Resiliency and Adaptation to Climate Change and Ocean Acidification: Public Comments Received 1/24/2011-4/29/2011

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Name

Bruce Wright

Organization

Aleutian Pribilof Islands Association

Which Priority Objective would you like to provide comment on?

Resiliency and Adaptation to Climate Change and Ocean Acidification

What near-term, mid-term, and long-term actions would most effectively help the Nation achieve this policy objective?

Introduction:

I participated on the Pew Ocean Commission as the Science Advisor for Alaska Governor Knowles and generally agree with all 9 objectives. But they are general statements, and I would like to focus on what I perceive as the most pressing topic for the oceans: Resiliency and Adaptation to Climate Change and Ocean Acidification. As the Senior Scientist of the Aleutian Pribilof Islands Association, a regional Native non-profit organization, I work with the Tribes and communities in the Aleutian and Pribilof Islands on renewable energy projects (wind, geothermal, hydro and tidal), energy conservation projects and climate change monitoring and mitigation measures. My harmful algal blooms (HABs), sea level rise and ocean acidification monitoring projects data are revealing regional changes likely driven by increased ocean temperatures and acidification.

The Problem: Oceans becoming saturated with CO2

The increase of CO2 into the world' s ocean from anthropogenic carbon emissions has resulted in a pH decline of about 0.1 units since the beginning of the Industrial Revolution. Ocean acidification results from the chemical interactions of CO2, water and the carbonate system of the ocean and results in a decline in the concentration of the carbonate ion, essential for many phytoplankton and zooplankton. Alaska is expected to experience exacerbated effects of ocean acidification since cold northern upwelling waters of Alaska are already laden with CO2. Ocean acidification could reduce CaCO3 deposition rates of key calciferous plankton enough that we expect shifts in the food web. Increased ocean acidification could easily result in loss of ocean productivity which would have a direct negative effect on subsistence and commercial marine resources. Some species of shellfish (shrimp, clams, oysters, crab) are already having difficulties maintaining their shells in high acid oceans; if ocean acidity increase too much these species may perish.

As the oceans become more acidic they are less reliable as a sink for CO2; they are becoming saturated with CO2. The Southern Ocean has been absorbing less CO2 from the atmosphere since 1981 even though CO2 levels have increased 40% due to burning of fossil fuels. Oceans once absorbed half of all human carbon emissions, but the Southern Ocean is taking up less and less and is reaching its saturation point. This is evidence of a positive feedback that could rapidly accelerate the rate of climate change. Climate models predict that this kind of feedback will continue and intensify; as the oceans reach their saturation point more CO2 will stay in our atmosphere.

The Solution: Remove CO2 from the biosphere by deacidifying the oceans:

We need to get the acid out of our oceans. Researchers have described a technology to reduce the accumulation of atmospheric carbon dioxide (CO2) caused by human emissions. The process electrochemically removes hydrochloric acid from the ocean and then neutralizes the acid with a silicate reaction using volcanic rocks; this simulates and accelerates natural chemical weathering. The new technology de-acidifies the ocean's waters. As a result, the ocean's alkalinity would increase, enabling the uptake and storage of more atmospheric CO2 in the form of bicarbonate. This process may be able to safely and permanently remove excess CO2 in a matter of decades. This

process could be run in remote locations and powered by stranded energy, such as geothermal in Alaska and especially near volcanoes. To deacidfy the oceans would involve building dozens of facilities on coasts of volcanic. The Aleutian Islands are on the Ring of Fire, have many sites with abundant renewable energy (geothermal, wind, hydro and tidal) and the chemistry needed to process the acid in the ocean to an inert byproduct.

What are some of the major obstacles to achieving this objective; are there opportunities this objective can further, including transformative changes in how we address the stewardship of the oceans, coasts, and Great Lakes?

lack of leadership and forward thinking

What milestones and performance measures would be most useful for measuring progress toward achieving this priority objective?

measureable recovery in ocean chemistry

Name

Greg Rau

Organization

Institute of Marine Sciences, U. California, Santa Cruz

Which Priority Objective would you like to provide comment on?

Resiliency and Adaptation to Climate Change and Ocean Acidification

What near-term, mid-term, and long-term actions would most effectively help the Nation achieve this policy objective?

Solicit, foster, and support research on potential methods of restoring, remediating, and mitigating climate and ocean acidification impacts on ocean ecosystems. The current IOP Task Force statement (pg 37) vaguely calls for "adaptive actions" and development of "resilience strategies and priorities". What needs to be acknowledged is that the root cause of climate and acidification impacts - elevated atmos CO2 - is likely to worsen in the coming decades and therefore we must contemplate actively managing the biology and chemistry (probably in selected areas) in order to provide refugea for threatened species. Selected coral reefs would be one example. Given the current political climate, it is too risky to assume that CO2 emissions and atmospheric CO2 will be declining anytime soon.

What are some of the major obstacles to achieving this objective; are there opportunities this objective can further, including transformative changes in how we address the stewardship of the oceans, coasts, and Great Lakes?

Reliance on biological "resiliency and adaptation" alone as a method of combatting climate and acidification impacts will likely lead to diminished numbers of marine species. This is because the rate of climate and acidity change is likely to outstrip many species' resiliency and ability to (genetically?) adapt. If you are going to rely exclusively on such natural selection and "evolution" to solve the problem the surviving marine ecosystems will likely bear little resemblance to those we currently enjoy/rely on. We need to face the possibility that marine ecosystems will need to be actively managed to survive. The policy must address: What are the most effective management strategies, including chemical, biological, and physical interventions? I'll attach one example of potential chemical intervention to combat ocean acidification, but my point is let's find out what all of our options might be and then let's scientifically evaluate their cost, safety, and effectiveness. Let's do this now so we can make intelligent choices on active management practices as soon as they are needed, not decades too late.

What milestones and performance measures would be most useful for measuring progress toward achieving this priority objective?

When marine species begin to disappear we will know our policies have failed, and it will be too late to save those species. We do not want to reach this milestone unless we have first tried all potential interventions. Now is the time to acknowledge that such action may be needed and to solicit and evaluate what those interventions might be. We do not want to simply monitor the problem and let nature take its course as seems to be implied in the current policy statement.

Regards,

Greg H. Rau, Ph.D.

Senior Research Scientist

Institute of Marine Sciences

University of California, Santa Cruz (off-campus)

Attachment: Attachment included in index: "Rau, Greg H. 'Electrochemical Splitting of Calcium Carbonate to Increase Solution Alkalinity: Implications for Mitigation of Carbon Dioxide and Ocean Acidity.' *Environmental Science & Technology* 43.23 (2008): 6 pages. Print and electronic. Found on page 52 of document.

Name

Margo Blaha

Organization

Florida Institute of Technology

Which Priority Objective would you like to provide comment on?

Resiliency and Adaptation to Climate Change and Ocean Acidification

What near-term, mid-term, and long-term actions would most effectively help the Nation achieve this policy objective?

a) Near-term:
It should be mandated that coastal communities identify all risks (environmental, economic, social) from a 1 meter sea-level rise and map expected flood areas. Perhaps this risk assessment could be accomplished within the boundaries of a regional CMS Plan. There should be a local public awareness campaigns to educate people of their risk and inform them what their local government is doing to try and mitigate that risk. In conjunction with what is happening at the local level, the nation needs to become a global leader in finally adopting a national policy to curb greenhouse gas emissions. b) Mid-term: The flood maps should be publicized and future development and growth should account for such flooding scenarios. In other words, it should become national policy that development is not encouraged within high-risk areas. If a private landowner chooses to build or live there, they take all that risk upon themselves with no governmental subsidies available to them (i.e. no more federal flood insurance). A review must be done of policies that do not provide long-term benefits and are environmentally destructive, such as beach renourishment projects. Federal funding for such projects should be evaluated and halted, if deemed necessary. Coastal states will need to do a review of their building permitting process and update criteria to account for sea level rise area. c) Long-term: Existing coastal structural reinforcements, such as seawalls built on beach dunes, need to be evaluated with regard to environmental impact, and new polices should promote that high impact seawalls be taken down. There may need to be the implementation of more incentive-based policies that encourage the migration of people who currently live in high risk flooding areas to areas of lower risk. The government should encourage the development and implementation of renewable energy to our national grid system. This can be accomplished through incentive programs (using monies saved from not funding federal flood insurance) that help to create new businesses.

What are some of the major obstacles to achieving this objective; are there opportunities this objective can further, including transformative changes in how we address the stewardship of the oceans, coasts, and Great Lakes?

A major obstacle may be obtaining the support of local communities because any successful adaptation plan will result in a major shift from the traditional economic model of people living and working in expensive and high risk areas along the coast. Much of county revenue is based on taxing expensive properties in these areas. Also, the tourism industry will be very reluctant to agree to policies that prevent resorts from being built on beaches or see renourishment projects end. The opportunity is now for the federal government to take the lead in how we need to view living along coastal areas in the future. Coastal areas should be advertised as dynamic and fragile environments that humans have exploited for far too long without attention to the consequences. Policy shifts need to be demonstrated as necessary if the beauty and life of the coasts are to be there for our children and grandchildren to enjoy.

What milestones and performance measures would be most useful for measuring progress toward achieving this priority objective?

Significant milestones will occur when every coastal municipality (from the smallest town to largest megacity) has adequately measured and mapped all of their risk from sea-level rise and increased coastal storms. A performance measure will be that this mapping occurs in a timely fashion (no longer than three years). Progress towards the adoption of a plan that mitigates risk can be measured as the steps taken at the local and national level to implement policies that work to effectively and equitably decrease the number of people inhabiting the coastal zone. To this end, a performance measure will be a decrease in population size within the coastal zone by 10% over a five year period. Additionally, governance that, through new policies, promotes growth in non hazardous areas is another performance milestone.

Name

Todd Harwell

Organization

Florida Institute of Technology

Which Priority Objective would you like to provide comment on?

Resiliency and Adaptation to Climate Change and Ocean Acidification

What near-term, mid-term, and long-term actions would most effectively help the Nation achieve this policy objective?

i. Near-Term: Routine integrated ecosystem assessments and forecasts of factors and activities contributing to climate change should be implemented and conducted, including briefings delivered to Congress. This will allow the National Ocean Council to determine the areas or entities most prominently contributing to climate change that should be addressed on a priority level.

ii. Mid-Term: Make efforts to transition to more renewable energy practices that will ultimately reduce greenhouse gas emissions. Such practices have been introduced in the Report to Congress by the EISA in 2009. Introducing more renewable energy practices, such as marine hydrokinetic energy in the form of offshore wind farms, will not only allow the United States to become more energy independent, but it will also reduce greenhouse gas emissions and the level of carbon dioxide in the atmosphere.

iii. Long-Term: Institute and enforce stricter regulations on humans to protect the environmental health of our ecosystems. Some of these regulations may include introducing more National Marine Sanctuaries and reserves, stricter fishing regulations and enforcement to reduce overfishing, reduction of fertilizer use in commercial and residential coastal areas, and ultimately limiting and reducing the carbon dioxide amounts released in the atmosphere by businesses and industries.

What are some of the major obstacles to achieving this objective; are there opportunities this objective can further, including transformative changes in how we address the stewardship of the oceans, coasts, and Great Lakes?

i. The numerous, widespread, and various impacts of climate change may be difficult to monitor, especially in collaboration with other agencies and organizations.

ii. Media, politicians, and stakeholder groups that strongly oppose and refute the validity of climate change and the scientific evidence that supports it.

iii. Increasing human impacts on our ecosystems and the increasing contributions to perpetuating climate change such as greenhouse gas emissions.

What milestones and performance measures would be most useful for measuring progress toward achieving this priority objective?

i. Immediate implementation of the National Ocean Policy and the Nine Priority Objectives.

ii. Continued support and reporting of climate change-related findings from NASA.

iii. Assessments and updates on the level of carbon dioxide in the atmosphere.

iv. Assessments of industrial greenhouse gas emissions.

v. Monitoring and reporting of continued climate change evidence such as sea surface temperatures, sea level, ice sheets in the Arctic, and levels of carbon dioxide in the atmosphere.

Attachment: Attachment included in index: “Todd A. Harwell.” Found on page 106 of document.

Name

Glen Bupp

Organization

Which Priority Objective would you like to provide comment on?

Resiliency and Adaptation to Climate Change and Ocean Acidification

What near-term, mid-term, and long-term actions would most effectively help the Nation achieve this policy objective?

What are some of the major obstacles to achieving this objective; are there opportunities this objective can further, including transformative changes in how we address the stewardship of the oceans, coasts, and Great Lakes?

What milestones and performance measures would be most useful for measuring progress toward achieving this priority objective?

Surveys should be done after 1 year of a public service media campaign to evaluate the effectiveness of the message.

The decision to reduce subsidies for storm insurance will be a milestone which will ensure wise coastal development.

Another significant milestone will be a flattening of the trend line in coastal development, which leads to a downward trend in coastal development and populations.

Name

Michael De Luca

Organization

National Estuarine Research Reserve Association

Which Priority Objective would you like to provide comment on?

Resiliency and Adaptation to Climate Change and Ocean Acidification

What near-term, mid-term, and long-term actions would most effectively help the Nation achieve this policy objective?

Near and mid-term actions should focus on gaining a better understanding of changing climates and sea levels on both the natural and human communities. Specific monitoring of various ecosystems will help to document environmental changes within natural communities. Vulnerability assessments and risk analysis of human built communities must be initiated. Such assessments will allow communities to consider potential impacts and develop mitigation plans. Efforts must also be made to assess potential impacts to commercial and recreational fisheries.

What are some of the major obstacles to achieving this objective; are there opportunities this objective can further, including transformative changes in how we address the stewardship of the oceans, coasts, and Great Lakes?

Major obstacles to achieving this objective include: lack of understanding of impacts from climate change and ocean acidification, lack of planning by many communities, lack of acceptance of the impacts relating to the issues, lack of political will to adequately address the issues and potential lack of funding to mitigate for impacts. In order to accomplish resiliency and adaptation strategies, monitoring and planning efforts need to begin sooner rather than later, and by developing state climate change strategies to be implemented at the local levels. Such efforts will result in positive changes to environmental stewardship and development of our coasts and oceans.

What milestones and performance measures would be most useful for measuring progress toward achieving this priority objective?

Programs to provide for monitoring of impacts to climate change need to be a continuing priority. Federal planning assistance needs to be in place for states to complete Climate Change strategic plans over the next 5-10 years. These efforts could be part of Coastal Zone Management funding which may also include strategies to develop local mitigation strategies for natural and human communities.

Name

Peter Saundry

Organization

National Council for Science and the Environment

Which Priority Objective would you like to provide comment on?

Resiliency and Adaptation to Climate Change and Ocean Acidification

What near-term, mid-term, and long-term actions would most effectively help the Nation achieve this policy objective?

In order to strengthen resiliency of coastal communities and marine and Great Lakes environments and their abilities to adapt to climate change impacts and ocean acidification, the Federal Government and its agencies should:

A. Develop an Oceans and Climate Change Initiative to coordinate agency activities to collectively and collaboratively manage the 1.76 billion acres of marine area under federal jurisdiction.

A. Help avoid "maladaptation" of the coast by:

i. Mainstreaming coastal adaptation and provide incentives for adaptation planning and activities across all federal programs, funding and regulatory approvals.

ii. Adopting policies that support implementation of large-scale ecosystem-based adaptation and green infrastructure into coastal adaptation and planning.

iii. Providing funding and incentives to plan and implement multidisciplinary coastal adaptation projects that include social, economic, and natural sciences.

iv. Developing an interagency online clearinghouse and community of practice for coastal adaptation information, databases, and models.

v. Develop a federal interagency communication and education strategy addressed to decision makers and the public.

vi. Requiring the inclusion of coastal adaptation planning into pre-disaster response and recovery plans.

B. Strengthen ocean resiliency (e.g., Marine Protected Areas (MPAs)).

C. Emphasize the importance of regional approaches to climate change adaptation solutions both within and outside the US;

D. Incorporate climate change and sea level rise considerations in macroeconomic policymaking, prioritizing climate stability in relation to GDP growth in order to ensure long term ecological and economic security.

E. Maintain satellite observations of sea level change as a priority.

F. Recognize in climate change discussions, governments and intergovernmental bodies (e.g. IPCC, Climate Convention of Parties) the importance of coastal and ocean carbon sequestration.

G. Within budget constraints, fund more research into sea level change, including adaptation strategies and current impacts on human population, ecosystems, and economies.

H. Invest in mutli-disciplinary research on geoengineering to consider efficacy, ecological impacts and ethical aspects to consider whether such options can be utilized.

I. Provide an annual projection of sea level rise for policymakers and the public.

J. Take into account sea level rise of up to two meters in long-term coastal planning.

K. Support local and regional planners to develop better knowledge on how activities within watersheds affect receiving waters.

L. Restore and mitigate wetlands and floodplains, including through public-private partnerships.

M. Take immediate action to conserve ecosystems that are already known to sequester carbon, while supporting research on coastal and ocean carbon sequestration.

N. Update the CZMA regulations to require effective and strong enforcement of state and local coastal management plans and recertification of local plans.

O. Ensure that the U.S. Army Corps of Engineers' cost/benefit analysis includes ecosystem services and elevates the importance of these services to be a primary concern.

What are some of the major obstacles to achieving this objective; are there opportunities this objective can further, including transformative changes in how we address the stewardship of the oceans, coasts, and Great Lakes?

What milestones and performance measures would be most useful for measuring progress toward achieving this priority objective?

Attachment: Attachment included in index: “National Council for Science and the Environment’s 11th National Conference on Science, Policy and the Environment: Our Changing Oceans.” Found on page 65 of document.

Index:

Attachments to Comments

And Letters Received

Pertaining to Resiliency and Adaptation to Climate Change and Ocean Acidification

April 29, 2011

Ms. Nancy Sutley, Dr. John Holdren, and Members
National Ocean Council
c/o Council on Environmental Quality
722 Jackson Place NW
Washington, DC 20503

Re: RAE Recommendations on *Objective 5: Resiliency and Adaptation to Climate Change and Ocean Acidification*

Dear Chairs Sutley and Holdren, National Ocean Council Members:

On behalf of Restore America's Estuaries (RAE) and our eleven member organizations, we offer the following recommendations to the National Ocean Council (NOC) for use in developing a Strategic Action Plan for *Objective 5: Resiliency and Adaptation to Climate Change and Ocean Acidification*. Since 1995, RAE has worked to preserve the nation's network of estuaries by protecting and restoring the lands and waters essential to the richness and diversity of coastal life. Through our eleven member organizations, we have successfully completed more than 900 coastal restoration projects nationwide, involved more than 265,000 volunteers, and restored more than 65,000 acres of coastal habitat.

RAE applauds the *Final Recommendations of the Interagency Ocean Policy Task Force* that recognizes the role of coastal ecosystems in shaping the Earth's climate and influencing climate variability. As the NOC works to develop its Strategic Action Plan for Objective 5, we urge the inclusion of the following action items that will help to overcome obstacles to achieving this objective.

Objective 5: Resiliency and Adaptation to Climate Change and Ocean Acidification

Obstacle 1: Lack of dedicated and ample funding

The lack of funding for implementing coastal adaptation strategies is far and away the biggest obstacle to achieving this objective. As such, we recommend the following actions:

Short-term action

Execute a mechanism to allow pooling of funds across federal agencies

In this era of constrained budgets and competing priorities, agencies should be given the tools necessary to work together on projects that they otherwise would not have the resources to complete individually. Specifically, the NOC should identify and execute a mechanism that allows the pooling of funds across agencies in order to increase the pace and scale of adaptation projects nationwide.

Mid-term action

Create a long-term, sustainable private sector funding mechanism by supporting the development of greenhouse gas offsets methodologies and protocols for habitat restoration and protection

Coastal resiliency depends on healthy, functioning coastal ecosystems. Habitat protection and restoration improves resiliency. The key impediment to protecting and restoring coastal ecosystems is the lack of public and private funding. The NOC can help provide a new tool for funding coastal habitat protection and restoration by supporting the development of greenhouse gas offsets methodologies and protocols for habitat restoration and protection. Specifically, the Council should support full implementation of the "*Findings of the National Blue Ribbon Panel on the Development of a Greenhouse Gas Offset Protocol for Tidal Wetlands Restoration and Management: Action Plan to guide protocol development*[1]," published in August 2010 by Restore America's Estuaries. This will allow new private investment in projects through the sale of carbon credits.

Coastal ecosystems sequester carbon from the atmosphere, and coastal wetlands, including tidal wetlands and mangroves, sequester carbon at rates 10-50 times greater than terrestrial forests. Worldwide, these same ecosystems are being lost at up to four times the rate of forests. In the United States, the opportunity for coastal restoration exceeds five to ten million acres.

Wetlands are also significant stores of existing carbon – centuries and millennia of carbon are stored in wetland soils. Degradation of these wetlands can cause a quick release of stored carbon, and thus protecting these carbon stores has strong potential as a climate mitigation strategy.

A key component of adaptation strategies is habitat protection and restoration, in a way that allows for landward migration of coastal wetlands. A potential funding source for implementing coastal adaptation strategies is protocols and methodologies for greenhouse gas offsets through tidal wetland projects. These projects should be located and planned to enhance the migration of tidal wetlands, while providing other significant ecosystem service values.

Greenhouse gas offsets protocols and methodologies will provide the linkage needed to bring tidal wetlands into the carbon markets and enable significant private sector funding for restoration and protection projects. The aforementioned Action Plan details the science and policy gaps that must be addressed in order to develop protocols and methodologies.

In the nearer term, demonstration projects in salt marsh and freshwater tidal managed wetlands would further development of the protocols and methodologies, advance the scientific understanding of the linkages between climate change and coastal restoration

[1] Restore America's Estuaries, 2010. Retrieved from http://www.estuaries.org/climate-change.html

and protection, and demonstrate a new investment opportunity to the private sector. Demonstration projects are detailed in the aforementioned Action Plan.

Performance measure: A potential performance measure for resiliency is the number of new acres of coastal habitat protected and restored.

