New Organizing Principle for Ocean Sciences

RECENTLY, something remarkable happened. The US Congress passed, and President Obama signed into law, five ocean-related bills that were included in the Public Lands Management Act of 2009. These five bills address: (1) ocean exploration and the National Oceanic and Atmospheric Administration's underwater research program, (2) the federal ocean acidification research and monitoring program, (3) the ocean and coastal mapping integration program, (4) the coastal and estuarine land conservation program, and (5) the integrated coastal and ocean observations program. These bills were passed after years of hard work by many, many dedicated individuals whose actions were bolstered by the reports of the Pew Oceans Commission (2003), the US Commission on Ocean Policy (2004), the Joint Ocean Commission Initiative (2009), and countless news media accounts of alarming findings regarding declining fisheries, loss of biodiversity, compromised water quality, and the stresses placed on our ocean, in part, as the result of atmospheric carbon dioxide loading and the resultant climate change.

Authorization of these bills is just the first step. The next challenge is to ensure that the multiple relevant agencies work together to fund and execute the ocean-related mandates covered in this landmark legislation. This task will not be a simple one, as once again there are many conflicting public opinions on the confounding environmental issues facing the world today. Already there are news alerts like the one issued recently by a *Wall Street Journal* RSS feed, linking to the article, "US in Historic Shift on CO_2" (Weisman and Hughes, 2009), that warned:

> *The US Environmental Protection Agency issued a finding that carbon dioxide and other greenhouse gases pose a danger to the public, setting the stage for a battle over regulations that could have far-reaching impact on the US economy.*
>
> *Unless superceded by Congressional action, the EPA finding potentially could lead to a wave of regulations across the economy, putting stricter emissions limits on a wide range of enterprises from power plants and oil refineries to automobiles and cement makers.*

The implication of this *Wall Street Journal* article is that attending to environmental concerns will negatively impact the economy. In the midst of fighting for funding, we as an ocean sciences community must also commit to educating people that conservation of the environment is not an extra "cost" that must be borne by business and industry—that conservation in the long run is cost-effective and wise business. This sustainable development will require a new paradigm—where economists and environmental scientists work together.

This country is in the midst of a critical transition period involving a re-examination of the core principles that guide national and international economic and environmental policies. The fundamental task for us as ocean scientists is to find a "new organizing principle" that drives our research and education agendas. In the past, the Cold War served as an organizing principle. When the Cold War drew to a close in the late 1980s to early 1990s, it was replaced with a call for improved ecosystems management and remediation. Like America's current medical system that is a "sick-care system" rather than a "health-care" system, ecosystems management now needs to evolve from a reactive and curative system to a proactive and preventive environmental health system. Just as preventive personal health care places more responsibility on the individual, so does preventive environmental health care shift responsibility to individuals.

Safeguarding the health of ocean, coastal, and Great Lakes environmental systems requires a much better understanding of how natural systems work and how they can be "engineered"

for wise use and conservation. Historically, ocean scientists have tended to focus on natural sciences and technology, while excluding the social sciences. It is important now to add socio-political and economic sciences to the multidisciplinary definition of ocean sciences. With this broader definition comes the recognition that the "services" provided by the environment, such as carbon dioxide assimilation, nitrogen fixing, water filtration, and ecotourism, among many others, have real dollar value. We need to regard conservation of the environment as a positive business practice and to see that economic choices do not assume that the "services" provided by nature or natural systems should be considered "free." When we conduct cost-benefit analyses for new products and new processes, for example, the price of using natural systems needs to be established and factored in. Users of "natural services" should pay. Research in the socio-political and economic sciences has the potential to directly impact the prospects of creating the equivalent of "preventive health care" for the ocean. As our multidisciplinary research reveals answers to complex societal questions, we have the responsibility to use all venues of information technology and mass media to educate broadly.

Let us use the passage of these five ocean bills as a signal that America is ready to channel its energy and resources toward a more creative and constructive view of global natural resources. This new agenda will test the status quo of our research and educational systems. The challenge for the ocean sciences community is to respond with systems that arch, bend, and evolve with the needs of a dynamic, changing society.

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