A Next Generation Collaboratory Approach:
E-Science Knowledge Networks

THE LME COLLABORATORY NETWORK

THE VISION

A ***global network of Large Marine Ecosystem (LME) based collaboratories*** sustained by synergistic government, non-government, industrial and academic partnerships***.***

THE MISSION

To create a cyber-enabled environment designed to advance the collaborative research, discipline-informatics, environmental applications, and knowledge sharing needed ***to support the diverse multi-disciplinary communities of practice engaged in the science, management, conservation and governance of LMEs.***

RATIONALE:

Why Collaboratories? Why Now? - The Science is Ready

Over the last two decades an earth systems science community has emerged committed to infusing environmental, earth, and information science toward ***the practice of environmental and earth system science*** http://www.igbp.net/.

Concurrently, the international conservation community has been fostering ***the application of environmental and earth system science toward an ecosystem-based approach*** to resource management http://www.marineplanning.org/14.htm.

Through this work it has become clear that the ***full integration of the human dimension*** is central to the modern practice of environmental applications and earth system science, as well as an ecosystem-based approach to management***.***

Governments have responded to this convergence of information, application, earth system, and conservation science and the need to address systemic anthropogenic influences by incorporating concepts of ***environmental stewardship, sustainability, resilience, and adaptation*** into resource management agendas at all scales - international, national, state and local.

Consequently, this new systems and application science driven approach has resulted in recognition of the ***urgent need for dynamic synthesis of relevant data, information, and knowledge*** to implement this new management agenda. http://www.lme.noaa.gov/ http://www.ices.dk/aboutus/aboutus.asp, http://www.pices.int/about/default.aspx .

Over this same period of time the ***application of technological innovation has enabled*** unprecedented amounts of data to be generated from observations and models, while the ***World Wide Web has changed the way we practice and communicate science.***

The convergence of all of these factors creates both the need and opportunity to focus the leadership and knowledge gained over the last two decades toward cultivating the ***next generation of science leaders capable of innovating the science based decision support systems*** to advance best practices in ecosystem based management and global environmental change.

DRAFT

Why LME Network? Why Now? – The Mandate is Clear

The world's coastal ocean waters continue to be degraded by unsustainable fishing practices, habitat degradation, eutrophication, toxic pollution, aerosol contamination, and emerging diseases. Against this background is a growing recognition among world leaders that positive actions are required on the part of governments and civil society to redress global environmental and resource degradation with actions to recover depleted fish populations, restore degraded habitats and reduce coastal pollution. (http://www.lme.noaa.gov)

For more than two decades NOAA, in partnership with UNEP, IOC-UNESCO, and ICUN, and the GEF has led an international effort to establish a worldwide network of 64 Large Marine Ecosystems to serve as the global framework for ecosystem based management. Large marine ecosystems are areas of the ocean characterized by distinct bathymetry, hydrology, productivity and trophic interactions. Annually LMEs produce 95 percent of the world's fish catch thus making them the focal point of global efforts to reduce the degradation of linked watersheds, marine resources and coastal environments from pollution, habitat loss and over-fishing. http://www.lme.noaa.gov)

The challenge echoed around the world is how to integrate the requirements of natural systems with the needs of the people who depend upon them. As the concept of ecosystem-based management has developed, there has been a shift to better include human impacts and needs in the consideration of how to manage ecosystems. This change has developed in parallel with the move from single objective (or single sector) management to more holistic considerations of ecosystems including the multiple objectives that humans desire and our cumulative impacts on ecosystems. These changes create a foundation for transforming the way people address conflicts between the environment and the economy. To better capture human uses, needs and impacts in our management models, a scientific foundation for policy that characterizes the services integral to society is required. One step towards incorporating human and ecosystem needs is to include multiple objectives in planning and assessments in a collaboratory setting. (http://marineplanning.org/16.htm)

On June 12, 2009, President Obama issued a federal memorandum that states: "To succeed in protecting the oceans, coasts, and Great Lakes, the United States needs to act within a unifying framework under a clear national policy, including a comprehensive, ecosystem-based framework for the long-term conservation and use of our resources."