Obstacle 2: Lack of societal awareness

The lack of society's awareness of the importance of protecting and restoring ecosystems in the face of climate change impacts is an obstacle that will pose difficulty to achieving this objective. Similar to our nation tackling litter prevention in the 1960's and recycling in the 1990's, there is a need to educate and change personal behavior toward ecosystem value. As such, we recommend the following actions:

Short-term action

Create mechanisms for improved communication between all stakeholders

The NOC should employ robust stakeholder processes that will ensure engagement across all sectors, including local interests. In particular, the NOC should make better use of the wealth of climate change adaptation knowledge and experience that exists within the NGO community. Creating partnerships with NGOs brings considerable new assets to the table and helps ensure coordinated approaches.

Mid-term action

Creation of a Coastal Restoration Corps

The NOC should help to create a social service corps dedicated to coastal and estuarine habitat restoration. We view this corps as having the potential to leverage existing restoration assets, increase our nation's capacity to undertake much-needed habitat restoration, and change societal behavior to bring about a more robust stewardship ethic.

Tremendous untapped potential exists within the current collection of groups undertaking restoration throughout the country via community-based efforts. The goal of a Coastal Restoration Corps (CRC) is to network these groups with a national brand and collectively harness their expertise and ability in order to grow the size and effectiveness within the coastal restoration movement. Having a nationwide network will result in better coordination and integration of restoration and conservation efforts. A summary document[2] is available that provides additional information on designing and implementing a restoration corps concept.

Initially, the CRC would implement projects currently ready to go but unable to be executed due to lack of staffing or similar hurdles. As evidenced by NOAA's ARRA

[2] Restore America's Estuaries, 2011. Retrieved from http://www.estuaries.org/images/stories/Coastal_Restoration_Corps_workshop_two-pager_final.pdf

restoration proposal process, a substantial backlog of coastal restoration projects exists – more than 800 shovel-ready projects totaling more than $3 billion[3] – and the CRC would be a powerful tool to accomplish on-the-ground work in a coordinated manner.

Once firmly established, the CRC would help address ongoing threats to our nation's coasts and estuaries. As a result of both the importance of and stressors affecting our coasts and estuaries, the CRC would provide an ongoing service of not only implementing much-needed habitat restoration projects but also providing workforce experience and training for the next generations of restoration professionals. In addition, the CRC would work to engage and inform local communities about the threats, such as climate change and acidification, and allow them to take steps to adapt to them. In doing so, our coasts will continue to be improved over the span of decades through habitat restoration projects as future generations mature with a stewardship ethic and the knowledge and experience to make a meaningful difference.

One of the key elements of the CRC is to incorporate proven and scientifically valid practices into community-based habitat restoration. To that end, the CRC – and the restoration community as a whole – needs to have the wherewithal to investigate and share lessons learned surrounding current and upcoming techniques. We encourage the NOC to foster an environment and ongoing dialogue about what works, what doesn't, and how we, as a community can best work to restore coastal and estuarine habitats. Given the changes facing our coasts, it is more essential than ever to be able to have an approach that is flexible, while being scientifically robust, in order to adapt to changing circumstances.

Milestones and Performance Measures: The CRC will function not only to directly restore habitat but also engage communities and provide needed workforce experience. As a result, a suite of metrics will be applicable to the CRC that directly relates to regional ecosystem protection and restoration. Metrics include, but are not limited to:

- Habitat restored – e.g. acres of marsh, tons of shell, miles of riparian corridor, numbers of seedling plantings
- Volunteers in the CRC
- Community volunteers engaged as part of CRC projects
- Match leveraged
- Career path(s) of former CRC volunteers
- Economic effects of projects – ideally, economic data would be collected prior to and after implementation of restoration projects such that the full economic effect of the project would be measured

Restore America's Estuaries appreciates the opportunity to comment and looks forward to working with the National Ocean Council on this Action Plan.

[3] "Commerce Secretary Gary Locke Announces $167 million in Recovery Act funding for 50 Coastal Restoration Projects." NOAA press release, June 30, 2009. Most recently available at http://www.noaanews.noaa.gov/stories2009/20090630_restoration.html

Sincerely,

Jeff Benoit
President and CEO
Restore America's Estuaries

Tim Dillingham
Executive Director (and RAE Chair)
American Littoral Society

Peter Clark
President (and RAE Vice Chair)
Tampa Bay Watch

Donald S. Strait
Executive Director (and RAE Secretary)
Save the Sound – Long Island Sound

Jonathan F. Stone
Executive Director (and RAE Treasurer)
Save The Bay – Narragansett Bay

Roy Hoagland
V.P. of Env. Protection & Restoration
Chesapeake Bay Foundation

Steven Peyronnin
Executive Director
Coalition to Restore Coastal Louisiana

Peter Shelley
Senior Counsel
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Robert Stokes
President
Galveston Bay Foundation

Todd Miller
Executive Director
North Carolina Coastal Federation

Kathy Fletcher
Executive Director
People For Puget Sound

David Lewis
Executive Director
Save The Bay – San Francisco

Objective 5: Resiliency and Adaptation to Climate Change and Ocean Acidification: Strengthen resiliency of coastal communities and marine and Great Lakes environments and their abilities to adapt to climate change impacts and ocean acidification.

- *Research and Information*: Support efforts by states to improve understanding of the potential impacts of climate change through efforts such as baseline studies and mapping. Support scientific research on potential impacts of ocean acidification on marine life and food webs as well as to economic, social, and cultural effects on coastal communities. Improve the communication of relevant scientific findings to resource managers, policymakers, and the public.
- *Adaptation and Mitigation Efforts*: Support efforts to create regionally or locally specific plans to mitigate and adapt to impacts of climate change, including ocean acidification, on coastal communities.

Climate change will likely disproportionately affect coastal areas. The major impacts of climate change will include coastal sea level rise, salt water intrusion, increased ocean temperature, ocean acidification, changes in physical characteristics of marine systems, increased harmful algal blooms, spread of invasive species, habitat loss, species migrations, and changes in dynamics of marine ecosystems. The WCGA addresses climate change as one of two overarching objectives. Currently, we are sponsoring a scientific study by the National Research Council of potential sea level rise along the West Coast. The study would help coastal communities efficiently plan and prepare for the immediate and future effects of rising seas on their local infrastructure and economy. The three states have also developed a work plan for comprehensive offshore seafloor mapping in state waters to identify critical areas and to create a baseline for future monitoring. Parts of this mapping have been completed; however, significant additional investment is needed to complete the work plan.

The uncertainty of the impacts to the ecosystem and key species in response to climate change and the fact that these impacts will vary locally and regionally present major obstacles for decision makers, resource managers and the public. To help coastal communities address and plan for impacts of climate change, we recommend funding efforts to conduct regional studies that provide locally relevant information to assess these impacts over the coming decades and to develop mitigation and adaptation actions for our coastal communities. These efforts should support interagency collaboration and include education, monitoring, and adaptive management.

April 29, 2011

Ms. Nancy Sutley, Dr. John Holdren, and Members
National Ocean Council
c/o Council on Environmental Quality
722 Jackson Place, NW
Washington, DC 20503

Re: Recommendations for the Resiliency and Adaptation to Climate Change and Ocean Acidification Strategic Action Plan

Dear Chairs Sutley and Holdren and National Ocean Council Members,

The undersigned organizations provide the following comments in order to inform the National Ocean Council ("NOC") as it develops a Strategic Action Plan ("Action Plan") for the national priority objective relating to "Resiliency and Adaptation to Climate Change and Ocean Acidification." Over the past decade, researchers have observed and predicted numerous, and in some cases rapid, oceanographic changes in the United States due to climate change and ocean acidification. It is clear that the environmental changes associated with climate change and ocean acidification are having immediate and lasting effects on our living marine resources, coastal habitat and infrastructure, and the goods and services that they provide. Enhancing the resiliency of living marine resources by reducing significant and cumulative threats, and providing opportunities for adaptation to these stresses should be a guiding goal of not only this Action Plan, but should also be an imbedded goal in other Strategic Action Plans.

The Action Plan should include specific guidance and actions for each of the following elements: (1) mitigation; (2) integrated observation, research, and modeling; (3) sea-level rise; (4) resilience and adaptation policies and programs; and (5) mechanisms for funding. These elements are essential for our nation to adequately manage for resilient oceans, coasts and Great Lakes that are able to adapt to the profound changes associated with climate change and ocean acidification.

I. Mitigate actions which contribute to climate change and ocean acidification

A. Demonstrate consistency with Executive Order 13514

Climate change and ocean acidification are driven by increased carbon dioxide and other air pollutant emissions which enter the atmosphere and the oceans, triggering major changes to fundamental marine and coastal parameters including pH, temperature, sea-level, currents, salinity, and nutrient timing and availability. Actions that reduce the amount of greenhouse gas pollutants are the most important steps that can be taken to reduce the negative effects of climate change and ocean acidification. On October 5, 2009, President Obama signed Executive Order 13514, which requires each federal agency to submit a 2020 target to cut greenhouse gas pollutants by: reducing energy use in agency buildings; increasing

renewable energy use and renewable energy projects on agency property; and reducing the use of fossil fuels in agency fleets.

i. Recommendation

The Action Plan should make clear that agency compliance with Executive Order 13514 is critical to mitigate the impacts of ocean acidification and climate change. While this Action Plan should not concern itself with implementing actions related to this Executive Order, it should emphasize that reducing greenhouse gas pollution is the only way to slow down climate change and ocean acidification. Furthermore, strategies throughout this Action Plan should be consistent with any implementing actions of Executive Order 13514.

B. Inform mitigation decisions and actions

As later articulated in these recommendations, research, observations, and modeling are critical to inform the current and evolving understanding of the ecological and socioeconomic impacts of climate change and acidification. Further research will undoubtedly hone our understanding of the risks associated with specific greenhouse gas levels to ocean, coastal, and the Great Lakes ecosystems and resources. The Action Plan should detail how this information will be transferred to agencies, the administration, state agencies, and congressional and international policymakers to identify and prioritize risks associated with a range of greenhouse pollutant concentrations and to inform ongoing efforts to reduce greenhouse gas emissions to safe levels.

i. Recommendation

The Action Plan should include steps for recommending emission thresholds to administration, congressional and international policymakers that will minimize the potential negative impacts of climate change and ocean acidification on our oceans, coasts and Great Lakes. Emission thresholds should be based on scenarios developed through ongoing research, observations and modeling. Such updates and recommendations should also be directed at agencies, to inform the refinement of agency emission targets and action plans separately set under Executive Order 13514.

C. Inform selection of allowable greenhouse gas offsets

Carbon offsets – the practice of enhancing sequestration capacity to offset increased emissions under carbon market schemes – should be prescribed only on the basis of (1) their ability both to reduce the ongoing and expected impacts of climate change and ocean acidification, and (2) their consistency with the requirement to protect, maintain, and restore the health and biological diversity of ocean, coastal, and Great Lakes ecosystems and resources, and improve their resiliency, as prescribed in Executive Order 13547. The NOC should evaluate carbon sequestration programs based on consistency with these principles and provide recommendations to policy-makers based off these evaluations.

i. Recommendation

To enhance the resiliency of our oceans, coasts and Great Lakes, the Action Plan should commit agencies to support only carbon management strategies – including carbon offset strategies - that do not negatively affect the health, biological diversity, and resiliency of ocean, coastal, and Great Lakes ecosystems and resources. In addition, members of the National Ocean Council should commit to supporting, where possible, measures that will reduce emissions directly rather than supporting offset strategies.

II. Guide and support integrated research, observation and modeling programs

A key step to designing and implementing effective adaptation strategies is to improve our understanding of climate change and ocean acidification impacts that are already underway, and to strengthen capabilities to forecast change over time. This will require an enhanced commitment to ocean science research in three main areas, natural and socio-economic data collection and assessment, monitoring, and modeling. Priority research should include studies relevant to assessing and predicting impacts that most directly affect vulnerable marine ecosystem function and human population centers. While there have been repeated calls for research programs dedicated to better understanding the effects of global change on our oceans, these efforts are not yet fully underway, and the necessary scientific foundation to design resiliency and adaptation strategies remains largely lacking.[1] In light of this, the Action Plan should contain guidance to support and accelerate the implementation of (1) a national ocean acidification research program and (2) a national *ocean* climate change research program.

A. Support implementation of a National Ocean Acidification Research Program

There is scientific consensus that the chemistry of the ocean is changing at an unprecedented rate and magnitude due to anthropogenic carbon emissions, and that these changes pose a significant risk to vulnerable species and the function of marine ecosystems.[2] However, the full ecological and socioeconomic implications of ocean acidification remain unclear.

In response to growing concerns about ocean acidification, the federal government has taken important steps to better understand this phenomenon. The Federal Ocean Acidification Research and Monitoring Act of 2009 directed federal agencies to develop a strategic interagency research and monitoring plan and authorized the funds for its implementation through 2012. In addition, the EPA is currently conducting a review of its marine pH standard, and is evaluating criteria for listing waters as threatened or impaired for ocean acidification under the Section 303(d) of the Clean Water Act, based on ocean acidification impacts.

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[1] e.g., the National Ocean Research Priorities Plan, the Global Change Research Act of 1990, the Federal Ocean Acidification Research and Monitoring Act of 2003, and the National Research Council's review of Ocean Acidification

[2] National Research Council, 2010. Ocean Acidification: A National Strategy to Meet the Challenges of a Changing Ocean. The National Academies Press, Washington, DC.

i. Recommendation

With the Interagency Working Group on Ocean Acidification (IWGOA) national research plan nearing completion and the recent release of NOAA's Ocean and Great Lakes Acidification Research Plan, the government is poised to implement a comprehensive national research and monitoring program. The Action Plan should identify opportunities to support this program, including through funding and timely implementation of plan goals. Specifically, the Action Plan should recommend full funding levels needed for agencies to carry out actions under the IWGOA strategic research plan.

In addition, the NOC should encourage the IWGOA to prioritize important research actions that help inform the implementation of Executive Order 13547, including the immediate establishment of monitoring programs in known vulnerable areas along the U.S. coasts, such as regions in the subarctic which are expected to become undersaturated in aragonite, within decades[3]; upwelling zones off the west coast that are already experiencing seasonal exposure to undersaturated waters[4]; estuaries and regions adjacent to large rivers that are influenced by regular pulses of acidic river water[5]; regions with episodes of low dissolved oxygen (e.g., the Gulf of Mexico); and regions with significant shell fish beds and coral reefs, organisms which are particularly vulnerable to increased ocean acidity. Biological components of the ecosystem should be monitored alongside physical and geochemical observations, to simultaneously track the direct and indirect ecological impacts. A comprehensive monitoring system should be developed with input from federal and state agencies, academic research groups, commercial shellfish and other fisheries interests, and fisheries management councils. The development of reliable, easily maintainable measurement systems, run by trained individuals, will be essential to gathering high quality data over time.

The NOC should recommend that research on biological responses to ocean acidification be prioritized by ecologically important and economically valuable species. While the literature on biological responses across taxa is growing, there are numerous important species that have not been investigated. In addition, there is a basic need for studies that look across entire life cycles of species, that investigate the capacity for evolutionary response, and that explore the biological responses of organisms combining ocean acidification with additional stressors (e.g., climate change and reduced oxygen). Evaluations of economic impacts should be conducted for those commercially valuable species that exhibit vulnerabilities.

Model-development and forecasting should be designed to provide the necessary scientific foundation for deriving resilience and adaptation policies. Predictive models should be developed for geochemical, ecological, and socioeconomic systems and should be applied to identify our vulnerabilities as well as serve as early warning systems.

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[3] Steinacher, M., et al., *Imminent ocean acidification in the Arctic projected with the NCAR global coupled carbon cycle-climate model.* Biogeosciences, 2009. **6**(4): p. 515-533.

[4] Feely, R.A., et al., *Evidence for upwelling of corrosive "acidified" water onto the continental shelf.* Science, 2008. **320**(5882): p. 1490-1492.

[5] Salisbury, J., et al., *Coastal Acidification by Rivers: A Threat to Shellfish?* Eos, Transactions, American Geophysical Union, 2008. **89**(50): p. 513-528.

Finally, the efforts described above must be coupled with a data-management program that can make the observational data publically available through user-friendly data portals. This will be particularly important in supporting coastal and marine spatial planning. Rhode Island, for example, used its authority under the Coastal Zone Management Act, to develop a Special Area Management Plan as a marine spatial plan that includes a chapter on climate change that overlays climate change onto all aspects of the planning effort. They are also beginning to incorporate anticipated changes into their management decisions. Climate change and ocean acidification data should be provided and used as an overlay in all regional coastal and marine spatial plans.

B. Establishment of a National Ocean Climate Change Research Program

Similar to ocean acidification, climate change can increase the vulnerability of marine resources, ecosystems, and dependent human communities, thereby altering the management context. While research on the impacts of climate change to oceanic systems is a generally more developed field of research as compared to ocean acidification, the United States is currently lacking a detailed, comprehensive, interagency research program for climate change impacts to marine resources and ecosystems in the United States.

i. Recommendation

The Action Plan should identify the development of a comprehensive, interagency research program for climate change impacts on marine resources and ecosystems in the United States. Various existing and related efforts (e.g., the U.S. Global Change Research Program (USGCRP) and the U.S. Integrated Ocean Observation Systems) should be expanded and developed into an integrated research plan similar to those presented by the Interagency Working Group on Ocean Acidification and NOAA on ocean acidification. In addition, there should be coordination between the Interagency Working Groups developing climate change and OA research plans.

Delay in the development of an integrated national system of ocean observatories continues to impede climate-related ocean research. The National Ocean Council should support an accelerated deployment of that system.

Finally, the Action Plan should support efforts – particularly through existing actions by the National Climate Service and the US Global Change Research Program – to create a timeline of actions that can deliver consistent and timely data to regional, state, and local government entities to inform both emissions reduction actions and efforts to implement adaptation and resilience-building strategies. These systems should be sufficiently flexible to accept and make available new information collected through research, observation, and modeling activities articulated in this Action Plan, and should be durable enough to provide an accessible repository for new information and products over time.

III. Provide guidance and support to cope with sea-level rise

The economy and well-being of our coastal communities depend on our ability to manage and adapt to sea-level rise and its associated impacts in a sustainable way. Sea-level rise as a result of climate change

will present many challenges to coastal communities. For example, a study of Chesapeake Bay concludes that even under conservative estimates of sea-level rise, over 167,000 acres of undeveloped dry land and approximately 161,000 acres of brackish marsh could be lost.[6] In California, accelerated erosion alone could result in a loss of 41 square miles (over 26,000 acres) of coast by 2100.[7]

Table 1 presents a summary of some possible changes to coastal features from sea-level rise, as well as how those changes could affect the local community.

The costs associated with avoiding and/or responding to the impacts of sea-level rise will be substantial. Yet quantifying these social and economic costs can be difficult. Indeed, in many instances, "the unavailability of high spatial resolution topographic and socioeconomic data precludes quantitative assessment of people and property at risk to [sea-level rise] and flooding, at this time."[8]

Table 1.

Coastal Changes from Sea-level Rise[9]	**Examples of Potential Negative Local Impact**
Coastal Erosion	Barrier island and dune loss, habitat and organism loss, loss of beach access and recreation, potential population displacement, land loss, property and infrastructure damage.
Coastal Inundation	Population displacement, land loss, property and infrastructure damage (roads, railways, sewage treatment, water supply, power plants, ports, emergency response and healthcare facilities), increased pollution (hazardous waste sites, sewage spills), barrier island and dune loss, habitat and organism loss, loss of beach access and recreation.
Increased Frequency of Storm Flooding	Property and infrastructure damage, potential population displacement.
Wetland Accretion and Migration	Habitat and organism loss, loss of storm-surge protection.[10]

[6] National Wildlife Federation, *Sea-Level Rise and Coastal Habitats of the Chesapeake Bay: A Summary* (2008) at 1, available at http://www.nwf.org/News-and-Magazines/Media-Center/Reports/Archive/2008/Sea-Level-Rise-Chesapeake-Bay.aspx

[7] California Climate Change Center, *The Impacts of Sea-Level Rise on the California Coast* at xi (May 2009), available at www.pacinst.org/reports/sea_level_rise/report.pdf.

[8] Vivien Gornitz, Stephen Couch , Ellen K. Hartig, *Impacts of sea-level rise in the New York City Metropolitan Area*, Global and Planetary Changes 32 (2002) 61– 88 at 77; *see also A Focus on the Mid-Atlantic Region, supra* note 9, *at 27.*

[9] *See, e.g.,* Gesch, D.B., B.T. Gutierrez, and S.K. Gill, 2009: *Coastal Elevations*. In: *Coastal Sensitivity to Sea-Level Rise: A Focus on the Mid-Atlantic Region*. A report by the U.S. Climate Change Science Program and the Subcommittee on Global Change Research. [J.G. Titus (coordinating lead author), K.E. Anderson, D.R. Cahoon, D.B. Gesch, S.K. Gill, B.T. Gutierrez, E.R. Thieler, and S.J. Williams (lead authors)]. U.S. Environmental Protection Agency, Washington DC, pp. 25-42 at 27 (hereinafter *Coastal Sensitivity to Sea-Level Rise*).

[10] Wetland accretion and migration results in the creation of new wetland habitat; however, where the rate of accretion or migration fails to keep pace with wetland loss, the result can be an overall reduction in wetland habitats. *See, e.g.,* Cahoon, D.R., D.J. Reed, A.S. Kolker, M.M. Brinson, J.C. Stevenson, S. Riggs, R. Christian, E. Reyes, C. Voss, and D. Kunz, 2009. *Coastal Wetland Sustainability*. In *Coastal Sensitivity to Sea-Level Rise*, pp. 43-56.

Wetland Drowning	Habitat and organism loss, loss of storm-surge protection.
Expansion of Estuaries	Loss of intertidal habitat and submerged aquatic vegetation.
Salt Water Intrusion	Impact on drinking water supply.

