitment to support *climate* observing systems—which according to the most recent report from the Climate Change Science Program is over 50 percent complete. However, support for this system is in trouble, which is compounded by the fact that considerably fewer resources are dedicated to supporting an *ocean-focused* component of the observing system. A recent NRC study found that remote sensing satellite programs in NASA are at great risk and that the next generation of satellites is generally less capable than the current, rapidly diminishing system. Projected budgets show U.S. investment in these capabilities falling by 2012 to its lowest level in two decades.⁴ Support for a dedicated ocean observing program appeared in the President’s budget for the first time this year, at the level of \$16 million, a fraction of what Congress has been providing in recent years.

As a consequence our knowledge of physical ocean-related processes is limited, and our capacity to understand biogeochemical and ecological processes languishes due to the lack of capacity to study, much less monitor and model these systems and their responses to change. The expert scientific witnesses appearing before the Subcommittee today have testified to this fact, presenting us with quantifiable data that human have contributed to the increased acidification of the oceans and that there are very real and potentially damaging consequences associated with this change. Yet, the ocean scientific community does not have access to funding to support large-scale field experiments, study environments that are naturally more acidic, or more fully examine the geologic record to understand past events that may have resulted in similar conditions.

It is now obvious that enhanced and integrated observing systems are a key element underlying a robust ocean and climate science strategy. From a research perspective this need was clearly articulated in the release of the Administration’s *Ocean Research*

⁴ Earth Science and Applications for Space: National imperatives for the Next Decade and Beyond, NRC 2007.

Priorities Plan and Implementation Strategy in January, in which the deployment of a robust ocean-observing system was highlighted as a critical element of the plan. Such an observing system will require a commitment to deploy and maintain infrastructure and instrumentation, such as satellites, research vessels, buoys, cabled underwater observatories, and data management networks. A sustained, national Integrated Ocean Observing System (IOOS), backed by a comprehensive research and development program, will provide invaluable economic, societal, and environmental benefits, including improved warnings of coastal and health hazards, more efficient use of living and nonliving resources, safer marine operations, and a better understanding of climate change. However, the value of this system will be fully realized only if an adequate financial commitment is also provided to support integrated, multidisciplinary scientific analysis and modeling using the data collected, including socioeconomic impacts. Unfortunately, support for the lab and land-based analysis of the data derived from these systems is often inadequate, diminishing the value of these programs, while support for socioeconomic analysis is virtually nonexistent.

The lack of a comprehensive climate change response strategy and supporting governance regime that integrates fundamental research and development, monitoring and analysis, and modeling efforts is a major weakness in our national effort. It must be immediately addressed to ensure that policy makers have the scientific information necessary to guide their deliberation regarding both mitigation and adaptation strategies. Congress should develop legislation, perhaps with guidance from the National Research Council, requiring the development of a comprehensive science strategy that incorporates support for ocean-related sciences with a focus on enhancing the predictive capacity of physical and ecological models. This advancement is necessary to provide policy makers and the public with the information necessary to make informed decisions regarding the collateral impact of potential mitigation strategies—such as carbon sequestration in or under the oceans or biofuel production that results in increased runoff of agricultural pollutants into coastal watersheds—and strategies for increasing the resiliency of coastal communities and marine ecosystems to climate generated impacts.

Conclusion

The recent elevation of national conversation surrounding climate change and its economic and environmental implications validate similar discussions voiced by the ocean community upon the release of the U.S. Commission and Pew Commission reports. At the heart of the matter is the need for more a robust science enterprise capable of advancing our understanding of the processes that drive our planet and can better guide the decisions of policy makers. The integration across agencies and scientific disciplines, with a focus of developing products and services useful to policy makers and the public, will only occur if we succeed in implementing and integrating new governance regimes for climate change and ocean policy that facilitates greater collaboration, including resources and expertise outside of the federal system.

This transition must be well thought out and deliberate, perhaps pursuing a phased approach such as that recommended in the U.S. Commission report. In it, we recommended that the initial focus be on strengthening NOAA, followed by a

realignment and consolidation of ocean programs that are widely distributed throughout the federal government. The final phase would be the consolidation of natural resource oriented programs under a single agency. This approach responds to the recommendation of the Volker Commission, which identified the proliferation and distribution of agencies and programs throughout the federal government as a major hindrance to efficiency and effectiveness of the federal system.⁵

I am appealing to you publicly, as Leon and I have done in private to many of you, to take up the mantle of governance reform in the ocean community. It is the critical first step in the process toward realigning and focusing the resources and energy of the ocean community toward restoring the health and viability of our oceans and coasts. I understand it will be difficult, but increased public awareness and concern about the health of the environment has provided us with a unique and timely opportunity to leave a lasting legacy, one we can appreciate when sitting on a beach --free of closure and swimming advisory signs-- on a sunny summer afternoon with our children or grandchildren while looking out over the horizon of a sparkling blue sea.

Madame Chair and Members of the Subcommittee, I appreciate the opportunity to appear before you today, and look forward to working with you to address the ocean and coastal issues raised in this hearing. I would be happy to answer any questions that you may have.

⁵ National Commission on the Public Service: *Urgent Business for America: Revitalizing the Federal Government for the 21st Century* http://www.brookings.edu/gs/cps/volcker/volcker_hp.htm 2004