The Obama Administration's proposed new Ocean Policy specifically designates 9 Large Marine Ecosystems within the United States to serve as the unifying framework for integrating science, management and governance toward a comprehensive approach to ecosystem-based management. (http://www.whitehouse.gov/sites/default/files/page/files/2009ocean_mem_rel.pdf)

Climate change has added new urgency to this effort as President Obama noted in his June 12, directive: "Oceans both influence and are affected by climate change. They not only affect climate processes but they are also under stress from the impacts of climate change. We have a stewardship responsibility to maintain healthy, resilient, and sustainable oceans, coasts, and Great Lakes resources for the benefit of this and future generations." (http://www.whitehouse.gov/sites/default/files/page/files/2009ocean_mem_rel.pdf)

Two decades of international leadership in cultivating an LME-based Community of Practice, coupled with President Obama's recent call for designating LMEs to serve as unifying framework for a comprehensive approach to ecosystem-based management, creates the perfect backdrop for a global network of Large Marine LME-based (next generation) collaboratories sustained by a synergistic government-non-government-industrial-academic partnership.

DRAFT

What is the current notion of a Collaboratory?

A collaboratory refers to a community-specific computational environment for research and education that provides high-performance computing services, data and information services, knowledge management services, human interface and visualization services, and collaboration services, all of which are essential to facilitating high scientific productivity. (http://en.wikipedia.org/wiki/Collaboratory).

What is a 'Next Generation" Collaboratory Approach?

Simply put, next generation collaboratories serve as the living laboratory for discipline based informatics and application science. Next generation collaboratories bridge the virtual community and the virtual observatory by placing human dimension and modern informatics at the forefront of discovery and the generation of knowledge. It moves beyond a community-specific computational environment to a distributed human driven escience based knowledge network made up of multi-disciplinary communities of practice. It balances communication patterns, organizational structure and technical infrastructure, understands what activities are synchronous versus asynchronous, geographically localized versus distributed and has well defined goals, roles, and responsibilities for participants. A next generation collaboratory utilizes the web and semantics as two powerful scale-free environments.

Why A Living Laboratory for the WWW, informatics, and applications?

Since its inception the World Wide Web has changed the ways people work, play, communicate, collaborate and educate. There is however, a growing realization among researchers across a number of disciplines that without new research aimed at understanding the current, evolving and potential Web, we may be missing or delaying opportunities for new and revolutionary capabilities. (http://news.rpi.edu/update.do?artcenterkey=2726, http://tw.rpi.edu/wiki/Tetherless_World_Constellation)

The web has fully emerged and is moving beyond pages to data. The semantic web is demonstrated to be effective in production environments. The social web and user-generated content has opened new lines of investigation. Collaborative and content environments are beginning to merge. Modern informatics enables a new approach. In contrast to nearly all-existing technical-based approaches, informatics starts with the use case. Instead of building successive layers of technology from the low (data) levels up -- in hopes they will be used -- the practice of informatics determines what questions people want to ask, and what tasks need to be performed. Informatics works from the upper levels down to meet (and often build or adapt) the underlying technical infrastructure.

RECAP:

Mission:

T*o create a cyber-enabled environment* designed to advance the collaborative research, discipline-informatics, environmental applications and knowledge sharing needed ***to support the diverse multi-disciplinary communities of practiced engaged in the science, management, conservation and governance of LMEs.***

Cultivate the next generation of leaders capable of innovating science based decision support and information systems to advance a global agenda of sustainable resource management and environmental change while progressing ***new standards for open and participatory government.***

Provide focus on full cycle ecological systems by bringing together experts in biological, geophysical, chemical, engineering, and social science domains while simultaneously engaging a much broader multidisciplinary coastal constituency of decision makers to include: policy professionals, resource managers, conservation advocates, cultural historians, educators, students and residence ***in a wide range of inquiry based synthesis activity.***

Vision:

A ***global network of Large Marine Ecosystem (LME) based collaboratories*** sustained by a synergistic government, non-government, industrial and academic partnerships***.***

DRAFT