Where estimates have been made, the potential costs associated with damage from sea-level rise are high:

- "A study by the Organization of Economic Cooperation and Development found that Greater Miami presently has over $400 billion in property at risk from coastal flooding and by the year 2070 that value could rise to over $3.5 trillion.[11] Unless steps are taken to reduce greenhouse gas emissions, by the year 2070 the sea-level may rise 27 inches and 70% of Miami-Dade County would be vulnerable to flooding."[12]
- In Boston, "the cumulative 2000 to 2100 damage and adaptation costs of coastal flooding in metro Boston could range from approximately $6 billion to $94 billion."[13]
- In California, "sea-level rise, in combination with extreme events could result in more extensive damage. Hundreds of miles of valuable shoreline and habitat, millions of Californians, and trillions of dollars in assets and economic activity are potentially at risk."[14]
- In California, a 1.4 meter sea-level rise will put 480,000 people at risk of a 100-year flood event, including many members of low-income communities and people of color. The cost of replacing property at risk of coastal flooding under this sea-level rise scenario is estimated to be nearly $100 billion (in year 2000 dollars).[15]

Moreover, as noted by the U.S. Climate Change Science Program, "the cost of preparing now is small compared to the cost of reacting later."[16] Similarly, California has noted, "operating in a state of emergency will result in hasty decisions with unintended negative consequences, greater costs, and poorer outcomes."[17]

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[11] City of Miami Climate Action Plan Miami (June 2008) at 4, citing Nicholls, R. J. *et al.* (2008), *Ranking Port Cities with High Exposure and Vulnerability to Climate Extremes: Exposure Estimates*, OECD Environment Working Papers, No. 1, OECD Publishing. doi:10.1787/011766488208. http://www.miamigov.com/msi/pages/Climate%20Action/MiPlan%20Final%20062608.pdf

[12] City of Miami Climate Action Plan at 4.

[13] Paul Kirshen & Kelly Knee & Matthias Ruth, *Climate change and coastal flooding in Metro Boston: impacts and adaptation strategies*, Climatic Change (2008) 90:453–473 at 470; *see also* Paul Kirshen, Matthias Ruth, and William Anderson, *Climate Change in Metropolitan Boston, New England Journal of Public Policy (2005) 89-103 at 97.*

[14] Pacific Council on International Policy, *Preparing for the Effects of Climate Change – A Strategy for California, Report by the California Adaptation Advisory Panel to the State of California* at 16 (hereinafter "*A Strategy for California*") (Nov. 2010) at 16, *available at* http://www.pacificcouncil.org/document.doc?id=183).

[15] *The Impacts of Sea-Level Rise on the California Coast, supra* note 7, at xi.

[16] *A Focus on the Mid-Atlantic Region* at IX.

[17] *A Strategy for California, supra* note 14, at iii.

i. Recommendations

In light of these significant threats to our coasts and the coastal economy, the NOC should consider, at a minimum, action in the following six areas: (1) support the identification of areas that may be affected; (2) support preparation of adequate Special Area Management Plans and Natural Hazard Mitigation Plans; (3) use and enhance the Coastal Barrier Resources System; (4) support steps to help reduce vulnerability through education and community involvement; (5) encourage the adoption of no-regrets or co-benefit policies; and (6) support emergency response.

(1) Support identification of areas that may be impacted

The most critical first step to evaluate the social and economic costs of sea-level rise is to ensure a robust understanding of the areas that will be impacted by sea-level rise under both likely and worst case scenarios. In order to aid in this process, NOC should engage in the following:

a) Support efforts of federal, state and local governments to create an inventory of the types and value of infrastructure and critical facilities in high risk areas;
b) Prioritize in the short term the identification of critical facilities at risk (such as roads, hospitals, drinking water supplies and conveyance systems, sewage treatment and conveyance infrastructure) so as to inform longer term planning, construction, funding and other resiliency goals. Identifying this critical infrastructure should take place based on available information and refined as improved data becomes available;
c) Support high resolution data collection, mapping and research to make information as relevant as possible to local decision-makers;
d) As recommended by the recent New York City Panel on Climate Change, NOAA should include sea-level rise projection into its SLOSH model (Sea, Lake and Overland Surges from Hurricanes), which indicates potential areas of inundation depending on the category of hurricane.[18]

(2) Support the Preparation of Adequate "Special Area Management Plans" and "Natural Hazard Mitigation Plans"

The Coastal Zone Management Act (CZMA) contains the express goal of encouraging the preparation of Special Area Management Plans in those areas likely to be affected by sea-level rise or fluctuating water levels of the Great Lakes.[19] In addition, the term "coastal zone enhancement objective" includes "[p]reventing or significantly reducing threats to life and destruction of property by eliminating

[18] William Solecki, Lesley Patrick, and Michael Brady, *Climate Projection Levels- Incorporating Climate Change into Design and Performance Standards, 1196 Ann. N.Y. Acad. Sci.* 293-352, 318 (2010), *available at* http://onlinelibrary.wiley.com/doi/10.1111/j.1749-6632.2010.05325.x/pdf.
[19] CZMA § 303(3), 16 U.S.C. §1452(3)

development and redevelopment in high-hazard areas, managing development in other hazard areas, and anticipating and managing the effects of potential sea-level rise and Great Lakes level rise."[20]

It is essential that the NOC and its member agencies provide financial[21] and technical[22] support to ensure these management plans adequately address sea-level rise concerns. Moreover, the administration should support in the budget full funding of these planning efforts in the budget.

Similarly, it is critical that NOC member agencies ensure that state and local Natural Hazard Mitigation Plans, created with supplemental funding from the Disaster Mitigation Act of 2000 include adequate consideration of the hazards associated with climate change, including sea-level rise and associated flooding.[23] The law requires that such plans "identify the natural hazards, risks and vulnerabilities of areas within the state"[24] and include consideration of the "probability of future hazard events."[25] Given the strong evidence of climate change and its associated threats, states with plans that fail to include a process to evaluate climate change impacts should not be eligible for non-emergency Stafford Act assistance and Federal Emergency Management Agency mitigation grants provided under the Act,[26] including the enhanced funding share provided under 42 U.S.C. § 5165(e).

(3) Use and enhance the existing Coastal Barriers Resources System

The Coastal Barriers Resources Act (CBRA) was enacted in 1982 to reduce unwise federal expenditures, protect fish, wildlife and other natural resources, and minimize the loss of human life from destructive storms like hurricanes. Today, the Coastal Barrier Resources System (CBRS) , or the System, includes 3.1 million acres of land and associated aquatic habitat along the Atlantic coast, Gulf of Mexico and Great Lakes. Barrier islands, beaches, wetlands, nearshore waters and estuaries are included in the System.

The Action Plan should contain specific commitments by federal agencies to meet their obligation to certify compliance with the CBRA. The CBRA requires federal agencies to annually certify that they are complying with the Act's funding restrictions, yet this rarely occurs. The full savings benefits from the CBRA will not be realized if federal agencies fail to comply with the Act. The Action Plan should recommend that the Department of Interior be provided with funding to transfer its current paper maps into easy-to-use electronic digital form. This investment would yield larger tax savings by improving the System's efficiency and ease of use.

The Action Plan also should include a commitment by the Federal Emergency Management Agency (FEMA), which is updating its Flood Insurance Rate Maps, to accurately portray CBRS units. This is particularly important since these maps are widely used by bankers, insurers, developers and home-owners to make decisions about coastal properties.

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[20] *Id.* at §309(a)(2), 16 U.S.C. §1456b(a)(2)
[21] *Id.* at § 1456b(d).
[22] *Id.* at § 1456c(a).
[23] *See* 42 U.S.C. §5121 et seq.
[24] 42 U.S.C. § 5165(b)(1).
[25] 44 C.F.R. § 201.4(c)(2). For local plan requirements, see 44 C.F.R. 201.6(c)(2).
[26] *See* 44 C.F.R. § 201.4(a); *see also* 42 U.S.C. § 5165(a).

Finally, the Action Plan should contain agency commitment to the identification of the undeveloped coastal barriers of the future and to protection of these areas, including by limiting taxpayer and business subsidies of development in these areas.

(4) Support and help reduce vulnerability through education and community involvement

The NOC and its member agencies can reduce vulnerability to sea-level rise by raising both national and local public awareness to help ensure the public better understands the issues associated with sea-level rise and how communities can best prepare for change. This should include a robust explanation of the potential costs associated with sea-level rise and the potential costs of inaction.

Reducing vulnerability also requires communities to explore the adoption or enhancement of additional legal mechanisms to aid in adaptation to sea-level rise, including mechanisms such as sea wall waivers and rolling easements.[27] Such mechanisms are under consideration in California and Washington as part of their adaptation planning documents, [28] as well as in Lee County, Florida and Worcester County, Maryland.[29] Examples of oft-cited managed retreat initiatives include the Pacifica State Beach managed realignment project and the Surfers Point project at Ventura Beach[30, 31] and Monterey.[32] The Strategic Action Plan should encourage consideration of these alternative legal mechanisms.

Further, the NOC should support demonstration projects, through technical and financial assistance, to promote understanding of sea-level rise impacts and options for reducing the effects of those impacts. In addition, the NOC should explore and provide information on best available information (including traditional ecological knowledge) and best practices for community adaptation and resilience strategies from communities already facing impacts of climate change to help inform decisions and management practices in other vulnerable areas.

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[27] *See, e.g.,* J.G. Titus et al., *State and Local Governments Plan for Development of Most Land Vulnerable to Rising Sea-level Along the U.S. Atlantic Coast*, 4 Envtl. Res. Letters 4 (Oct.-Dec. 2009); James G. Titus, *Rising Seas, Coastal Erosion, and the Takings Clause: How to Save Wetlands and Beaches Without Hurting Property Owners*, 57 MD. L. REV. 1279, 1313 (1998).

[28] *See, e.g., A Strategy for California* at 17; Washington State Department of Natural Resources' Aquatic Resources Program, *Preparing for Climate Change Impacts to State-Owned Aquatic Lands: A Climate Change Adaptation Strategy for the Washington State Dep't of Natural Resources* at 19 (July 2009), *available at* http://www.ecy.wa.gov/climatechange/2010TAGdocs/DNR_AL_strategysummary.pdf. *But cf. Severance v. Patterson*, No. 09-0387, 2010 WL 4371438 (Tex. Nov. 5, 2010)(invalidating aspects of a Texas statute regarding "de facto" rolling easements).

[29] *[Draft] Lee County [Florida] Climate Change Resiliency Strategy* at 55-60 (July 2010), *available at* http://www.lee-county.com/gov/dept/sustainability/Documents/Committee/2010/August%2018/DRAFT%20Lee%20County%20Climate%20Change%20Resiliency%20Strategy%20CCRS%20201.pdf; *Sea-level Rise Response Strategy, Worcester County, Maryland* at 3-8 to 3-11, 3-20 (Sep. 2008), *available at* http://www.dnr.state.md.us/dnrnews/pdfs/Worcester.pdf.

[30] *A Strategy for California* at 17, citing Philip Williams & Assocs., *Pacifica State Beach Managed Retreat, Beach and Estuary Restoration*, available at http://www.pwa-ltd.com/projects/pr_cstl_Pacifica.html

[31] *Id.*, citing Philip Williams & Assocs., *Surfers Point*, available at http://www.pwa-ltd.com/projects/pr_cstl_SurfersPnt.html

[32] *Id.*

(5) Encourage the Adoption of No-Regrets or Co-Benefit Policies

Non-structural solutions[33] such as the strategic acquisition of land, buffer zones, wetland and open space preservation all create multiple benefits that the NOC should encourage as options to address flooding and sea-level rise concerns.

The use of green infrastructure and low impact development in watershed planning also offers many benefits and should be encouraged.[34] Large volumes of urban stormwater runoff, discharged through municipal sewer systems, can exacerbate storm surge-related flooding. Green infrastructure can be employed to help reduce this effect, by managing runoff before it reaches the sewers. Even in the absence of storm surges, increased seawater inflow into sewer outfalls and sewage treatment plant outfalls can reduce the ability of sewers and sewage treatment plants to discharge effluent by gravity. In combination with stormwater runoff entering sewer systems from the land, this can cause backups in streets and basements, as well as flooding of wastewater treatment plants (*e.g.*, in combined sewer systems, where both stormwater and sanitary sewage are directed to treatment plants).[35] Therefore, reducing the flow of stormwater into municipal sewers, by using green infrastructure, can help reduce the adverse effects of seawater inflow into sewer systems. These benefits should be recognized by the NOC.

The NOC also must recognize the important role public and private utilities should play in anticipating and responding to the impacts of sea-level rise.[36] Ensuring climate-ready utilities is a key aspect of preparing for climate change effects. In this vein, the NOC should encourage and, where possible, require water and energy utility operators to prepare and update their own site- and system-specific vulnerability assessments,[37] which should include addressing utility vulnerability to sea-level rise.

(6) Support Emergency Response

In the event efforts prove unsuccessful in avoiding the full impacts of sea-level rise, the NOC should be part of coordinated planning and response efforts to help impacted communities. The NOC and its member agencies should ensure local, state and national emergency preparedness plans are updated to reflect current and future information about sea-level rise.

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[33] For one definition of non-structural solutions, *see New York State Sea Level Rise Task Force Report to the Legislature* (Dec. 31, 2010) at 14, available at http://www.dec.ny.gov/energy/67778.html

[34] *See, e.g., New York Sea-level Rise Report*, *supra* note 33, at 39.

[35] *See* NYC Panel on Climate Change, *Climate Risk Information* (Feb. 2009) at 27 (http://www.nyc.gov/html/planyc2030/downloads/pdf/nyc_climate_change_report.pdf)

[36] *See, e.g., New York Sea-level Rise Report, supra note 33,* at 32.

[37] *See, e.g.,* USEPA, *Climate Change Vulnerability Assessments: A Review of Water Utility Practices* (Aug. 2010), *available at* http://water.epa.gov/scitech/climatechange/upload/Climate-Change-Vulnerability-Assessments-Sept-2010.pdf.

IV. Provide guidance on resilience and adaptation policies

A. Link to existing climate change adaptation strategies and action plans

The Action Plan should set forth specific guidance to NOC agencies, as well as to administrative, congressional and international policy-makers, on resilience and adaptation policies, and should encourage adoption of such policies within each agency through existing discretion. In developing this guidance, the Action Plan should consider, and as appropriate, incorporate existing and developing adaptation strategies and policies.

i. Recommendation

Adaptation strategies specified by the Interagency Climate Change Adaptation Task Force, including in the international context, and through the National Fish, Wildlife, and Plants Climate Adaptation Strategy should be adopted in the Action Plan, so long as they are consistent with the policy and stewardship principles articulated in Executive Order 13547 (particularly the protection, maintenance, and restoration of the health, biological diversity, and resilience of the ocean, our coasts, and the Great Lakes), the broader Task Force recommendations, and the latest information about the impacts of climate change and ocean acidification on ocean, coastal, and Great Lakes ecosystems and resources. Such strategies and actions should be taken with the understanding that federally funded, permitted, and undertaken actions on land and along the coasts may significantly affect the health, diversity, and resilience of those ecosystems and resources. This Action Plan should provide necessary steps and actions to ensure ongoing coordination and consistency.

B. Specify that each agency have a climate change/ocean acidification adaptation plan

i. Recommendation

Once appropriate adaptation strategies are identified through efforts such as the Interagency Climate Change Adaptation Task Force, the Action Plan should specify, as a measurable outcome, the development and implementation of a climate change and ocean acidification adaptation plan by each agency whose jurisdiction is relevant to such a plan. Each federal adaptation plan should include strong environmental criteria to ensure that adaptation projects meet the principles of protection, maintenance, and restoration of the health, biological diversity, and resilience of the ocean, our coasts and the Great Lakes indicated in Executive Order 13547. Specifically, adaptation actions should focus on activities that protect or enhance existing natural infrastructure, like wetlands, reefs, and barrier islands that buffer against storms; conduct floodplain restoration to improve natural flood control capacity; and that employ non-structural approaches and avoid activities such as building sea walls or conducting beach renourishment.

C. Specify that each federal agency include the impacts of actions in the context of climate change and ocean acidification in NEPA analysis.

i. Recommendation

Climate change and ocean acidification can increase the vulnerability of marine resources, ecosystems, or human communities, causing a proposed action to result in consequences that are more damaging than prior experience. Federal agencies working in the marine environment should begin to include the impacts of actions, in the context of climate change and ocean acidification, in their NEPA evaluations. The analyses should incorporate the following principles:

- EISs for proposed actions with significant CO2 emissions should include discussion of ocean acidification impacts of those emissions, in addition to climate change impacts.

- The consequences of all federal agency actions that directly or indirectly affect our nation's ocean resources should be evaluated, quantitatively or qualitatively, in the context of a changing marine environment. For example, assessments of an action's cumulative impacts on ocean resources must account for the effects of climate change and ocean acidification, which impose significant stresses on many marine ecosystems.

- To ensure the sustainability – and adaptability – of our fisheries resources, fisheries scientists and managers should routinely examine, in the context of NEPA reviews of Fisheries Management Plans and related actions under the Magnuson-Stevens Act, how environmental changes associated with climate change and ocean acidification could influence the population dynamics and the future of managed fisheries.

D. Connect agency actions to compliance with the policy and stewardship principles

Executive Order 13547 requires "All executive departments, agencies, and offices that are members of the Council and any other executive department, agency, or office whose actions affect the ocean, our coasts, and the Great Lakes…to the fullest extent consistent with applicable law…(to) take such action as necessary to implement the policy set forth in section 2 of this order and the stewardship principles…set forth in the Final Recommendations and subsequent guidance from the Council". Section 2 specifically states that in addition to the requirement to protect, maintain, and restore the health and biological diversity of ocean, coastal and Great Lakes ecosystems and resources, that "To achieve an America whose stewardship ensures that the ocean, our coasts, and the Great Lakes are healthy and resilient, safe and productive, and understood and treasured…(that) it is the policy of the United States to…improve the resiliency of ocean, coastal, and Great Lakes ecosystems, communities, and economies". This requirement, including in determining what actions "affect the ocean, our coasts, and the Great Lakes", should be implemented in a manner that recognizes how these resources and ecosystems are being and will continue to be altered by climate change and ocean acidification and the need to protect and restore the ability of these ecosystems and resources to adapt to and withstand change. Departments, agencies, and offices have a requirement to judge the appropriateness of proposed actions and to proactively select actions based on expected implications for ecosystem and resource health, biological diversity, and resilience – to the fullest extent consistent with applicable law.

i. Recommendation

The natural resilience of marine ecosystems should be maintained by curtailing other human-caused threats, such as offshore drilling and overfishing that decrease the ability of the oceans to cope with climate change impacts and rising acidity. Ocean acidification and climate change are not isolated threats, but act in concert with others. Ocean ecosystems will have the best chance of surviving the pressures of climate change and ocean acidification if they are not simultaneously struggling to overcome other threats.

The Action Plan should provide such guidance as necessary to ensure that the individual mandate described above is fully adopted across all departments, agencies, and offices whose actions affect the ocean, our coasts, and the Great Lakes and each department, agency and office must commit to complying with this mandate as provided.

E. Create incentives for regional, state, and local development and adoption of adaptation and resilience-building strategies

i. Recommendation

Members of the National Ocean Council should detail, through this Action Plan, existing department, agency, and office authorities and activities, including grant programs, which can be employed to encourage development and implementation of adaptation and resilience-building activities at the regional, state, and local levels and clear steps to achieve a refocusing of authorities and activities as necessary. This will require priority consideration, in federal grant or funding programs, for onshore and offshore activities with the fewest impacts, and funding for strategies specifically designed to promote resilience and adaptation. This Action Plan should recommend adoption of federal grant or funding selection criteria that will result in priority consideration for onshore and offshore activities best able to protect, maintain, and restore ocean, coastal, and Great Lakes health, biological diversity, and resilience, as a means to reduce ecosystem and resource vulnerability to ongoing and expected change, and funding for development and implementation of specific ocean, coastal, and Great Lakes adaptation strategies. In addition, direct federal support for regional, state, and local development and implementation of adaptation and resilience-building strategies must:

a) be consistent with the policy and stewardship principles articulated in EO 13547 and the final Task Force recommendations;
b) ensure that regional, state, and local activities are developed using the best available information, including traditional ecological knowledge and information developed under this Action Plan; and
c) ensure that regional, local, and state adaptation and resilience-building activities reinforce strategies developed at the federal level, including through this Action Plan, the work of the Interagency Climate Change Adaptation Task Force, and the National Fish, Wildlife, and Plants Climate Adaptation Strategy.

V. Ensure Adequate Funding

For all of the above items, it is critical the NOC and the administration support full funding of efforts needed to implement such actions, across NOC agencies and beyond where necessary. Specifically, full funding of the Federal Ocean Acidification Research and Monitoring Act as well as NOAA's Climate Service are fundamental to ensuring attainment of the goals and strategies of this Strategic Action Plan.

The lack of funding for implementing coastal adaptation strategies is the biggest obstacle to achieving this objective. As such, we recommend the following:

i. Recommendation

Execute a mechanism to allow pooling of funds across federal agencies

In this era of constrained budgets and competing priorities, agencies should be given the tools necessary to work together on projects that they otherwise would not have the resources to complete individually. Specifically, the NOC should identify and execute a mechanism that allows the pooling of funds across agencies in order to increase the pace and scale of adaptation projects nationwide.

Thank you for the opportunity to submit comments for the development of the Strategic Action Plan pertaining to Resiliency and Adaptation to Climate Change and Ocean Acidification.

Sincerely,

Sarah Chasis
Senior Attorney and Director, Oceans Initiative
Natural Resources Defense Council

Bruce J. Stedman
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William Chandler
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San Diego Coastkeeper
San Francisco Baykeeper
San Luis Obispo Coastkeeper
Santa Barbara Channelkeeper
Santa Monica Baykeeper
Ventura Coastkeeper

April 29, 2011

Ms. Nancy Sutley, Dr. John Holdren, and Members
National Ocean Council
c/o Council on Environmental Quality
722 Jackson Place, NW
Washington, DC 20503
Comments submitted electronically to WhiteHouse.gov/administration/eop/oceans/comment

Re: National Ocean Council Strategic Action Plan for Climate Change (Objective 5)

Dear Chairs Sutley and Holdren and National Ocean Council Members:

The California Coastkeeper Alliance (Alliance) represents 12 Waterkeeper organizations safeguarding the coast from the Oregon border to San Diego. The Alliance and its member Waterkeepers work daily to protect and enhance healthy marine habitats and coastal watersheds throughout the state, for the benefit of Californians and California ecosystems. On behalf of the Alliance, I am pleased to submit these comments on the National Ocean Council Strategic Action Plan for Objective 5: Resiliency and Adaptation to Climate Change and Ocean Acidification (Strategic Climate Change Action Plan or Action Plan).

The stated purpose of the Action Plan is to "strengthen resiliency of coastal communities and marine and Great Lakes environments and their abilities to adapt to climate change impacts and ocean acidification." The Alliance strongly supports the work of the National Ocean Council to develop an Action Plan to adapt our coast and oceans to climate change impacts. We commend the Council for establishing a goal of "resiliency" to climate change impacts, instead of merely aiming to reduce vulnerability. The term reflects the Council's vision of resilient coastal and marine ecosystems with the capacity "to absorb and utilize or even benefit from perturbations and changes that attain it, and so persist without a qualitative change in the system's structure,"[1] a vision that the Alliance shares.

The Council's development of a science-based, specific, and well-funded Strategic Climate Change Action Plan could significantly improve the ability of California[2] and other coastal states to develop strong adaptation policies. In order to accomplish this, we suggest the below actions, which are organized into two main issue areas: impacts to the coast, including sea level rise; and impacts to seawater quality and marine life, including ocean acidification.

[1] Holling, Crawford Stanley, "Resilience and Stability of Ecological Systems," *Annual Review of Ecology and Systematics* 4:1-23 (1973).
[2] The California Climate Adaptation Strategy, released in December 2009, summarizes the best known science on climate change impacts in California and outlines possible solutions that can be implemented within and across state agencies to promote resiliency. California Natural Resources Agency, "2009 California Climate Adaptation Strategy: A Report to the Governor of the State of California in Response to Executive Order S-13-2006," (CA Climate Adaptation Strategy), available at www.climatechange.ca.gov/adaptation.

THE COUNCIL MUST TAKE SWIFT ACTION TO PROTECT COASTAL COMMUNITIES, ECONOMIES, AND ECOSYSTEMS FROM SEA LEVEL RISE AND OTHER CLIMATE IMPACTS.

Approximately 85% of California's residents live or work along bay or coastal areas without the means to adjust to expected impacts.[3] Scientists estimate that sea level has risen seven inches since 1900, and is projected to rise 12-18 inches by 2050 and 21-55 inches by 2100.[4] Extreme weather events like storm surges will make these impacts more severe. Large numbers of people and extensive infrastructure will be at risk from inundation during coastal storms as higher sea levels, high tides and storm surges coincide.[5] Projected inundation will impact water supply canals, wastewater treatment plants, and power plants throughout California.[6] Increasing rates of coastal erosion, beach loss, and saltwater intrusion into groundwater basins are also projected.[7]

The Council should craft actions to address sea level rise and other climate change-driven impacts to the coast around three high-level goals, as described in detail below:

1. Reform federal policies and laws so that they protect the public, economy, and environment from sea level rise.
2. Identify significant sources of funding to support states' assessment, planning and implementation of adaptation strategies for sea level rise.
3. Promote coastal resilience by prioritizing adaptation strategies that enhance an ecosystem's natural adaptive capacity and limiting the use of structural barriers such as sea walls.

1. <u>Reform federal policies and laws so that they protect the public, economy, and environment from sea level rise</u>.

One of the biggest obstacles to climate change adaptation is a lack of institutional capacity to address sea level rise, ocean acidification, and other climate change-driven impacts to the coast and ocean. Agencies currently don't have the legal mandate, funding, and in some cases, the data to address emerging climate change impacts. We are facing environmental, economic, and public safety issues of unprecedented magnitude without laws and policies in place to ensure an informed, uniform approach. Federal,[8] state and local agencies, and the environmental and other laws that they administer, were put in place before the problem of climate change was recognized, and can at times actually operate counter to the pressures that climate change increasingly places on our people, infrastructure and environment.

Although significant federal regulatory reform and funding is needed to facilitate sea level rise adaptation, implementation will happen largely at the local level and will involve amending local coastal plans, general plans, and other local policy tools such as zoning laws and other ordinances. Accordingly, federal activities related to coastal adaptation should be coordinated closely with states by involving coastal zone management programs early in the planning process.

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[3] Ewing, L., "Considering sea level rise as a coastal hazard," Proceedings of Coastal Zone '07. Portland, OR, July 22-26, 2007; CA Climate Adaptation Strategy at p. 3.
[4] California Climate Change Center, Climate Change Scenarios and Sea Level Rise Estimates for the California 2008 Climate Change Scenarios Assessment (Draft Paper), available at www.energy.ca.gov/2009publications/CEC-500-2009-014/CEC-500-2009-014-D.PDF.
[5] *See* California Climate Change Center, "The Impacts of Sea-Level Rise on the California Coast," (May 2009), available at www.pacinst.org/reports/sea_level_rise/report.pdf; CA Climate Adaptation Strategy at p. 68.
[6] CA Climate Adaptation Strategy at p. 65.
[7] *Id.* at p. 69.
[8] Notably, the National Oceanic and Atmospheric Administration (NOAA) is restructuring to create a new Climate Service. *See* http://www.noaa.gov/climate.html.

Near-Term Action: Work with the Council on Environmental Quality (CEQ) to draft National Environmental Policy Act[9] guidance on the coastal impacts of climate change, including sea level rise. This work should expand upon CEQ's *Draft NEPA Guidance on Consideration of the Effect of Climate Change and Greenhouse Gas Emissions*,[10] providing agencies with detailed guidance on how to take action to implement the statement that "climate change effects should be considered in the analysis of projects that are designed for long-term utility and located in areas that are considered vulnerable to specific effects of climate change (such as increasing sea level or ecological change) within the project's timeframe."[11]

Near-Term Action: Conduct a review and analysis of federal ocean, coastal, and water quality laws, including the Clean Water Act, and Coastal Zone Management Act, to identify gaps with respect to climate change impacts, and recommend amendments that will facilitate climate change adaptation. The review and analysis should inform a formal recommendation, resolution, or report to Congress on how to amend the regulations of affected federal agencies.

Near-Term Action: Convene a Task Force to analyze sea level rise maps and projections to determine how public access to beach and coastal areas will be impacted nationwide. The Task Force should subsequently publish these maps online for ready public access.

Mid-Term and Longer-Term Action: Draft recommendations and strategies, in consultation with the Coastal States Organization and other entities, on how to preserve and enhance coastal public access nationwide through new regulations and other means. This is the mid-term action; the longer-term action should be to ensure the implementation of these new public access protections.

Mid-Term Action: Partner with state agencies to: (a) identify and evaluate coastal infrastructure (wharves, docks, levees, piers, seawalls, flood control structures) and other coastal structures subject to sea level rise for structural integrity and for hazards associated with potential removal, (b) map changes in property boundaries based on the projected changes in the elevation of the mean high tide line, and (c) post such maps online and make them readily accessible to the public.

Mid-Term Action: Survey state agencies' public trust responsibilities with respect to sea level rise; draft guidance or other formal documents that acknowledge federal and state agencies' public trust responsibilities with respect to sea level rise and that make recommendations as to the implementation of the doctrine's responsibilities.

2. Identify significant sources of funding to support states' assessment, planning and implementation of adaptation strategies for sea level rise.

States' coastal programs directly manage shoreline development; work closely with local governments on land use planning, habitat acquisition, and a variety of other coastal land use activities; play a key role in coordinating state and local agencies; and review and condition federal permits in the

[9] National Environmental Policy Act, 42 U.S.C. §§ 4321 et seq.
[10] Council on Environmental Quality, *Memo: Draft NEPA Guidance on Consideration of the Effect of Climate Change and Greenhouse Gas Emissions* (February 18, 2010), available at http://www.whitehouse.gov/sites/default/files/microsites/ceq/20100218-nepa-consideration-effects-ghg-draft-guidance.pdf.
[11] *Id.* at 7.

coastal zone.[12] Immediate funding is needed for coastal states impacted by sea level rise and other climate-driven changes to implement these mandates. Projected sea level rise, compounded by shifting precipitation and extreme weather events, will impact an estimated 480,000 residents and at least $100 billion in property throughout California.[13] If California does not take action to mitigate sea level rise impacts and other projected climate impacts, the costs will be crippling. A 2008 report estimates that if no adaptation actions are taken in California, damages across sectors could result in "tens of billions of dollars per year in direct costs and expose trillions of dollars of assets to collateral risks."[14]

Many other coastal states are already taking steps to address the potential impacts of sea level rise, but they need federal funding to support these efforts. A recent survey by the California State Lands Commission found that Governors of several states, including Florida, Louisiana, Maryland, New Jersey, New York, South Carolina, Virginia, and Washington, have issued Executive Orders establishing various climate change commissions and advisory committees to consider and act on the potential effects of global climate change, including sea level rise.[15] A relatively modest but immediate infusion of federal dollars to help California and other coastal states adapt to projected changes will reap significant benefits. Conversely, doing nothing will result in crippling costs.

Near-Term Action: Dedicate federal funding to support regional, state, and local efforts to conduct detailed vulnerability assessments, identify and map climate change impacts, and develop and implement plans to deal with projected impacts in the climate corridor.

Near-Term Action: Explore, in the review of federal agencies and policies as described above, the extent to which Federal Emergency Management Agency (FEMA) resources can be used for proactive hazard management with respect to sea level rise and other sources of flooding. As one example, FEMA could condition its approval of states' Hazard Mitigation Plans, and thus funding, on the inclusion of climate change adaptation action plans. Ensure implementation of proactive hazard management by FEMA as appropriate.

Near-Term Action: Secure funding and direction for NOAA and other agencies to support the states in specific efforts such as technical assistance, mapping, modeling, data, forecasting products, and intergovernmental coordination.[16]

3. Promote coastal resilience by prioritizing adaptation strategies that enhance an ecosystem's natural adaptive capacity and limiting the use of structural barriers such as sea walls.

Decisions about how to deal with rising sea level, inundation, and associated impacts will have a profound impact on the future of the California coast, and on coastal areas across the country. Coastal managers will begin to either prioritize environmentally-destructive strategies such as coastal armoring,

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[12] *See* Coastal States Organization Climate Change Work Group, Second Annual Report: The Role of Coastal Zone Management Programs in Adaptation to Climate Change, at p. 23, (September 2008), available at http://www.coastalstates.org/wp-content/uploads/2010/07/CSO-2008-Climate-Change-Report2.pdf.

[13] Heberger, Matthew, Heather Cooley, Pablo Herrera, Peter H. Gleick, and Eli Moore, "The Impacts of Sea Level Rise on the California Coast," (2009) PIER Research Report, CEC-500-2009-024-D, Sacramento, CA: California Energy Commission.

[14] CA Climate Adaptation Strategy at p. 3, citing D. Roland-Holst and F. Kahrl, UC Berkeley "California Climate Risk and Response," (November 2008) available at: http://www.next10.org/research/research_ccrr.html.

[15] California State Lands Commission, "A Report on Sea Level Rise Preparedness, Staff Report to the California State Lands Commission," (December 2009) at p. 19.

[16] Coastal States Organization Climate Change Work Group, Second Annual Report: The Role of Coastal Zone Management Programs in Adaptation to Climate Change, at p. 23, (September 2008), available at http://www.coastalstates.org/wp-content/uploads/2010/07/CSO-2008-Climate-Change-Report2.pdf.

or more sustainable, "soft" protection solutions such as barrier beaches and wetlands, which are often more effective in the long term.[17] If structural methodologies, such as sea walls, become the default approach to deal with sea level rise, this choice would significantly alter the functioning of coastal habitats, which could in turn decrease the overall resilience of coastal ecosystems. Alternatively, with clear direction from the National Ocean Council, and with adequate time, data, and resources, coastal managers could pursue adaptation strategies that promote coastal resilience by protecting coastal areas from sea level rise with strategies that benefit both ecosystems and human infrastructure.

The National Ocean Council should ensure that the concept of resiliency,[18] which is referred to explicitly in the description of Objective 5, is used as a performance measure of the Action Plan. One fundamental component of strategies geared toward coastal resilience is the preservation of natural areas that contain critical habitat.[19] The California Climate Change Adaptation Strategy specifies that "the state should pursue activities that can increase natural resiliency, such as restoring tidal wetlands, living shoreline, and related habitats; managing sediment for marsh accretion and natural flood protection; and maintaining upland buffer areas around tidal wetlands."[20]

Near-Term Action: Emphasize coastal resilience in the face of sea level rise by issuing guidance that prioritizes state and local implementation of measures that enhance the natural adaptive capacity of ecosystems. Recommendations should include but are not limited to: (a) low-impact development techniques such as permeable pavement and vegetated buffers, which will slow and sink storm water runoff, mitigating flooding from storm surges and rises in sea level; (b) creating buffers of open space around beaches and wetland areas, which similarly increases the amount and diversity of coastal habitats and allows beaches and wetlands to migrate inland as the ocean advances; (c) restoring tidal wetlands, eelgrass beds, oyster beds and other natural coastal ecosystems, which both creates aquatic habitats for threatened species and establishes a natural buffer against extreme weather.

Mid-Term Action: The Council should prioritize funding for the recommendations outlined above, and for projects to identify, buffer, and protect critical habitats and allow the inland migration of rising seas in a manner consistent with protecting those habitats through habitat buyout programs, such as the Robert T. Stafford Act[21] and the Coastal Estuarine Land Conservation Program.[22]

THE COUNCIL MUST TAKE SWIFT ACTION TO ADDRESS OCEAN ACIDIFICATION AND OTHER CLIMATE CHANGE-DRIVEN IMPACTS TO WATER QUALITY.

In addition to sea level rise and associated impacts, California's coast and ocean are experiencing dramatic changes such as ocean acidification, warming, and changes to freshwater inputs. The ocean and dependent marine life are of prime importance to California, and to coastal communities and economies across the country. California's ocean-dependent economy generates an estimated $46 billion per year.[23]

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[17] CA Climate Adaptation Strategy at p. 75.
[18] *See generally* Beatley, Timothy, *Planning for Coastal Resilience: Best Practices for Calamitous Times.* Washington DC: Island Press (2009) (Planning for Coastal Resilience).
[19] *See* CA Climate Adaptation Strategy at p. 74.
[20] *See* California Climate Adaptation Strategy at p. 74.
[21] Robert T. Stafford Disaster Relief and Emergency Assistance Act, 42 U.S.C. §§ 5121-5207 (2007).
[22] National Oceanic and Atmospheric Administration, Coastal and Estuarine Land Conservation Program Final (2003), *available at* http://coastalmanagement.noaa.gov/land/media/CELCPfinal02Guidelines.pdf.
[23] *See* review of economic assessments of the value of beaches in Pendleton, Linwood, Philip King, Craig Mohn, D. G. Webster, Ryan K. Vaughn, and Peter Adams, "Estimating the Potential Economic Impacts of Climate Change on Southern California Beaches," (2009) PIER Research Report, CEC-500-2009-033-D, Sacramento, CA: California Energy Commission.

California invests heavily in a healthy ocean, engaging in an exhaustive multi-stakeholder process and spending an estimated $60 million over five years to designate networks of marine protected areas along the California Coast.[24] The State is projected to spend an additional $24 million every year to manage these marine protected areas.[25] But these investments are threatened by climate-driven changes such as ocean acidification, particularly if no preparations are made to adjust coastal and ocean management practices. The Council should craft its Strategic Climate Change Action Plan in order to monitor and mitigate the impacts of ocean acidification, as described below.

Near-Term Action: Work with NOAA to cultivate Congressional funding and other support for the NOAA Climate Service.[26] The reorganization would enable NOAA to more efficiently and effectively respond to the increasing demand for easily accessible and timely scientific data and information about climate change.[27]

Near-Term Action: Solicit existing and readily available information on ocean acidification and environmental baselines, and identify data gaps and research needs to guide coastal state management and regulation of water quality and marine life. Combine this research into a report on ocean acidification that includes recommendations for next steps for both research and monitoring, and provide estimates of the funding needed to implement these recommendations. Work with universities to make this research a new, coordinated priority for scholarship.

Near-Term Action: Building on ongoing efforts, such as CEQ's *Draft NEPA Guidance on Consideration of the Effect of Climate Change and Greenhouse Gas Emissions*,[28] create guidance for federal agencies to use in their review of coastal and ocean projects, funding requests and policies that would contribute significant amounts of greenhouse gas emissions. This guidance should specifically direct agencies to analyze and report on the greenhouse gas emissions associated with their decisionmaking. For example, agencies should restrict the approval of projects that would lead to increases in greenhouse gas emissions, unless all alternatives have been exhausted (*e.g.*, funding for ocean desalination facilities, which are energy intensive, should be directed toward conservation and localized, low-energy water sources such as stormwater capture).

Mid-Term Action: Ensure that the NOAA Climate Service, in partnership with the National Ocean Observing System, provides a reliable source for climate data, information, and decision support services and effectively coordinates with other agencies and partners, including regional frameworks and/or networks charged with housing, organizing, distributing and summarizing for the public, ocean acidification data. Work to secure funding for these efforts as needed.

Mid-Term Action: Work with U.S. EPA to ensure that water quality regulations, permits and policies protect the water quality of near-coastal areas from climate-driven water quality impacts, such as ocean

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[24] California Department of Fish and Game, "Estimated Long-Term Costs to Implement the California MLPA Master Plan Appendices," (January 2008) Appendix L., Page L-1, available at http://www.dfg.ca.gov/mlpa/pdfs/revisedmp0108l.pdf.

[25] *Id.*

[26] *See* National Oceanic and Atmospheric Administration, Proposed Climate Service in NOAA (February 15, 2011) available at http://www.noaa.gov/climateresources/resources/ProposedClimateServiceinNOAA_Feb15rev.pdf.

[27] *Id.* Note that at the time of this comment letter, NOAA was engaged in a formal appropriations process for the Fiscal Year 2012 Budget, which includes a reorganization that brings together its existing widely dispersed climate capabilities under a single line office management structure, the Climate Service.

[28] Council on Environmental Quality, *Memo: Draft NEPA Guidance on Consideration of the Effect of Climate Change and Greenhouse Gas Emissions* (February 18, 2010), available at http://www.whitehouse.gov/sites/default/files/microsites/ceq/20100218-nepa-consideration-effects-ghg-draft-guidance.pdf.

acidification and warming. For example, U.S. EPA should be identifying and restoring water bodies whose use is impaired, or threatened with impairment, by climate change, pursuant to Section 303(d) of the Clean Water Act.

Mid-Term Action: Create and implement nationwide a set of best practices for ocean acidification monitoring, including physical and biological indicators, ecosystem changes and carbon dioxide sources, in conjunction with U.S. EPA and other relevant federal agencies and research institutions. These practices will feed into the monitoring framework described above.

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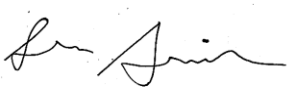
Thank you for the opportunity to provide these comments on an issue of critical importance to the health and well-being of current and future coastal residents and ecosystems. If you have any questions, please do not hesitate to contact us.

Regards,



Sara Aminzadeh
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April 29, 2011

The Nature Conservancy's Comments on the National Ocean Council's Strategic Action Plan for Resiliency and Adaptation to Climate Change and Ocean Acidification

The Nature Conservancy commends the National Ocean Council on its work to ensure that our oceans are healthy, safe and productive, and welcomes the opportunity to provide comments on elements of a strategic plan for priority objective 5: *Resiliency and Adaptation to Climate Change and Ocean Acidification.*

The Nature Conservancy is an international nonprofit organization dedicated to the conservation of biological diversity. Our mission is to preserve the plants, animals and natural communities that represent the diversity of life on Earth by protecting the lands and waters they need to survive. Our on-the-ground conservation work is carried out in all 50 states and in more than 30 foreign countries and is supported by approximately one million individual members. The Nature Conservancy has protected more than 117 million acres of land and 5,000 miles of river around the world. Our work also includes more than 100 marine conservation projects in 21 countries and 22 U.S. states.

We recognize that climate change is a clear and present threat to the lives and livelihoods of the millions of people that live and work in the coastal zone, as well as to coastal ecosystems and the benefits they provide to people. Rising sea levels, increasing erosion, salt water intrusion, increasing sea surface temperatures, possible increased severe storm events and coastal hazards, and ocean acidification all pose serious threats to coastal ecosystems and communities. Our coasts are changing at an accelerated rate that will increase more rapidly this century. Our old, existing models of coastal development and fortification – already expensive today – will become even more expensive. In addition, many of the anticipated responses to climate change – increased shoreline hardening, built infrastructure, and other "grey" solutions - can in themselves pose a significant risk to both human and ecological coastal communities if their potential impacts on ecosystems and the benefits they provide to people are not fully understood. Standard land use policy and coastal growth strategies are no longer sustainable or prudent given the information on sea level rise and storm surge now available. However, there are a growing number of examples that provide a roadmap for more progressive coastal development or realignment that builds in opportunities for both community and natural resource protection/persistence.

As part of an overall adaptation strategy for the nation, and complementing a national efforts to mitigate green house gas emissions and, we fully endorse the NOC's goal of strengthening resilience of coastal communities and marine and Great Lakes environments and their abilities to adapt to climate change impacts and acidification. This goal would be strengthened by clarifying how the NOC defines resilience in this context. We recommend that this definition be focused on the ability of a system or a community to undergo, respond to and recover from change and disturbance, while maintaining its main functions and character.

The nation's natural resources can and should be a critical part of our adaptation strategy, and nowhere is that more true than on our coasts. The Council on Environmental Quality recognized this in its *Recommended Actions in Support of a National Climate Change Adaptation Strategy*[1] when it recommended applying ecosystem based approaches to adaptation be a guiding principle for national action. We recommend the NOC embrace this principle in its SAP, and clearly define ecosystem based adaptation (EBA) as the protection, restoration and sustainable use of ecosystems to support societal adaptation[2]. EBA is about using our natural

[1] White House Council on Environmental Quality. Progress Report on the Interagency Climate Change Adaptation Task Force: Recommended Actions in Support of a National Climate Change Adaptation Strategy. October 5, 2010.
[2] For full definition see: Convention on Biological Diversity, second ad hoc technical expert group on biodiversity and climate change, second meeting, Helsinki 18-22 April 2009; Document: UNEP/CBD/AHTEG/BD-CC-2/2/6, 27 May 2009

resources to reduce human vulnerability to the negative impacts of climate change and benefit nature. There is increasing evidence that EBA can be a cost effective alternative to built infrastructure, particularly when all ecosystem services co-benefits are included in full cost/benefit analyses, as shown in a recent report by the Economics of Adaptation Working Group – a group comprised of the ClimateWorks Foundation, Global Environment Facility, European Commission, McKinsey & Company, The Rockefeller Foundation, Standard Chartered Bank, and Swiss Re – that measures the cost per unit of benefit, or cost-effectiveness, of various adaptation approaches[3]. In particular, The Nature Conservancy believes that EBA must be mainstreamed into overall adaptation plans, as well as into more general coastal development and management plans, and disaster risk reduction and planning.

Below are what we believe are the most important actions the U.S. government can take in the short and long term to achieve the NOC's goal. We will also be providing comments on the national freshwater and fish, wildlife, and plants adaptation strategies, and hope that these three strategies will be integrated to ensure they are mutually reinforcing.

RECOMMENDATIONS

All Federal agencies should consistently and systematically factor climate change analyses into their decision making, including for decisions on land and infrastructure investments and programs that fund land acquisition and restoration.

Short term:

- All federal agencies working in coastal, estuarine and riverine areas in the U.S. and internationally, including NOAA, FEMA, the Army Corps of Engineers, the Department of Agriculture, and the Department of Interior, should incorporate the direct and indirect physical effects of projected sea level change in managing, planning, engineering, designing, constructing and operating projects and systems. One model of guidance for such requirements is the Army Corps of Engineers' circular on "Water resource policies and authorities incorporating sea-level change considerations in civil works projects"[4]. This requires project planners and designers to consider how sensitive people and ecosystems are to climate change and other disturbances, and develop alternatives for the entire range of possible future rates of sea level change that minimize adverse impacts and maximize benefits. This guidance, which expires on July 1, 2011, should be renewed, as well as considered as a model for other federal agencies.

- In addition, all Federal agencies should, to the extent possible, factor in the effects on both human and ecological communities of likely human responses to climate change, particularly where such responses could negatively impact coastal ecosystems and the benefits they provide to people, and potentially inadvertently increase their vulnerability.

- Maps and other analytical tools and decision support systems used by federal agencies such as FEMA, DOI, USACOE, NOAA, DOA, etc… should include climate change and other future conditions for the purposes of assessing future risk and conditions. In particular, FEMA's nationally recognized "high hazard" areas should be reconsidered/corrected based on currently available and credible sea level rise and surge information, and this information incorporated into criteria used to direct federal funding for coastal realignment,

[3] Economics of Climate Adaptation Working Group, 2009. Shaping climate-resilient development: a framework for decision-making. ClimateWorks Foundation, Global Environment Facility, European Commission, McKinsey & Company, The Rockefeller Foundation, Standard Chartered Bank, Swiss Re.

[4] Department of the Army, U.S. Army Corps of Engineers. "Water resource policies and authorities incorporating sea-level change considerations in civil works programs". Circular no. 1165-2-211. 1 July 2009.

restoration, and protection. Agencies that do not have their own projections for impacts of climate change and sea-level rise should adopt these updated and corrected maps for use in their own planning processes. Where agencies do have their own projections, these should be consistent with each other.

- Federal agencies should continue to develop, refine, and make available critical information on the science of climate change and adaptation by:

    - Developing and providing data to fill critical gaps. These include LIDAR data for all U.S. coastal areas, sediment transfer budgets, and the physical location of critical habitats that can play a role in ecosystem based adaptation approaches and/or be impacted by the development of "hard" infrastructure. These data should be freely and easily accessible to all levels of government and stakeholders.
    - Setting up a system to reassess coastal climatic data (sea level rise and surge frequency) and reevaluate and downscale global climate models on a 3-5 year cycle to ensure the best available information is directing action. This information should be freely provided in a form that is easily used by state and local entities.
    - Instituting a national community resilience education program to increase awareness of coastal change and EBA, focusing on the efficacy and cost effectiveness of ecosystem based adaptation in order to build public confidence and help make EBA and hybrid green/grey approaches more viable where appropriate. This campaign should include educating the public about what climate change projections mean on the ground, as well as the full costs and benefits of different adaptation options, including impacts to natural systems.

- The NOC should make adaptation planning accessible to users at all levels through provision of information, development of decision support systems and capacity building. Decision support tools should be built and made accessible to decisionmakers, communities, and all stakeholders in order to allow them to assess risk and vulnerability. These should allow users to visualize the impacts of climate change, including sea level rise and associated storm surges, and should be used for coastal development planning, land use zoning, restoration planning, and hazard management plans.

Long term:

- SLR and surge frequency projections should be consistent for all agencies, and linked to states for consistent comparable analyses. This information could be developed/compiled by an agency such as NASA's Goddard Space Center, then disseminated through mechanisms such as NOAA's Coastal Services Center.

- Climate adaptation criteria/climate change analyses should be built into all federal programs that fund land acquisition/restoration, e.g. CELCP, the Flood Mitigation Assistance Program, the Pre-Disaster Mitigation Program, and the Hazard Mitigation Grant Program. Investments should be prioritized in lands and programs that are resilient, are less vulnerable to climate change, provide or are projected to provide critical ecosystem services that contribute the resilience of human communities, and could continue to function sustainably even in the face of climate change. These determinations should be made using consistent national projections, as noted previously.

- Agencies such as FEMA that invest in the recovery and rebuilding of areas impacted by natural disasters or pre-disaster preparedness in high risk areas, should factor vulnerability to climate impacts into their

insurance and investment decisions, and develop incentives for realignment[5] in areas where rebuilding is not possible or sustainable.

Ecosystem-based adaptation should be "mainstreamed" into agency planning and decision making such that there are EBA options available in decisions on issues such as coastal development, coastal protection, disaster preparedness, post-storm recovery planning and others

Short term:

- Agency regulations and procedures should emphasize enhancing and sustaining ecosystems first, as "no regrets" ecosystem based adaptation actions – i.e. those that provide benefits even if climate change impacts are less than expected - that protect and/or restore natural resources while addressing human adaptation challenges.

- In cases where "grey" infrastructure is the best adaptation option, provisions must be made to determine what ecosystems may be impacted, and how that could in turn affect the vulnerability/resilience of coastal communities. Efforts should be made to protect as much as possible of these systems, and mitigate for any unavoidable impacts. We support clear and strong language requiring mitigation to be included with each alternative under consideration and the explicit sequence of "avoid, minimize and mitigate" as fundamental to the planning process and consideration of alternatives. We also support the requirement that compensatory mitigation be implemented in advance or concurrent with project activities to the extent practicable. "Hybrid" solutions that bring together green and grey infrastructure should also be considered as a means of minimizing impacts on ecosystems.

Long term:

- The U.S. government should lead by example and build multi-agency partnerships to implement high profile pilot adaptation projects in around the nation that can provide information and ultimately guidance on the appropriateness of different adaptation options, including EBA, in different settings. These demonstration sites should:
    - build on existing "centers of gravity" where several agencies are working and have resources
    - be designed to test and demonstrate the effectiveness of alternate adaptation strategies, including EBA
    - cover a diverse set of ecosystems and geographies, such as the Southeast, Mid-Atlantic, Northeast, Pacific Northwest, southern Pacific coast, and islands
    - demonstrate diverse settings for sea level rise impacts, including islands with few retreat options, low coastal plains, and steep shorelines.
    - contain and compare adaptation options across a diversity of land uses (including urban vs. rural areas, suburbs vs. natural areas, etc…).

[5] Realignment and retreat are often used interchangeably in the literature. The primary alternative to shore protection is commonly known as *retreat* (or *relocation*). Retreat often emphasizes the management of human expectations, so that people do not make investments inconsistent with the eventual retreat. A retreat can either occur as an unplanned response in the aftermath of a severe storm or as a planned response to avoid the costs or other adverse effects of shore protection. In Great Britain, an ongoing planned retreat is known as "managed realignment". From: CCSP, 2009: *Coastal Sensitivity to Sea-Level Rise: A Focus on the Mid-Atlantic Region*. A report by the U.S. Climate Change Science Program and the Subcommittee on Global Change Research. [James G. Titus (Coordinating Lead Author), K. Eric Anderson, Donald R. Cahoon, Dean B. Gesch, Stephen K. Gill, Benjamin T. Gutierrez, E. Robert Thieler, and S. Jeffress Williams (Lead Authors)]. U.S. Environmental Protection Agency, Washington D.C., USA, 320 pp.

Federal agencies should compile/develop and deploy a risk management framework for making adaptation decisions that includes comprehensive risk, vulnerability and economic assessments that include social, environmental and ecosystem services factors.

Short term:

- The NOC and interagency community should work to leverage and reinforce existing resources. For example: bringing together NOAA's national sea level rise viewer and a national social vulnerability index to provide a credible method/source to define federal need for adaptation funding and assistance.

Long term:

- The NOC should bring together expertise from different agencies to address critical gaps in information and analysis, to break down silos and produce more consistent and relevant information. For example, the NOC could bring together FEMA's methodologies for risk and vulnerability assessment with NOAA's expertise on coastal ecosystems and the benefits they provide to develop a new framework all relevant agencies can use.

- When determining what type of adaptation actions to take, agencies should factor in full cost/benefit analyses of both green and grey options. These must include the value of ecosystem services co-benefits potentially lost or created, including green house gas emissions, where ecosystem services are defined as "the benefits natural systems provide to humans" or "the contributions natural systems make to human well-being". These ecosystem services should include 'existence values', that is, the gains in well-being people receive from their appreciation of the existence and conservation of particular species or ecosystems, independent of any direst use of these species or systems. Existence values can be quantified using well-established methods widely applied in the fields of natural resource and environmental economics. The recent revision of the *Principles and Standards for Water and Related Resources Implementation Studies*, as required by Section 2031 of the Water Resources Development Act of 2007 (WRDA 2007), provides an example of how such guidelines could be integrated into the work of federal agencies.

- The NOC should ensure that all relevant agencies develop and implement social vulnerability assessments that take into account not only the physical and socio-economic characteristics of a community, but also the level of dependence of the community on ecosystems, how their vulnerability could be affected by possible responses to climate change that impact these ecosystems, and the potential for them to recover after a disaster or other event. For example – how dependent is the community on a fishery? On nature based tourism? How would the loss of those systems - including from the implementation of other adaptation measures - affect the community?

National coastal and marine adaptation planning measures should take into account the protection and preservation of biodiversity in the fact of climate change.

Short term:

- The NOC should ensure adequate funding and resources for existing federally protected areas on and near the coasts and facilitate the designation and expansion of coastal National Wildlife Refuges, National Parks and Seashores, National Estuary Programs, National Estuarine Research Reserves, National Marine Sanctuaries, and other federal protected and managed areas that have biodiversity conservation as a principal mandate. Ensure that climate change adaptation is a priority consideration in the designation and management of these areas.

- All relevant federal agencies should improve the management of these areas by integrating likely future climate scenarios into the development and implementation of comprehensive management plans.

Long term:

- Federal agencies should fund and otherwise advance research into how coastal natural resources will respond to climate change. Specifically, they should fund research into the mechanism and timing of transgression of various habitat types (marshes, barrier islands, eelgrass, etc.), and into the behavior of ecological communities during transgression and other climate-mediated change.

National adaptation planning should ensure that we are preparing for the "coast of the future".

Short term:

- All existing hard coastal infrastructure should be assessed to determine what will need to be fortified, otherwise modified, or abandoned in a way that does not leave behind a legacy of pollution, fragmentation or other stress on natural areas, species or systems.

- Adaptation, and particularly ecosystem based adaptation approaches, should be integrated into coastal and marine spatial planning (CMSP) efforts. For example, the use of coastal ecosystems that provide shoreline protection services that help reduce the vulnerability of human communities could be integrated into CMSP analyses. Similarly, CMST could be used to determine location of sensitive or strategic activities that could be relocated as part of adaptation strategy

Long term:

- Coastal, flood and land use planning must be integrated to take into account both sea level rise and inland flooding to avoid having water trapped in coastal areas.

- We need to pave the way for a healthy future marine environment by taking care of the land today. We know some new places will be inundated, at least temporarily, by sea level rise, effectively creating new marine environments and bringing new influences into existing environments. In order to ensure the health of these systems, including clean water that can support both fisheries and recreation, we need to get rid of legacy pollution, etc. in critical areas likely be inundated or in the path of increased storm surge.

Given that much of the on the ground planning and implementation of adaptation efforts will occur at the state and local level, mechanisms must be developed to encourage state and local agencies to follow the above recommendations in their own activities, particularly integrating climate change analyses into their decision making and mainstreaming ecosystem based adaptation options into their actions.

Long term

- Federal legislation, regulations, policies and programs should provide incentives to state and local entities to follow the above recommendations when developing, revising and implementing their relevant plans (including Coastal Zone management plans, Natural Hazard Mitigation Plans, etc...) and include consideration of climate change related hazards and impacts as well as ecosystem based adaptation solutions. Incentives could be either positive or negative, such as giving priority to states that consider such

elements for Federal funding programs such as CELCP or declaring states that fail to do so ineligible for non-emergency Stafford Act assistance and Federal Emergency Management Agency mitigation grants.

- The Administration and Congress should develop new, dedicated sources of funding for adaptation at the local, state and federal level that incorporate the principles laid out by the CEQ-led Interagency Climate Adaptation Task Force, particularly the need to apply ecosystem based approaches.

NEXT STEPS

We again commend the National Ocean Council on its increased attention to climate change and climate adaptation and thank you for this opportunity to comment on the development of a strategic plan for priority objective 5: *Resiliency and Adaptation to Climate Change and Ocean Acidification.*

We believe the Administration has a tremendous opportunity to establish realistic, future-oriented, cooperative adaptation programs across the federal government and to help ensure that actions across sectors are innovative, comprehensive and cohesive. We look forward to working with you over the coming months as you develop your draft and final plans.

5. Resiliency and Adaptation to Climate Change and Ocean Acidification: Strengthen resiliency of coastal communities and marine and Great Lakes environments and their abilities to adapt to climate change impacts and ocean acidification

1. What near-term, mid-term, and long-term actions would most effectively help the Nation achieve this policy objective?

Near-term actions should focus on expanding baseline data bases under an EBM framework, and development or refinement of decision support tools for producing and evaluating alternative strategies for dealing with climate change impacts and ocean acidification. Even short-term actions should be made within the framework of projected climate change impacts, especially sea level rise, over coming decades.

2. What are some of the major obstacles to achieving this objective; are there opportunities this objective can further, including transformative changes in how we address the stewardship of the oceans, coasts, and Great Lakes?

There is still a reluctance by some elected officials to acknowledge that climate change is occurring, or that there is anything that can be done about it. The projected impacts of sea level rise in particular stagger the imagination, though the recent scenes of tsunami damage in Japan, and damage from Hurricane Katrina, have provided very graphic images of what impacts are possible from inundations of coastal areas caused by storm events, tsuamis, earthquakes, and other forces of Nature. The other challenge is a reluctance by some decision makers to accept models generated by computer simulations as being "real," or to invest large sums of money to make zoning or infrastructure changes based on models.

A major transformative change the Sierra Club would like to see would be a shift from strategies of armoring coastal areas to combat coastal "erosion," to strategies that promote resilience of ecosystems under scenarios of sea level rise. Such strategies include discouraging development in vulnerable coastal areas, setting aside conservation areas through zoning or land purchases as needed to promote resilience, and reforming flood insurance policies so as to discourage building or re-building in flood prone areas, taking into account projections of sea level rise.

As we have pointed out elsewhere in our comments, combatting ocean acidification requires reductions of carbon dioxide emissions world wide, and the United States must play its role. The EPA should enforce regulations to reduce carbon dioxide emissions nationwide, and Congress should enact and implement legislation to promote clean and renewable energy sources.

3. What milestones and performance measures would be most useful for measuring progress toward achieving this priority objective?

An early milestone should include an assessment of each Regional Ocean Council's plans for promoting resilience of coastal communities, marine, and Great Lakes environments given the range of projected increases in sea level rise and ocean acidification levels. Performance measures should be developed to track projected improvements in resiliency based on adaptive management steps taken in response to projected threats to resiliency.

Environ. Sci. Technol. **2008,** *42,* 8935–8940

Electrochemical Splitting of Calcium Carbonate to Increase Solution Alkalinity: Implications for Mitigation of Carbon Dioxide and Ocean Acidity

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Received February 6, 2008. Revised manuscript received September 5, 2008. Accepted September 12, 2008.

Electrochemical splitting of calcium carbonate (e.g., as contained in limestone or other minerals) is explored as a means of forming dissolve hydroxides for absorbing, neutralizing, and storing carbon dioxide, and for restoring, preserving, or enhancing ocean calcification. While essentially insoluble in water, $CaCO_3$ can be dissolved in the presence of the highly acidic anolyte of a water electrolysis cell. The resulting charged constituents, Ca^{2+} and CO_3^{2-}, migrate to the cathode and anode, respectively, forming $Ca(OH)_2$ on the one hand and H_2CO_3 (or H_2O and CO_2) on the other. By maintaining a pH between 6 and 9, subsequent hydroxide reactions with CO_2 primarily produce dissolved calcium bicarbonate, $Ca(HCO_3)_{2aq}$. Thus, for each mole of $CaCO_3$ split, there can be a net capture of up to 1 mol of CO_2. $Ca(HCO_3)_{2aq}$ is thus the carbon sequestrant that can be diluted and stored in the ocean, in natural or artificial surface water reservoirs, or underground. The theoretical work requirement for the reaction is 266 kJ_e per net mole CO_2 consumed. Even with inefficiencies, a realized net energy expenditure lower than the preceding quantity appears possible considering energy recovery via oxidation of the H_2 produced. The net process cost is estimated to be <$100/tonne CO_2 mitigated. An experimental demonstration of the concept is presented, and further implementation issues are discussed.

1. Introduction

Due to the climate and environmental effects of excess CO_2 in the atmosphere, a variety of methods exist or have been proposed for pre- or post-emission capture and sequestration of CO_2 (*1, 2*). For example, it is well-known that CO_2 will react with dissolved hydroxides such that the CO_2 concentration in a gas mixture in contact with the solution will be reduced via absorption and reaction within the solution, with such processes having industrial applications (*3*). More recently the use of solutions containing $Ca(OH)_2$ or NaOH have been proposed for large-scale chemical absorption of air CO_2 using various means of active or passive contacting of air or other gas mixture and the solution. For example, Kheshgi (*4*) suggested placing CaO or $Ca(OH)_2$ in the ocean to chemically enhance passive uptake of CO_2 from the atmosphere, largely forming $Ca(HCO_3)_2$ in solution as the CO_2 storage product. Other schemes employ engineered structures for actively contacting of air with NaOH, forming Na_2CO_3 in solution (*5*−*7*). By subsequently reacting this solution with $Ca(OH)_2$, $CaCO_3$ is formed and NaOH is regenerated. The $CaCO_3$ is then calcined at high temperature to form concentrated CO_2 as the final storage product while also forming CaO. The latter is then hydrated to regenerate $Ca(OH)_2$. In this way alkaline hydroxide solutions are recycled and conserved as opposed to the once-through production and release of alkalinity in the concept proposed by Kheshgi (*4*). However, in both cases significant quantities of thermal energy are required to either produce or regenerate the hydroxide solutions, especially the calcination of $CaCO_3$. This contributes significantly to the cost of either process, plus additional CO_2 is produced if the source of the thermal energy is derived from the combustion of fossil fuels. One way to avoid this CO_2 production in calcining is to employ nonfossil energy sources such as solar thermal energy (*8, 9*).

Another source of hydroxide is electrochemical salt splitting wherein a dissolved salt is split into acid and hydroxide components in the presence of a charged anode and cathode, respectively. For example a solution containing dissolved NaCl can be electrolyzed to form hydrochloric acid (HCl), hypochlorite (ClO^-), chlorate (ClO_3^-), and/or chlorine gas (Cl_2) at the anode and sodium hydroxide (NaOH) at the cathode (*10, 11*). The hydroxide solution can then be removed for subsequent use. Various electrodes and cation- and anion-permeable membranes can also be employed to facilitate the hydroxide formation and separation (*12, 13*). Such a process can be used for the recovery and removal of salts in a solution or waste stream, thus also allowing for the purification of the original solution (*12, 13*).

Obviously, such electrochemically produced hydroxide solutions could be used for CO_2 and other acid gas mitigation (*14*). However, producing hydroxide in quantities sufficient for large scale CO_2 removal could in the case of a metal chloride-containing electrolyte means massive coproduction of one or more chlorine-containing compounds. If these were not consumed in appropriate ways they would pose a significant environmental impact. In addressing this problem House et al. (*15*) proposed that the Cl_2 and H_2 formed during the electrochemical splitting of dissolved NaCl be reacted in a fuel cell to produce electricity and HCl. This strong acid could then be neutralized by reacting with mineral bases as contained in naturally occurring and abundant silicate minerals, thus converting the chlorine to relatively innocuous magnesium and calcium chlorides. Implementing such a scheme on a scale relevant to global CO_2 mitigation would, however, require the careful handling and management of large quantities of Cl_2 and HCl (*15*).

2. An Alternative

As a potentially safer and simpler approach, it is proposed that $CaCO_3$ rather NaCl be used as the primary compound for the electrochemical formation of mineral hydroxide. Due to its very low solubility, $CaCO_3$ is not an obvious choice for such aqueous electrochemistry. However, $CaCO_3$ is soluble in acid, which is locally produced in high concentrations in the anolyte of a water electrolysis cell (*10*). Specifically, as shown in Figure 1, the acidity (H^+) generated at the anode will react with and dissolve mineral carbonate placed immediately adjacent to the anode. The resulting Ca^{2+} and CO_3^{2-} ions then migrate toward the cathode and anode, forming $Ca(OH)_2$ and H_2CO_3 (and/or $CO_2 + H_2O$), respec-

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10.1021/es800366q CCC: $40.75
Published on Web 10/25/2008

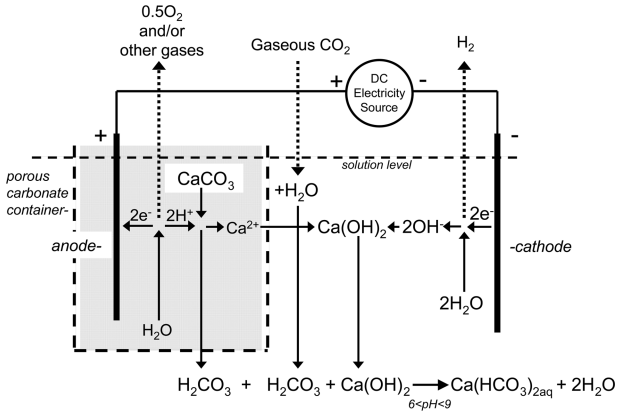

FIGURE 1. Schematic of the electrochemical splitting of calcium carbonate, $CaCO_3$, to form calcium hydroxide, $Ca(OH)_2$. The initial passage of direct electrical current through the solution by the presence of soluble salt ions is not shown. The excess $Ca(OH)_2$ can subsequently react with dissolved CO_2 to form predominantly $Ca(HCO_3)_{2aq}$ when solution pH is between 6 and 9.

tively. This therefore allows the use of very abundant and inexpensive carbonate minerals, such as limestone and dolomite, to generate hydroxide solutions without resorting to thermal calcination of mineral carbonates or, necessarily, the electrochemical splitting of NaCl. Previously, the electrochemical splitting of highly soluble K_2CO_3 was proposed as a means of regenerating KOH for air CO_2 capture (*16*).

The calcium hydroxide formed will subsequently react with the CO_2 dissolved in the solution, forming dissolved calcium carbonate and bicarbonate. The formation of the bicarbonate will be favored when solution pH is kept between 6 and 9 (*17*). Under such conditions, because bicarbonate ions (valence = −1) require half the balancing cation equivalents as do carbonate ions (valence = −2), the carbonic acid formed at the anode is quantitatively insufficient to react with and hence neutralize all of the metal hydroxides produced in the solution. That is, at such pH even if all of the excess carbonic acid originally produced at the anode were to quantitatively react with the $Ca(OH)_2$ produced at the cathode, there would be insufficient acid to neutralize all of the $Ca(OH)_2$ generated. This excess $Ca(OH)_2$ would then be free to react with any additional acid contained in the solution including CO_2. As dissolved CO_2 is consumed, a difference in CO_2 partial pressure would be produced between the solution and the overlying air causing the CO_2 in the overlying air to diffuse into the solution. In this way CO_2 is removed from the overlying gas mixture or air and reacted with the excess hydroxide to form $Ca(HCO_3)_{2aq}$ that then becomes the storage compound of the CO_2 consumed.

3. Net CO_2 Sequestration

In the course of forming calcium bicarbonate, some calcium carbonate will spontaneously form via well-know, pH-dependent equilibrium reactions, and if above a certain saturation concentration, will subsequently precipitate from solution, unlike $Ca(HCO_3)_2$. Since $CaCO_3$ is the starting compound that is initially electrochemically split, there can be no net CO_2 uptake and storage unless at least some of the calcium salt formed remains as $Ca(HCO_3)_2$ in solution. Thus $CaCO_3$ precipitation from the solution formed must be avoided if maximum CO_2 removal is to be achieved. Such chemical precipitation can be avoided by (i) dilution with water, (ii) pH adjustment, (iii) thermal adjustment, and (iv) the addition of carbonate precipitation inhibitors (e.g., Mg^{2+}, sulfates, phosphates, certain organic compounds). In the case of seawater, it has been observed that $CaCO_3$ stays in solution and will not abiotically precipitate even in concentrations approaching 20 times saturation (*18, 19*) due to chemical inhibitors naturally present in ocean water (*20*).

However, $CaCO_3$ precipitation can be biologically effected. Of particular concern for CO_2 mitigation would be the enhancement of marine biological calcification by the presence of the added alkalinity in the form of mineral bicarbonates (*21, 22*), with the $CaCO_3$ precipitated being balanced by an equimolar regeneration of molecular CO_2. In the extreme this could ultimately result in the eventual biological removal of all excess carbon absorbed by the ocean via $Ca(OH)_2$ addition, though over geologic time scales (*15, 23*). On the other hand such alkalinity addition could help offset the loss of biological calcification that is presently occurring due to CO_2-induced ocean acidification (*24, 25*). The net long-term effectiveness and benefits to CO_2 mitigation and to biological calcification of adding calcium hydroxide and/or calcium bicarbonate to natural waters requires further study. At the very least, adding 1 mol of net CO_2 storage per mole of $CaCO_3$ split by the process would likely be in effect over the next century, when CO_2 emissions will be highest (*15*). Such issues would be moot with underground $Ca(HCO_3)_{2aq}$ storage.

Another factor affecting net CO_2 mitigation by the process would be the CO_2 emissions associated with supplying and operating such an electrochemical system. Assuming the required electricity would come from rewable sources (types and quantities discussed below), additional energy requirements and hence CO_2 emissions can be anticipated in limestone/carbonate mining, crushing, and transport, in water pumping (if required), and in harvesting end products such as H_2 (if conducted). However, analyses of such emissions from related technologies (*15, 26, 27*) suggest that CO_2 emissions from such activities could be small relative to the CO_2 consumed and avoided in an optimized system. A full lifecycle analysis of CO_2 emissions, consumption, avoidance, and hence, net mitigation by such a system is needed.

4. Thermodynamics and Energy Cost

Assuming the net reaction,

$$CaCO_3 + 2H_2O + CO_2 + (\text{DC electricity}) \rightarrow \uparrow H_2 + \uparrow 0.5O_2 + Ca^{2+} + 2(HCO_3^-) \quad (1)$$

the theoretical work requirement, ΔG, is 266 kJ/mol CO_2 consumed (1682 kWh/tonne CO_2 consumed). This compares with an energy expenditure of 360 kJ_e/mol CO_2 (2273 kWh_e/tonne CO_2) estimated from the typical energy used in the commercial production of H_2 in alkaline electrolysis cells (*26*), assuming a 1:1 molar ratio in H_2 produced:net CO_2 consumed (eq 1). Some of this energy cost could be offset or avoided via the subsequent oxidation of the H_2 in a fuel cell or by diverting the H_2 to a gas diffusion anode if used in the electrolysis cell. In the former case, about 121 kJ_e/mol H_2 could be recovered in a 50% efficient fuel cell, for an offset of 121 kJ_e/mol CO_2 yielding a net energy expenditure based on the commercial electrolyzer example of 360 − 121 = 239 kJ_e/mol CO_2 consumed. Use of gas diffusion electrodes would reduce energy expenditure by about $^1/_3$ (*13*), which would then yield about the same net energy expenditure. Thus, energy requirements of this magnitude might be feasible, though with added capital and operating costs. For comparison, land-based air capture schemes reportedly have a primary energy requirement (mostly thermal) of >350 kJ/mol CO_2 captured (*7*), but where air contacting is mechanically assisted, hydroxide is thermally regenerated, pressurized molecular CO_2 rather than $Ca(HCO_3)_{2aq}$ is the end product, and gross CO_2 capture rather than net CO_2 mitigation may be calculated.

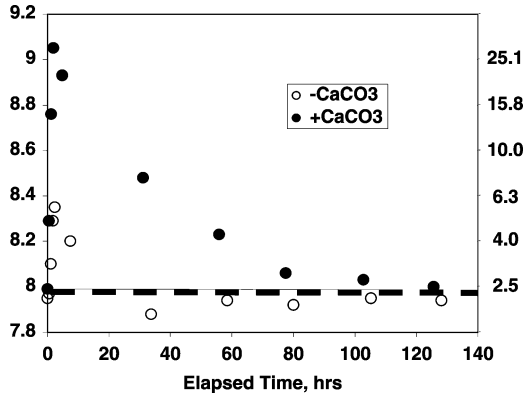

FIGURE 2. Time course of seawater pH during 1.5 h of electrolysis using an anode that either was or was not encased in seawater-saturated $CaCO_3$ powder, followed by 5 days of solution exposure to ambient air. The corresponding solution $[OH^-] = 10^{(pH-7.6)}$ at a mean experiment temperature of 16.5 °C and salinity of 35 ppt (17). Dashed line denotes pretreatment values.

Note also that in principle 22 tonnes of CO_2 can be captured per tonne H_2 generated (eq 1). Thus, depending the amount of CO_2 emitted directly or indirectly in operating such a system (see "Net Carbon Sequestration" section), the system has the potential of producing hydrogen that is significantly carbon-negative, in contrast to current commercial H_2 production methods (*26*).

5. Experimental Demonstration

A 9 cm × 1 mm diameter graphite rod anode was placed vertically into a hollow, porous cylindrical container (tea strainer; mean i.d. = 4 cm, height = 8 cm) the inside surface of which had been lined with a porous paper filter and then filled with reagent grade, powdered $CaCO_3$. This anode container was then submerged in a glass beaker containing 300 mL of local (Santa Cruz, CA) seawater. The anode container was positioned such that the upper surface of the $CaCO_3$ mass was just above the surface of the seawater, while the vertical anode penetrated into the mass such that about 1 cm of the anode was below the seawater level, the submerged part of the anode thus being completely encased by a seawater-saturated carbonate "paste". An equivalent, naked graphite rod (cathode) was placed vertically into the solution at a distance of about 4 cm from the anode at equivalent seawater depth outside of the anode container. The initial pH of the seawater solution was then measured using a calibrated pH probe (Oakton model 300). The anode was then connected to the positive lead and the cathode to the negative lead of a DC power source providing a measured voltage through the cell that ranged from 3.5 to 3.6 V at 6.4 to 7.0 mA. After 1.5 h of electricity application the pH of the solution rose to a value of 9.05 (Figure 2), measured while electricity was temporarily turned off and after gentle stirring of the seawater to reduce chemical heterogeneity, thus determining true bulk solution pH. The electricity was then permanently turned off, the electrodes and anode container removed from the seawater, and the solution poured into a shallow dish (11 cm i.d.). The pH of the solution was then periodically monitored and was observed to return to near its initial value over the course of 5 days (Figure 2). The experiment was repeated without the presence of $CaCO_3$ and paper filter (experimental control), with a maximum pH of 8.35 being obtained, followed by a return to pH values near that of the initial seawater (Figure 2).

It is concluded that the rise in pH observed in both treatments was the consequent of the reduction and loss from solution of hydrogen and the production of hydroxide at the cathode. Using a seawater chemistry model (*28*) with starting chemistry typical of central California coastal surface water, the alkalinity addition required to effect the maximum pH deviations observed was calculated to be 1.1 and 0.3 mmol/L, respectively, for the experimental and the control treatments. In the latter treatment the OH^- produced is presumed to have been balanced by Na^+ from the splitting of seawater NaCl, whereas Ca^{2+} from the splitting of $CaCO_3$ is presumed to balance the additional OH^- generated in the carbonate treatment, in this case 0.8 mmol/L. Evidence of NaCl splitting was indicated by the odor of chlorine in both treatments, and possibly another unidentified irritant gas was also generated. Such experiments must be conducted under adequate ventilation both during and after electrolysis.

The decrease in pH following the termination of electricity input in both treatments is consistent with the excess OH^- reacting with CO_2 that slowly diffused in from the overlying air to form primarily HCO_3^- balanced by the excess Ca^{2+} and/or Na^+. According to the preceding chemistry model (*28*) such neutralization would have required the absorption of 1.0 and 0.2 mmol/L of CO_2 in the experimental and the control, respectively, yielding a net increase in CO_2 absorption in the carbonate treatment of 0.8 mmol/L. An absorption of 1.0 mmol/L of CO_2 occurring over approximately 120 h into 0.3 L of solution with a surface area of 95 cm^2 yields a mean gross CO_2 absorption rate of 0.073 μmole m^{-2} sec^{-1}. Subtracting the CO_2 generated by the splitting of $CaCO_3$, 0.4 mmol/L, then leads to an estimated net CO_2 uptake of about 0.6 mmol/L in the carbonate treatment, requiring a mean net CO_2 absorption rate of 0.044 μmole m^{-2} sec^{-1}. For comparison, an estimated net CO_2 absorption by the ocean of 7 Gt/yr (*29*) yields a mean net air-to-sea CO_2 absorption rate of 0.015 μmole m^{-2} sec^{-1} or about $^1/_3$ that estimated for the experiment. Conducting the experiments under more realistic ocean or surface reservoir conditions (wind, waves, mixing) would likely have greatly enhanced the CO_2 flux rate in the experiments.

The energy input for the preceding net CO_2 absorption amounted to about 34 mWh_e, or about 8×10^6 kWh_e/net tonne CO_2 consumed. This energy expenditure is $>10^3$ higher than anticipated from the commercial alkaline solution electrolysis example discussed above, indicating that the experimental cell configuration used was very far from being thermodynamically optimal.

6. Large Scale Implementation

While the electrochemical system described could have application to localized hydroxide production, CO_2 absorption, and/or hydrogen generation in various industrial or commercial settings, might such a system be applicable at a scale large enough to make an impact globally? For example, the use of hydroxide solutions in specially designed air contacting devices have been considered for large scale atmospheric CO_2 absorption (*5*−*7, 30, 31*), and such devices might provide an effective use for the calcium hydroxide produced here for CO_2 mitigation. Also, to the extent that CO_2 rather than carbonate or bicarbonate would be the desired end product in such systems, the preceding electrochemistry might prove useful for stripping (calcining) and concentrating the captured CO_2 from the carbonate or bicarbonate formed, and for reforming hydroxides. It would also be possible to add the hydroxide solution produced to large bodies of water in contact with air so as to chemically remove and store at least some atmosphereic CO_2 (*4, 15*). Comprising 71% of the earth's surface (3.61×10^8 km^2, excluding surface roughness), the ocean is the ultimate air contactor for planetary scale CO_2 absorption. Indeed <5% of the ocean surface would be needed to absorb an additional 1 Gtonne of atmospheric CO_2/yr if seawater CO_2 absorption

rates could be continuously enhanced as experimentally observed above.

The electrolysis could in fact be done directly in open reservoirs or the ocean where the electrodes and carbonate would penetrate the water surface from either stationary (e.g., docks, jetties, platforms) or mobile, piloted, or autonomous vessels (barges, ships, buoys, etc.). With nonfossil-fuel electrical power generated onsite (wind, wave, tidal, ocean thermal, solar), the electrochemical splitting of the carbonate could proceed in situ, generating hydroxide alkalinity directly into the water body. Calcium carbonate would need to be supplied to the structure at the rate of at least 2.3 tones per net tonne CO_2 consumed, the exact quantity dependent upon the purity and reactivity of the mineral carbonate used. In turn the H_2 and other gases produced (if produced) would need to be harvested, used, or safely disposed.

For ease of access and transportation of reactants and products, flow-through, shore-based systems would be attractive, with the adjacent ocean providing a ready source of water and energy as well as a subsequent air-contacting surface and carbon storage reservoir. At inland sites, wastewater or groundwater could be used for the process, with above- or below-ground reservoirs providing a storage area for the solution once reacted with CO_2. In any case, unlike point-source mitigation, air CO_2 capture has the advantage of being able to be sited anywhere that energy, reagents, air contacting surface area, and societal and economic interests are optimal (*5, 7, 15*).

While any source of DC electricity of appropriate current and voltage could be used for the preceding electrolysis, use of low-or non-CO_2 producing renewable electrical energy sources would be particularly attractive for maximizing net CO_2 mitigation. Nonreactive electrodes such as graphite or stainless steel would be preferred, but more exotic metals, alloys, or coatings might prove beneficial and cost-effective. For example, manganese-containing, oxygen-selective anodes (*10, 32*) could be used to reduce or avoid the generation of chlorine and/or chlorine compounds under circumstances where a chloride salt is present in the electrolyzing solution, e.g., seawater. Chlorine generation may also be suppressed by (1) the use of very high or very low electrode current densities (*10*), (2) the use of ion selective membranes to exclude chloride ion from entering the anolyte (*12, 13*), or (3) the diversion of the H_2 produced at the cathode to a gas diffusion anode (*12, 13*). It might also be possible to avoid gas production altogether through the use of bipolar membranes that selectively block gas-generating cations or anions from leaving or entering the catholyte or anolyte, respectively (*12, 13*). Prevention of some or all gas evolution would reduce the overall electrical energy required for the carbonate splitting. In any case, the ancillary production of compounds by this process and their use, fate, impact, or avoidance requires further study.

7. Other Benefits and Issues

The H_2 produced at the cathode could be used as an energy source/carrier or as a chemical feed stock, the value of which could help offset the cost of the simultaneous hydroxide solution production. For example the oxidation of the H_2 using a fuel cell or internal combustion engine could be used to generate electrical or mechanical energy, thus recovering some of the energy used in the original electrochemical process. Electricity so generated could in fact be used to power the electrolysis during periods of renewable power intermittency, as in the case of wind, wave, solar, or tidal power usage. Alternatively, the ability to electrochemically produce CO_2-absorbing solutions and thus carbon credits could add value to systems otherwise primarily designed to levelize intermittent energy sources using electrolytic hydrogen production/energy storage, e.g., wind-hydrogen systems (*26*). Using O_2 or air as the H_2 oxidant, fresh water would be the chemical end product, which may have significant added value in certain settings, for example, deserts adjacent to the ocean or other saline reservoirs.

The addition to the ocean of $Ca(OH)_2$ produced by the electrolysis would be useful at least locally in neutralizing marine acidity that is being generated by the ongoing, passive invasion of anthropogenic CO_2 into the ocean (*24, 33*). Furthermore, this hydroxide and/or the subsequent formation of $Ca(HCO_3)_{2aq}$ via reaction with CO_2 would be beneficial to biological marine calcification (*21, 22*) that is otherwise threatened by the above decrease in ocean pH. Indeed, enhanced calcification on and around negatively charged cathodes submerged in seawater have been observed and proposed as a way of stimulating reef building (*34*). However, unlike the process presented above where an external source of alkalinity is added to seawater via the electrochemical splitting of limestone, cathodic carbonate precipitation effected by simple electrolysis of seawater alone will occur at the expense of excess CO_2 lose from seawater at the acidic anode, resulting in a net source rather than a net sink of atmospheric CO_2. Also, if carbonate or hydroxide precipitation occurs on the cathode this could impact the performance of the electrolysis cell. Indeed, a white precipitate was observed on the experimental cathode above, but did not seem to degrade current passage through the solution over the course of the experiments, perhaps due to the relatively high voltage used. In large-scale applications, such precipitation might be managed or avoided via sufficient solution flow or adjustment of electrical current densities (*10*), or by the occasional reversal of electrode polarity.

8. Economics

Given the uncertainties in the optimum chemistry, design, and operation of such a system, a precise assessment of net cost is currently not possible, but the following might be illustrative. Assuming a net reaction as described by eq 1, process costs are estimated. *Energy*: Commercial electrolytic generation of H_2 requires at least 50 kWh_e/kg H_2 (*26*). Since 2 kg H_2 would be produced per 44 kg noncarbonate CO_2 consumed (eq 1), $50 \times 2/44 = 2.273$ kWh_e would be used per net kg CO_2 captured, or 2273 kWh_e/net tonne CO_2 consumed. Assuming \$0.06/kWh_e (e.g., unsubsidized wind (*26*)), then $2273 \times \$0.06 = \$136.38$/net tonne CO_2 consumed. *Capital, operation, and maintenance (O&M)*: Advanced alkaline (KOH) electrolyzer capital cost is reportedly \$600/tonne H_2 produced (*35*). Assuming a similar capital cost for the electrolyzer envisioned here yields a CO_2 equivalent capital cost of $\$600 \times 2/44 = \$27.27$ /net tonne CO_2 consumed. O&M charges are assumed to be 3% of capital expenditure (*26*), bringing the total CO & M cost to \$28.09/net tonne CO_2 consumed. *Mineral carbonate*: If the limestone used contains 95% $CaCO_3$, 2.42 tonnes of limestone are then required per net tonne CO_2 consumed. At an assumed delivered price of \$8/tonne of crushed stone (*36*), mineral carbonate cost would then be \$19.36/net tonne CO_2 consumed. Substantial cost savings could be achieved, however, through the use of waste limestone fines (<9.5 mm) that comprise more than 20% of U.S. limestone production (*37*). Since it is currently unknown what the most cost-effective carbonate particle size for the process might be, it is uncertain if additional grinding/sieving of the crushed/waste stone would be required. Based on grinding cost estimates for a related process (*27*), an additional \$3/net tonne CO_2 consumed is budgeted here, bringing the estimated total carbonate cost to \$22.36/net tonne CO_2 consumed. *Water*: 0.82 tonnes of water are consumed per net tonne CO_2 consumed. Assuming in situ use of seawater, cost would be nil. Otherwise, water source and pumping costs would need to be considered. Assuming an excess net CO_2 storage potential of 0.6 mmole CO_2/L in

seawater whose pH is initially elevated to 9 (see "Experimental Demonstration" section) then some 3.8×10^4 tonnes of water are required per tonne of CO_2 stored. This water quantity further recommends that the process be done very near or within the ocean or other water body to reduce or avoid pumping costs. The total gross cost of such a system is then projected to be \$136.38 + \$28.09 + \$22.36 = \$186.83/net tonne CO_2 consumed.

Potential cost offsets include *H_2*: Assuming the value of the H_2 produced is \$1500/tonne H_2, then the value added to CO_2 capture is \$1500 × 2/44 = \$68.18/net tonne CO_2 consumed. *Quantity and value of CO_2 mitigated*: If 9 tonnes of CO_2 are avoided per tonne H_2 produced (via this carbon-free electrolysis versus natural gas reforming (*26*)), and if 44/2 = 22 tonnes CO_2 are consumed from air per tonne H_2 produced (eq 1), then at total of 9 + 22 = 31 tonnes CO_2 are mitigated/tonne H_2 produced, or 31 tonnes × 2/44 = 1.41 tonnes CO_2 mitigated/net tonne CO_2 consumed. Assuming a value of \$10/tonne CO_2 mitigated yields \$10 × 1.41 tonnes CO_2 mitigated/net tonne CO_2 consumed = \$14.10/net tonne CO_2 consumed. *Other potential cost offsets (not monetarily valued here)*: (a) Energy storage and recovery including load leveling and peak shaving via H_2 storage/oxidation (*26*), (b) subsequent freshwater production via H_2 oxidation, (c) the value of O_2 or other gases produced, and (d) ocean acid mitigation, e.g., local or regional preservation or enhancement of economically important marine shellfish. The total estimated cost offset is then \$68.18 + \$14.10 = \$82.28/net tonne CO_2 consumed. Subtracting this from gross cost, yields a net cost of \$186.83 − \$82.28 = \$104.55/net tonne CO_2 consumed or (÷ 1.41 tonnes CO_2 mitigated/net tonne CO_2 consumed =) \$74.15/tonne CO_2 mitigated. For comparison, this latter figure is at the high end of the cost range estimated for the capture and geologic storage of molecular CO_2 from conventional power plant waste streams (*1*). However, lacking an optimized prototype system, the true cost, effectiveness, and potential of this electrolysis-based CO_2 mitigation scheme remains to be demonstrated.

To conclude, the magnitude and urgency of the global CO_2 problem requires that all mitigation alternatives be carefully considered and evaluated under the assumption that multiple technologies will be required (*38*). Because fossil fuels will remain our primary energy source for the foreseeable future (*39*), and because most of the associated CO_2 emissions cannot be feasibly controlled by point-source methods (e.g., automobiles, ships, planes, noncompliant point-source emitters), options for post-emission absorption of CO_2 from the air are needed. The passive absorption of air CO_2 by the ocean has already saved us from the climate impacts of about half of the anthropogenic CO_2 released thus far (*29*), and will ultimately absorb most of the human-induced atmospheric CO_2 transient whatever its ultimate size and duration (*40*). Yet we cannot rely on this natural ocean process to avoid severe climate and environmental impacts because it would take many tens of thousand of years to return to near preindustrial CO_2 levels under such a scenario (*40*), and in the meantime it would result in significant acidification of the ocean (*33*). Ways of using chemical reactions with globally abundant minerals to (i) mitigate point source CO_2 (*23, 41*−*44*) or (ii) to proactively modify ocean chemistry to enhance air CO_2 uptake (*4, 15, 23, 27*) have been proposed including the method described here. Most of the latter approaches will require significant energy input, yet the ocean itself has abundant and virtually untapped solar, wind, thermal, tidal, and kinetic energy (>2 × 10^6 TWh/yr (*45*)). Some small fraction of this energy could conceivably be converted to electricity and used to help electrochemically stabilize or reduce atmospheric CO_2 and/or to neutralize ocean acidity and to add alkalinity to preserve marine calcificying organisms such as corals and shellfish. However, the actual cost, impact, safety, benefit, and practical scale of such a mitigation method remain to be demonstrated.

Acknowledgments

Research supported in part by Grant 55043A/06-26 from the Energy Innovations Small Grant Program of the California Energy Commission, and Grant B558132 from the Carbon Management Program, Lawrence Livermore National Laboratory. I thank Richard Zeebe and Todd Martz for their assistance with solution chemistry modeling, and three anonymous reviewers for their helpful comments on the manuscript.

Literature Cited

(1) Metz, B.; Davidson, O.; de Conick, H.; Loos, M.; Meyer, L. *IPCC Special Report on Carbon Dioxide Capture and Storage*; Cambridge: New York, 2005.
(2) *U.S. Climate Change Technology Program Strategic Plan. Climate Change Technology Program*; National Energy Technology Laboratory, DOE: Washington, DC, 2006; Available at http://www.climatetechnology.gov/stratplan/ final/ index.htm.
(3) Danckwerts, P. V. *Gas-Liquid Reactions*; McGraw-Hill: New York, 1970.
(4) Kheshgi, H. S. Sequestering atmospheric carbon dioxide by increasing ocean alkalinity. *Energy* **1995**, *20*, 915–922.
(5) Keith, D. W.; Ha-Duong, M.; Stolaroff, J. K. Climate strategy with CO_2 capture from the air. *Climatic Change* **2006**, *74*, 17–45.
(6) Baciocchi, R.; Storti, G.; Mazzotti, M. Process design and energy requirements for the capture of carbon dioxide from air. *Chem. Eng. Process.* **2006**, *45*, 1047–1058.
(7) Zeman, F. Energy and material balance of CO_2 capture from ambient air. *Environ. Sci. Technol.* **2007**, *41*, 7558–7563.
(8) Meier, A.; Bonaldi, E.; Cella, G. M.; Lipinski, W.; Wuillemin, D. Solar chemical reactor technology for industrial production of lime. *Solar Energy* **2006**, *80*, 1355–1362.
(9) Nikulshina, V.; Hirsch, D.; Mazzotti, M.; Steinfeld, A. CO_2 capture from air and co-production of H_2 via the Ca(OH) $_2$-$CaCO_3$ cycle using concentrated solar power - Thermodynamic analysis. *Energy* **2006**, *31*, 1715–1725.
(10) Bennett, J. E. Electrodes for generation of hydrogen and oxygen from seawater. *Int. J. Hydrogen* **1980**, *5*, 401–408.
(11) Abdel-Aal, H. K.; Sultan, S. M.; Hussein, I. A. Parametric study for saline water electrolysis 2. Chlorine evolution, selectivity and determination. *Int. J. Hydrogen Energy* **1993**, *18*, 545–551.
(12) Rajeshwar, K.; Ibanez, J. *Environmental Electrochemistry*; Academic Press: San Diego, 1997.
(13) Genders, J. D. Electrochemical salt splitting *Watts New* 1995, 1 Available at http://www.electrosynthesis.com/news/mwatts.html.
(14) An, S.; Nishida, O. New application of seawater and electrolyzed seawater in air pollution control of marine diesel engine. *JSME Int. J. Series B* **2003**, *46*, 206–213.
(15) House, K. Z.; House, C. H.; Schrag, D. P.; Aziz, M. J. Electrochemical acceleration of chemical weathering as an energetically feasible approach to mitigating anthropogenic climate change. *Environ. Sci. Technol.* **2007**, *41*, 8464–8470.
(16) Stucki, S.; Schuler, A.; Constantinescu, M. Coupled CO_2 recovery from the atmosphere and water electrolysis: Feasibility of a new process for hydrogen storage. *Int. J. Hydrogen Energy* **1995**, *20*, 653–663.
(17) Zeebe, R. E.; Wolf-Gladrow, D. A. *CO_2 in Seawater: Equilibrium, Kinetics, Isotopes;* Elsevier Science: Amsterdam, 2001.
(18) Morse, J. W.; He, S. Influences of T, S and PCO_2: on the pseudo-homogeneous precipitation of $CaCO_3$ from seawater: Implications for whiting formation. *Mar. Chem.* **1993**, *41*, 291–297.
(19) Morse, J. W.; Gledhill, D. K.; Millero, F. J. $CaCO_3$ precipitation kinetics in waters from the Great Bahama Bank: implications for the relationship between Bank hydrochemistry and whitings. *Geochim. Cosmochim. Acta* **2003**, *67*, 2819–2826.
(20) Morse, J. W.; Mackenzie, F. T. *Geochemistry of Sedimentary Carbonates*; Elsevier: Amsterdam, 1990.
(21) Marubini, F.; Thake, B. Bicarbonate addition promotes coral growth. *Limnol. Oceanog.* **1999**, *44*, 716–720.
(22) Langdon, C.; Takahashi, T.; Sweeney, C.; Chipman, D.; Goddard, J.; Marubini, F.; Aceves, H.; Barnett, H.; Atkinson, M. J. Effect of calcium carbonate saturation state on the calcification rate of an experimental coral reef. *Glob. Biogeochem. Cycles* **2000**, *14*, 639–654.

(23) Lackner, K. S. Carbonate chemistry for sequestering fossil carbon. *Ann. Rev. Energy Environ.* **2002**, *27*, 193–232.
(24) Feely, R. A.; Sabine, C. L.; Lee, K.; Berelson, W.; Kleypas, J.; Fabry, V. J.; Millero, F. J. Impact of anthropogenic CO_2 on the $CaCO_3$ system in the oceans. *Science* **2004**, *305*, 362–366.
(25) Hoegh-Guldberg, O.; Mumby, P.; Hooten, A. J.; Steneck, R. S.; Greenfield, P.; Gomez, E.; Harvell, C. D.; Sale, P. F.; Edwards, A. J.; Caldeira, K.; Knowlton, N.; Eakin, C. M.; Iglesias-Prieto, R.; Muthiga, N.; Bradbury, R. H.; Dubi, A.; Hatziolos, M. E. Coral reefs under rapid climate change and ocean acidification. *Science* **2007**, *318*, 1737–1742.
(26) Committee on Alternatives and Strategies for Future Hydrogen Production and Use, National Research Council and National Academy of Engineering. *The Hydrogen Economy: Opportunities, Costs, Barriers, and R&D Needs*; National Academies Press: Washington DC, 2004.
(27) Harvey, L. D. D. Mitigating the atmospheric CO_2 increase and ocean acidification by adding limestone powder to upwelling regions *J. Geophys. Res., [Oceans]* **2008**, 113 doi: 10.1029/2007JC004373.
(28) Lewis, E.; Wallace, D. W. R. Program Developed for CO_2 System Calculations, ORNL/CDIAC-105; Carbon Dioxide Information Analysis Center, Oak Ridge National Laboratory, U.S. Department of Energy: Oak Ridge, TN, 1998; Available at http://cdiac.ornl.gov/oceans/co2rprt.html#single.
(29) Sabine, C. L.; Feely, R. A.; Gruber, N.; Key, R. M.; Lee, K.; Bullister, J. L.; Wanninkhof, R.; Wong, C. S.; Wallace, D. W. R.; Tilbrook, B.; Millero, F. J.; Peng, T. H.; Kozyr, A.; Ono, T.; Rios, A. F. The oceanic sink for anthropogenic CO_2. *Science* **2004**, *305*, 367–371.
(30) Elliott, S.; Lackner, K. S.; Ziock, H. J.; Dubey, M. K.; Hanson, H. P.; Barr, S.; Ciszkowski, N. A.; Blake, D. R. Compensation of atmospheric CO_2 buildup through engineered chemical sinkage. *Geophys. Res. Lett.* **2001**, *28*, 1235–1238.
(31) Johnson, N. A. C.; Blake, D. R.; Rowland, F. S.; Elliot, S.; Lackner, K. S.; Ziock, H. J.; Dubey, M. K.; Hanson, H. P.; Barr, S. Chemical transport modeling of potential atmospheric CO_2 sinks. *Energy Convers. Manag.* **2003**, *44*, 681–689.
(32) Fujimura, K.; Matsui, T.; Izumiya, K.; Kumagai, N.; Habazaki, H.; Kawashima, A.; Asami, K.; Hashimoto, K. Oxygen evolution on manganese-molybdenum oxide anodes in seawater electrolysis. *Mater. Sci. Eng., A* **1999**, *267*, 254–259.
(33) Caldeira, K.; Wickett, M. E. Anthropogenic carbon and ocean pH. *Nature* **2003**, *425*, 365–365.
(34) Hilbertz, W. Solar-generated building material from seawater as a sink for carbon. *Ambio* **1992**, *21*, 126–129.
(35) Bourgeois, R. *Alkaline Electrolysis Final Technical Report, DOE Award DE-FC36−04GO14223*; General Electric Global Research Center: Niskayuna, NY, 2006; Available at http://www.osti.gov/bridge/servlets/purl/886689-RWJlW5/886689.PDF.
(36) Willett, J. C. Stone, Crushed. In *2006 Minerals Yearbook*; USGS: Reston, VA, 2007.
(37) Hudson, W. R.; Little, D.; Razmi, A. M.; Anderson, V.; Weissmann, A. An Investigation of the Status of by-Product Fines in the United States, Report ICAR-101-1; International Center for Aggregates Research: Austin, TX, 1997.
(38) Pacala, S.; Sokolow, R. Stabilization wedges: Solving the climate problem for the next 50 years with current technologies. *Science* **2004**, *305*, 968–972.
(39) *World Energy Outlook*; International Energy Agency: Paris, 2006.
(40) Archer, D.; Kheshgi, H.; Maier-Reimer, E. Multiple timescales for neutralization of fossil fuel CO_2. *Geophys. Res. Lett.* **1997**, *24*, 405–408.
(41) Rau, G. H.; Caldeira, K. Enhanced carbonate dissolution: A means of sequestering waste CO_2 as ocean bicarbonate. *Energy Convers. Manag.* **1999**, *40*, 1803–1813.
(42) Caldeira, K.; Rau, G. H. Accelerating carbonate dissolution to sequester carbon dioxide in the ocean: Geochemical implications. *Geophys. Res. Lett.* **2000**, *27*, 225–228.
(43) Rau, G. H.; Knauss, K. G.; Langer, W. H.; Caldeira, K. Reducing energy-related CO_2 emissions using accelerated weathering of limestone. *Energy* **2007**, *32*, 1471–1477.
(44) Golomb, D.; Pennell, S.; Ryan, D.; Barry, E.; Swett, P. Ocean sequestration of carbon dioxide: Modeling the deep ocean release of a dense emulsion of liquid CO_2 in water stabilized by pulverized limestone particles. *Environ. Sci. Technol.* **2007**, *41*, 4698–4704.
(45) Rogner, H.-H. Energy resources. In *World Energy Assessment: Energy and the Challenge of Sustainability*; United Nations Development Program: New York, 2000.

ES800366Q

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April 28, 2011

Ms. Nancy Sutley, Dr. John Holdren and Members
National Ocean Council
c/o Council on Environmental Quality
722 Jackson Place NW
Washington, DC 20503

Re: CSO Recommendations on *Objective 5: Resiliency and Adaptation to Climate Change and Ocean Acidification*

Dear Chairs Sutley and Holdren, National Ocean Council Members:

On behalf of the Coastal States Organization (CSO), we offer the following recommendations to the National Ocean Council (NOC) for use in developing a Strategic Action Plan for *Objective 5: Resiliency and Adaptation to Climate Change and Ocean Acidification*. Since 1970, CSO has represented the interests of the Governors of the nation's thirty-five coastal states and territories, including the Great Lakes states, on issues relating to the sound management and development of coastal and ocean resources. CSO applauds the *Final Recommendations of the Interagency Ocean Policy Task Force* as it represents the evolution of the nation's management of ocean and coastal resources in a balanced approach.

Widespread climate-related changes already are being observed in the United States and its coastal waters and are only expected to grow. The socioeconomic and environmental impacts associated with climate change and ocean acidification are also projected to be most significant in the densely populated coastal areas of the United States.[1] Coastal communities are particularly 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 (thermal stratification) characteristics of marine systems, saltwater intrusion into groundwater aquifers, increased harmful algal blooms, spread of invasive species, habitat loss, species migrations, and changes in population dynamics among marine and coastal species. Climate change is having, and will continue to have, immediate and lasting effects on our nation's coasts, oceans, and Great Lakes, and the coastal economies dependent on the health of these ecosystems. Increasing the resiliency

[1] It is estimated that by 2020, nearly 75 percent of the U.S. population will live within 10 miles of the coast.

of our oceans, coasts and Great Lakes will require adaptation solutions that cross federal, state, regional, and local programs, policies, and political jurisdictions.

As the development of the Strategic Action Plan moves forward, CSO urges the National Ocean Council to consider CSO's recommendations and to value state and territorial input in order to successfully advance this objective and institutionalize the effort within the federal government. CSO's top recommendations for *Objective 5: Resiliency and Adaptation to Climate Change and Ocean Acidification* are as follows.

1. Build Upon Efforts of Coastal States and Regions
   Federal agencies should actively engage state coastal zone management programs to identify climate change impacts, vulnerabilities, and opportunities for adaptation. State and local governments have immediate responsibilities for managing many of the resources and communities that are likely to be impacted by climate change and are in the best position to assess localized impacts and identify vulnerabilities. Because climate impacts and vulnerability vary regionally, adaptation will be most effective when driven by local needs.

   Additionally, many coastal states are already addressing climate change issues through statewide, interagency climate change partnerships or commissions, and state coastal programs are providing information for, or responding to, specific action items generated by these climate commissions. In this capacity, state coastal programs are playing a key role in ensuring the consideration of coastal climate change impacts and examining the social, environmental, and economic impacts of accelerated sea level rise, resulting shoreline changes, and potential adaptation strategies. New policies are being developed at the state and local level to address the siting of public infrastructure, site-level project planning, wetland conservation and restoration, shoreline building setbacks, building elevations, and alternatives to shoreline "armoring." The Federal government can learn from these efforts and should coordinate as appropriate.

2. Define a Clear Federal Strategy for Intergovernmental Coordination
   Coastal states recommend a clear federal strategy for intergovernmental coordination on coastal adaptation to climate change. It will be important to define the roles of the various agencies and the mechanisms by which federal programs will coordinate with state partners on coastal adaptation. A key component of this strategy should be a new, stronger focus on interagency cooperation between the National Oceanic and Atmospheric Administration (NOAA), the Federal Emergency Management Agency (FEMA), the Department of the Interior (USDOI), including the U.S. Geological Survey (USGS) and the Fish and Wildlife Service (USFWS), state coastal programs and floodplain managers. The expertise and resources of these agencies should be leveraged to ensure a robust and coordinated strategy.

3. Adopt Integrated Approaches
   Because impacts from climate change will be experienced across all sectors, adaptation strategies should be incorporated into core policies, planning, practices and programs. Pre-disaster response and recovery plans, for example, should consider climate change and include adaptation planning. Integrated adaptation planning across various agencies will not only help ensure a coordinated approach but also increase efficiency.

Additionally, CSO encourages improved integration between adaptation planning for the built and natural environments. The built and natural environments are inextricably linked and facing similar impacts from climate change. Both environments should be considered in comprehensive adaptation planning.

Short Term Actions

In the short-term development of the Action Plan, CSO recommends that the National Ocean Council consider the following recommendations and develop supporting actions.

Acknowledge CZMA as Foundational Tool

The federal Coastal Zone Management Act (CZMA) should be recognized as one of the primary statutes that can foster adaptation to climate change at the state and local levels. For coastal states, the CZMA is a legal and policy foundation for many of the identified priorities in the National Ocean policy, and, along with existing state authority, provides tools and authority for effective coastal management. As state and local governments consider future climate change policies and strategies, coastal zone management programs will play an important role in identifying vulnerabilities and fostering adaptation to climate change. Without the CZMA, many states would not be taking action on climate adaptation plans.

CSO supports reauthorizing the CZMA with a strengthened authorization for climate change-related activities and funding to voluntarily develop and implement coastal adaptation plans that recognize the individual needs of each state, commonwealth, and territory, while building into a proactive national strategy.

Related Obstacles:

- **Impacts from climate change vary regionally.** The Strategic Action Plan should acknowledge this variability and allow flexibility to adapt to unique regional, state and local conditions, including political will, environmental pressures, data availability, and stakeholder processes. Climate change adaptation will be most effective when driven by local or regional risks and needs.

Incentivize Sustainable Adaptation & Identify Policies and Programs that Reduce Resilience

CSO encourages federal agencies to provide incentives for sustainable adaptation planning and activities across federal programs, funding, and regulatory approvals as well as offering grants to states taking voluntary action to address climate risks and increase community resilience. CSO also recommends identifying federal policies, programs, and projects that potentially reduce coastal community resilience. Adaptation activities should enhance, not undermine, community, ecosystem, and wildlife resilience.

Federal funding should be prohibited for infrastructure improvements where there is a reasonable basis to think that such infrastructure will either increase vulnerability to the effects of future climate conditions and/or will require remedial improvements or repairs due to the effects of climate-related events or conditions. For example, the National Flood Insurance Program (NFIP) should be modified to restrict coverage for building/re-building in high hazard and environmentally sensitive areas.

Related Obstacles:

- **Continued public and private investment in real property and improvements on properties located in areas subject to hazard events.** Market and regulatory mechanisms for assigning economic value to property and improvements in areas subject to hazards may not adequately reflect the true cost to recover from catastrophic events. The public underwrites much of the cost of protecting or maintaining development in areas subject to natural hazard events.

- **The perceived "high" cost for investing now in adaptation actions, when benefit of actions will not be realized until 20-50 years from now.** Urgency is lost when impacts are projected too far into the future. It will be critical to emphasize near-term consequences with supporting facts.

- **In many coastal areas, current development patterns and planned "build-out" areas have already been determined by local land use plans and are often located in areas vulnerable to future hazards.** The challenge is to address plans developed 10 -20 years ago that allow residential areas and/or infrastructure to be built in future hazard areas.

Create a Mechanism to Provide Consistent Funding

State coastal programs have used some core federal program funds (CZMA Section 306) to support climate change-related activities, and are increasingly utilizing CZMA Section 309 Enhancement Grants to study or plan for climate change impacts. Some coastal programs have also pursued funds from a variety of other state and federal sources. However, a more consistent funding mechanism to support climate change adaptation efforts is needed. Funds are needed for research and data acquisition, as well as to expand permitting and enforcement/compliance activities. Additionally, technical and planning staff is needed to work with existing coastal program staff, other federal, state, and local agencies, and academia to address key climate change issues and to build capacity.

Improve Availability of Data and Communicate Best Practices

CSO recommends establishing peer-reviewed methodologies for developing future climate scenarios and projections for sea level rise, storms, precipitation, and other climate variables. Several federal agencies, including NOAA, USGS, FEMA, USDOI, USDA, have expertise and/or data that would provide the foundation for and inform the development of such methodologies and scenarios.

Coastal programs are also interested in decision-support tools that compile historical shorelines, geomorphology, socioeconomic data, and model projections, as well as increased federal guidance on best practices, case studies, trainings, workshops, and/or software tools focused on community-level and statewide vulnerability assessments and adaptation planning. CSO also recommends enhancing communication and public outreach about climate change impacts and resiliency, and translating climate change science to be more accessible to local planners, decision-makers and the public.

For example, states would benefit from improved interpretation of NFIP maps and better guidance on how to enhance messaging and utilize tools (i.e., inundation maps) at the local level. Additionally, "future conditions mapping" that incorporates coastal erosion and anticipated future sea level rise projections on FEMA flood maps would be invaluable to the local planning process.

Mid-Term Actions

In the development of the Action Plan, CSO recommends that the National Ocean Council acknowledge the following recommendations and develop supporting actions critical to the mid-term success of climate change adaptation efforts.

Support Data and Information Sharing

CSO recommends developing regional, intergovernmental, climate adaptation "clearinghouses" to facilitate the acquisition and exchange of data, information, and best practices among federal, state, and local programs.

CSO supports the proposed NOAA National Climate Service as a potential mechanism to increase intergovernmental coordination and more efficiently and effectively respond to the demand for accessible and timely scientific data, information, and decision support services to help cities, states and tribes assess climate vulnerabilities, increase community resilience, and develop climate change adaptation plans.

Revise Infrastructure Standards

CSO recommends revising standards for federally-funded infrastructure investments so that they reflect likely future climate conditions. CSO also encourages the creation of guidelines, in consultation with the states, on how states can modify development standards to plan infrastructure that will withstand likely future climate conditions. It will be important to develop guidance on how to integrate likely future costs and benefits into the consideration of present-day policy options for planning for climate variability.

Long Term Actions

In the development of the Action Plan, CSO recommends that the National Ocean Council acknowledge the following recommendations and develop supporting actions critical to the overall success and long-term foundation of climate change adaptation in the regions.

Sunset Policies and Programs That Do Not Support Climate Adaptation Goals

To improve the resiliency of coastal communities to the effects of climate variability and change, terminate or sunset federal policies, practices, and projects that place communities at increased risk of damage from climate-related events.

Provide a Flexible Approach

CSO recommends that the Strategic Action Plan continue to allow flexibility to adapt to unique regional, state and local conditions, including political will, environmental pressures, data availability, and stakeholder processes. A successful Strategic Action Plan for climate change adaptation and ocean acidification will enable flexibility in regional approaches and

implementation. Flexibility is critical to building a robust and resilient process that can accommodate uncertainty and change.

Develop Capacity at All Governance Levels
With increased capacity, practitioners can define and develop planning processes, and consensus building tools, acquire and analyze data and information, implement strategies, enforce mechanisms and monitor activities. As mentioned in previous recommendations, coastal states need continued support and funding for climate change adaptation efforts.

Develop Review Process
CSO recommends that the Strategic Action Plan implement a systemic periodic review process to evaluate the climate change adaptation efforts across all agencies and jurisdictions. Adaptation is a long-term issue where success and impacts avoided are not always obvious. Milestones are needed.

Transformative Opportunities
Within the climate change adaptation objective, there are several opportunities for transformative change in the stewardship of our oceans, coasts, and Great Lakes. First and foremost, there is an opportunity to respond to existing climate change impacts in the near term while taking steps to better understand and prepare for future climate conditions over the long term. There is also an opportunity to build strong, productive linkages between the states, federal government, and other stakeholders. Because the impacts of climate change vary regionally, an opportunity exists to develop a regional framework for federal-state coordination on climate change adaptation.

Additionally, there is an opportunity to identify high hazard areas where infrastructure should not be permitted to be rebuilt in the event of catastrophic loss, as well as protect areas that provide ecosystem services to support resilient ecosystems and communities (i.e. acquire upland areas adjacent to wetlands to ensure wetland migration is possible; restoring habitat, wetlands that provide natural flood control and storm attenuation benefits).

Milestones and Performance Measures
CSO recognizes that the milestones and performance measures will play an important role in providing credibility to the implementation of the climate change adaptation objective. CSO recommends consideration of the following measures to evaluate progress:

- The number of communities that have adopted measures to improve resilience, implement climate adaptation policies or ordinances or include a Climate Action Plan/Adaptation Strategy in General Plan;

- The amount of capital improvements (in constant dollars) in areas at increasing risk of damage due to climate-related events and,

- The reduction in repetitive building in areas with high vulnerability to disruptive climate events and impacts.

Depending on the specific steps contained within the Strategic Action Plan for *Objective 5: Resiliency and Adaptation to Climate Change and Ocean Acidification*, CSO looks forward to discussing in more detail appropriate milestones and performance measures.

The states and territories strongly support the NOC in its work to implement the climate change and ocean acidification objective. CSO appreciates the opportunity to comment and work with the National Ocean Council on this Action Plan.

Sincerely,

Braxton Davis
Chair
Coastal States Organization

Kristen M. Fletcher
Executive Director
Coastal States Organization

Comments for the National Ocean Policy Strategic Action Plans from the National Council for Science and the Environment's 11th National Conference on Science, Policy and the Environment: Our Changing Oceans

For three days in January 2011, the National Council for Science and the Environment (NCSE) convened 1,250 leaders in ocean science, policy, management and education, conservation and business to explore issues affecting the world's changing oceans. Their objectives were to advance science based decision-making on oceans by:

1. sharing the most current state of the science;
2. linking science to policy and other decisions;
3. communicating key messages and reframing issues;
4. developing targeted and actionable recommendations; and,
5. catalyzing long-term collaborations

Meeting participants put forth a spectrum of ideas on specific challenges facing the world's oceans. Here we present those recommendations that are germane to the National Ocean Policy process, mapped onto the nine Priority Objectives from the Final Recommendations of the Interagency Ocean Policy Task Force. Recommendations that were not targeted for the National Ocean Policy Strategic Action Plans (e.g., recommendations directed at Congress or the private sector) are not included here.

Because there is considerable overlap among these priority areas, some recommendations are included in more than one area, but we also encourage those working on individual priorities to view recommendations in related areas (for example, ecosystem-based management is very much connected with marine and spatial planning).

Because of the nature of the conference, there is considerable diversity in the types of ideas put forth - research, policy, education and outreach; regional, national and international; single agency, multi-agency and public-private partnerships. There is also considerable diversity in the budgetary implications of the recommendations. We recognize that the current budgetary situation places considerable constraints on the NOC process; constraints that may limit that ability of the government to implement some excellent ideas contained in this document. We ask you to be a forward looking as possible in considering the recommendations included here and "do your best."

In addition to the nine priority areas, we encourage the National Ocean Council to develop sets of cross-cutting recommendations in the areas of education (including public education, and pre-professional STEM and workforce education as well as attention to diversity of those knowledgeable about the oceans) and science (inventory and monitoring, observations, and fundamental and applied research). We are concerned that without such cross-cuts, the need for a comprehensive and integrated approach to ocean and coastal education and research, is not likely to be addressed.

We also encourage cross-cutting looks at particular issues such as the importance of oceans for human health and well-being and energy – both traditional (oil and gas) and alternative (wind and waves).

These recommendations are presented in spirit of constructive suggestions from the conference participants. Not all of the conference participants endorse all of the recommendations, and no recommendation should be interpreted as official input from the organizations where conference participants work. For additional information about the conference please go to www.OurChangingOceans.org.

We hope that you find this input helpful. We would be pleased to meet with the members of the National Ocean Council and your various teams and to assist in other ways.

Best wishes and success with your important work.

Margaret Leinen
Conference Chair

Peter Saundry
Executive Director

Priority Area 5. Resiliency and Adaptation to Climate Change and Ocean Acidification

In order to strengthen resiliency of coastal communities and marine and Great Lakes environments and their abilities to adapt to climate change impacts and ocean acidification, the Federal Government and its agencies should:

A. Develop an Oceans and Climate Change Initiative to coordinate agency activities to collectively and collaboratively manage the 1.76 billion acres of marine area under federal jurisdiction.

A. Help avoid "maladaptation" of the coast by:

   i. Mainstreaming coastal adaptation and provide incentives for adaptation planning and activities across all federal programs, funding and regulatory approvals.

   ii. Adopting policies that support implementation of large-scale ecosystem-based adaptation and green infrastructure into coastal adaptation and planning.

   iii. Providing funding and incentives to plan and implement multidisciplinary coastal adaptation projects that include social, economic, and natural sciences.

   iv. Developing an interagency online clearinghouse and community of practice for coastal adaptation information, databases, and models.

   v. Develop a federal interagency communication and education strategy addressed to decision makers and the public.

   vi. Requiring the inclusion of coastal adaptation planning into pre-disaster response and recovery plans.

B. Strengthen ocean resiliency (e.g., Marine Protected Areas (MPAs)).

C. Emphasize the importance of regional approaches to climate change adaptation solutions both within and outside the US;

D. Incorporate climate change and sea level rise considerations in macroeconomic policymaking, prioritizing climate stability in relation to GDP growth in order to ensure long term ecological and economic security.

E. Maintain satellite observations of sea level change as a priority.

F. Recognize in climate change discussions, governments and intergovernmental bodies (e.g. IPCC, Climate Convention of Parties) the importance of coastal and ocean carbon sequestration.

G. Within budget constraints, fund more research into sea level change, including adaptation strategies and current impacts on human population, ecosystems, and economies.

H. Invest in mutli-disciplinary research on geoengineering to consider efficacy, ecological impacts and ethical aspects to consider whether such options can be utilized.

I. Provide an annual projection of sea level rise for policymakers and the public.

J. Take into account sea level rise of up to two meters in long-term coastal planning.

K. Support local and regional planners to develop better knowledge on how activities within watersheds affect receiving waters.

L. Restore and mitigate wetlands and floodplains, including through public-private partnerships.

M. Take immediate action to conserve ecosystems that are already known to sequester carbon, while supporting research on coastal and ocean carbon sequestration.

N. Update the CZMA regulations to require effective and strong enforcement of state and local coastal management plans and recertification of local plans.

O. Ensure that the U.S. Army Corps of Engineers' cost/benefit analysis includes ecosystem services and elevates the importance of these services to be a primary concern.

Index:

Attachments to Comments

And Letters Received

Pertaining to Resiliency and Adaptation to Climate Change and Ocean Acidification and Other Strategic Action Plans

SPO Maine State Planning Office
Executive Department

PAUL R. LEPAGE
Governor

DARRYL BROWN
Director

April 29, 2011

Nancy Sutley, Chair
Council on Environmental Quality
The White House
1600 Pennsylvania Avenue, NW
Washington, DC 20500

FILED ELECTRONICALLY

RE: National Ocean Council; Comments on the strategic plans to address national objectives

Dear Ms. Sutley:

We are writing in response to the January 24, 2011, Federal Register notice published by the Office of Science and Technology Policy.[1] The notice solicits comments for consideration by the National Ocean Council (NOC) in developing proposed strategic action plans for the nine priority objectives which are identified in final recommendations of the CEQ-led Interagency Ocean Policy Task Force (Task Force) and incorporated by reference in Executive Order 13547. The State of Maine has grave, fundamental concerns about the establishment of such a far-reaching policy, and its associated initiatives, that are completely outside the legislative process and in a manner that not only bypasses, but completely excludes, current statutorily established decision making bodies.

Overview:

Maine has a strong and enduring interest in protecting and enhancing the biological productivity of the ocean environment and opportunities for related beneficial human uses, such as commercial fishing, and both exercises its constitutional rights and participates in statutorily mandated regional resource management bodies whose authority has been established by statute and supersede those of the National Ocean Policy (NOP). Ensuring compatibility and minimizing potential conflicts among fishing and other valuable, traditional ocean uses and promising, emerging uses of the marine environment, such as deep-water offshore wind energy production, needs to be among the primary objectives of coastal and marine spatial planning and needs to be conducted under the aegis of those states and statutorily mandated regional resource management bodies. Accordingly, we urge the NOC to ensure that its strategic action plans

[1] The Maine State Planning Office (SPO) developed these comments in consultation with the Office of the Governor, Maine Departments of Marine Resources, Environmental Protection, and Conservation. SPO's duties include administration of the State's networked coastal zone management program.

answer to and serve these core interests and authorities, which are vitally important not only to Maine but to the nation as a whole.

Coastal and marine spatial planning (CMSP) is a central and defining feature of the NOP and a principal engine of change that may drive action and progress in meeting a number of the Policy's objectives. We recognize that CMSP has the potential to serve the above-noted, overarching public policy goals and to facilitate optimal use of the marine environment. Realization of that potential is, however, contingent on a number of factors, chief among them assurance that:

- Coastal marine spatial plans are conceived as dynamic, information-oriented tools to be employed by public and private decision-making bodies established by statute, operating under the constitutional authority of states, tribal or other authority, as opposed to static, prescriptive zoning plans that may both unduly hamper existing uses and discourage investment and innovation related to emerging uses;

- There is adequate representation of fisheries managers and the interests of the fishing industry and other existing users and stakeholders of the marine environment, including seats at the decision-making table for representative of states and of statutorily mandated regional resource management bodies such as the New England Fisheries Management Council (NEFMC) as well as interstate management bodies such as the Atlantic States Marine Fisheries Commission (ASMFC), at all planning and decision-making stages;

- Expectations regarding state contribution to CMSP efforts, including the nature and extent of state agencies' participation, are commensurate with resources available for plan development, implementation, and on-going improvement of information resources;

- Maine's interests are considered on par with those of other more densely populated and more developed states in its Northeast planning region; and

- The unique resources and environmental conditions of Maine’s coastal waters, which are generally subject to a lower degree of upland development-related influences than those of other Northeast states and not currently significantly exploited for commercial interests, are taken into consideration when evaluating and accurately reflected in developing policy options that may affect uses of or in its coastal waters.

The following comments highlight specific issues or concerns regarding several SAP objectives and are divided into recommended short, medium, and long-term actions.

Objective 1: "Ecosystem-Based Management: Adopt ecosystem-based management as a foundational principle for the comprehensive management of the ocean, our coasts, and the Great Lakes"

Short term:

- Clarify EBM definition. To ensure a shared understanding and facilitate comparison and assessment of relevant initiatives, the NOC should clearly define "ecosystem-based management" (EBM) as used in its strategic plans and related activities. This definition should be well-adapted to CZMA-based coastal planning and management; and consequently should specify that EBM is an approach and tool for use by managers of statutorily mandated resource management bodies to use in the exercise of their responsibilities and authorities The NOC's plan should recognize that such an approach necessitates and identifies sources for additional federal funding support, through the CZMA or otherwise, to ensure state-level capacity for:

    - scientific research to improve understanding of current environmental conditions, stressors, and impact thresholds;

    - a robust public process conducted under statutorily mandated regional resource management bodies to develop ecosystem values;

    - design and implementation of regulations based on sound science;

    - programs that monitor effectiveness and the ability to develop and populate indicator programs; and

    - translation of all of the above into outreach and education materials for a variety of audiences.

- Ensure NOC and fisheries-related EBM efforts are complementary. Fisheries management councils established under the Magnuson-Stevens Fisheries Conservation and Management Act (MSFCMA) have been leaders in the field of ecosystem based management and their work, and related focus on fisheries habitat issues, continues to evolve. NOC staff has reportedly advised that it is researching whether under the Federal Advisory Committee Act (FACA), MSFCMA councils, which are not executive branch agencies directly subject to the terms of Executive Order 13547, may participate on the Regional Planning Bodies (RPB) charged with developing CMSPs. Although NMFS, with whom the councils work closely, is on the NOC, statutorily mandated regional resource management bodies do not have a seat at the NOC. It is essential to include the statutorily mandated regional resource management bodies at the decision-making table, in particular at the NOC in addition to the RPB, and we object to the use of the Executive Order in an attempt to supersede or conflict with their legislative authority. The NOC's deliberations must include well-informed representation of fishing interests at all planning and *decision-making stages*. See also related comment regarding objective 2 (coastal and marine spatial planning).

- **Ensure eco-regional assessment serves states' needs**. The NOC should ensure opportunity for coastal states' active involvement in the design and implementation of eco-regional assessments. To optimize the assessments' utility for state coastal managers, the data used needs to be sufficiently detailed to capture the specific environmental conditions in states in a region. For example, use of the National Coastal Condition Assessment, which employs probabilistic (random) sampling, would be problematic. Many states, including Maine, have repeatedly objected to this approach; it enables generalized condition assessments that facilitate comparison of one state to another but it is of limited use in addressing specific, in-state problems that require coastal states' time, attention, and funds.

Medium term:

- Remove obstacles to federal agencies' consideration of state-produced data. The NOC should identify obstacles to and develop recommendations for changes in law and policy as needed to facilitate federal agencies' use of state-produced environmental data. Maine DEP, for example, notes that it has had difficulty sharing data with EPA even though it considers the state information superior to that used by EPA.

- Ensure well-coordinated monitoring efforts. Assurance of effective monitoring of ocean and coastal resources and key environmental conditions needs to be a centerpiece among NOC's strategies. At present, existing monitoring efforts are not effectively networked and integrated. The NOC, with assistance from the National Research Council, should:

    - inventory existing ocean and coastal resources-related monitoring efforts, particularly those supported with federal funds;

    - review past attempts to establish pertinent national or regional monitoring networks as a source of "lessons learned" and identify and present to state, federal and other statutorily mandated resource management bodies opportunities for coordination among related efforts and for consolidation of closely-related and potentially redundant efforts to optimize use of available funding; and

    - develop means to facilitate consistency and public availability of monitoring data collected, developed, or managed with federal funding support.

- Address data gaps. Notable gaps exist in key data about the marine environment and related human uses. The NOC's EBM strategy should include development of a well-concerted federal effort to ensure availability of improved and on-going collection, assessment, and management of offshore data needed to support decision making by both private interests and statutorily mandated regional resource management bodies. For example, seafloor mapping of OCS areas off Maine is sparse. This information is useful in defining ecosystems and identifying suitability for economic opportunities, such as commercial fishing and ocean energy development. In developing this strategy, the NOC should identify key data gaps, inventory current federal programs that support collection

of ocean and coastal data, and identify steps to ensure that federal agencies implement these programs in a manner well coordinated with state and statutorily mandated regional resource management bodies and that optimizes use of available federal resources in filling these data gaps.

Long term:

- Develop in conjunction with statutorily mandated regional resource management bodies and states an on-going federal program to support data collection, assessment, and management. Effective coastal and marine spatial planning will require consideration of and ease of access to the best available data. This necessitates updating and on-going management of information resources. The NOC should develop CZMA-based or other federal programs that provide opportunity for a stable, on-going source of federal funds to help support data collection, assessment, and management and other activities at the state and regional levels that are necessary to ensure the utility and continued refinement of coastal and marine spatial plans.

Objective 2: "Coastal and Marine Spatial Planning [CMSP]: Implement comprehensive, integrated, ecosystem-based coastal and marine spatial planning and management in the United States."

Short term:

- Ensure representation of fisheries management-related interests in decision making. Commercial fishing is among the predominant uses of the marine environment and has long provided significant sustainable economic benefits to Maine and the nation as a whole. The MSFCMA provides a statutorily established, science-based framework for management of fishing activities throughout the EEZ by industry, the public, as well as coastal states, which, in turn, manage fishing under constitutional authority in their territorial waters. It is essential that the NOC ensure that CMSP is undertaken with full respect for and recognition of MSFCMA-related, interstate, and state fisheries management decisions, authorities, and responsibilities. As noted above, the NOC's staff has reportedly advised that it is researching whether FACA precludes direct representation of MSFCMA councils on the RPBs established by the NOP. . We find exclusion of the councils from a central role in NOC-related planning and decision making, particularly the NOC itself, unacceptable. In addition, Maine is a member of the ASMFC, which serves as a deliberative body, coordinating the conservation and management of the states shared near shore fishery resources – including lobsters, shrimp and herring – for sustainable use. We strongly urge Presidential amendment of the NOP and associated provisions of regulation, if and as necessary, to ensure full, decision making representation by such statutorily established bodies.

- Avoid unfunded mandates or expectations. At this point, the federal government has provided no additional funds for coastal states, federal agencies, or statutorily mandated regional resource management bodies, to support their involvement in CMSP efforts

under Executive Order 13547. Under these circumstances, we strongly object to any move by the NOC to establish objectives or expectations regarding state participation in development and implementation of CMSP that are not matched with an identified source of federal support. CMSP should not become or be seen as a new unfunded federal mandate or a source of unrealistic public expectations.

- Planning areas. The geographic scope of the planning area on which the regional planning bodies will focus needs to be shaped by and commensurate with the available resources. It may be unworkable and unrealistic in one or more regions to develop a CMSP that includes all marine waters, from estuaries to the limits of the EEZ. We suggest that each region rightfully defer to the relevant statutorily mandated regional resource management bodies and states in defining planning areas to allow its work to reflect regionally specific social, political, and ecological considerations. This flexible approach would reflect and support region-specific issues and make the CMSP effort more efficient and more effective by building on existing efforts and institutions.

- Recognition of sub-regional differences and state autonomy. Provisions for development and implementation of regional CMSPs should ensure that each state retains its autonomy and a co-equal role among states in its region. While Maine has worked well and values its collaboration with neighboring coastal states through NROC and other regional efforts, a number of significant differences exist between Maine's coastal character, the substantially greater length of our coastline, the diverse environmental and ecological conditions, and the greater proportion of our economies being marine resource base, and those of southern New England. A uniform, regional approach to a variety of issues may not be appropriate. The Federal Consistency provision in the CZMA requires that Federal actions that may have reasonably foreseeable effects on any coastal use or resource, either directly or indirectly, be consistent with the enforceable policies of National Oceanic and Atmospheric Administration (NOAA) approved state coastal management programs. CZMA consistency determinations must be submitted to the state for review to address federal actions that may occur both in and beyond the coastal zone, such as energy projects, which have the potential to impact coastal uses or resources, such as Maine's commercial fisheries. Adhering to the CZMA Federal Consistency provision will help to avoid or reduce long term use-conflicts, as it will allow for each state to be consulted, allowing for sub-regional differences to be addressed including through existing, statutorily mandated regional resource management bodies before activities take place, thus ensuring the success of proposed activities in coastal waters.

- Support necessary stakeholder engagement. The NOC's strategic plan should emphasize the importance of, encourage, and identify additional federal resources to help support the well-informed engagement of statutorily mandated regional resource management bodies, marine harvesters and other public stakeholders in the CMSP process.

- Adopt result-oriented performance measures. CMSP is a process tool; even an excellent plan is not, in and of itself, a sufficient outcome. The NOC should, in consultation with statutorily mandated regional resource management bodies, adopt concrete, action-oriented performance measures, such as reduction of permitting time in pre-planned

areas, renewable ocean energy generation capacity approved for siting, or other measures that by their nature demonstrate efficient, technically-sound, and well-coordinated governmental decision-making that fosters and avoids and minimizes conflict among beneficial uses of our shared marine environment.

- BOEMRE and CMSP. Working to address national renewable energy policy goals, the Bureau of Ocean Energy Management, Regulation, and Enforcement (BOEMRE) is moving forward in cooperation with coastal states to identify OCS areas that may be well-suited to offshore wind energy development. While we do not suggest that BOEMRE in any way slow the progress of its work to facilitate well-sited renewable offshore energy development, the NOC should clarify the relationship between BOEMRE's on-going efforts, including its work with state task forces, and regional planning bodies' efforts to develop CMSPs, with particular attention to how these efforts will be integrated. An agreement between the NOAA and BOEMRE establishing a framework to facilitate coordination on OCS renewable energy development is needed to assist in these goals.

Medium term:

- Concurrent review of the federal governance framework. The NOC should undertake a concerted, interagency federal effort, in conjunction with statutorily mandated regional resource management bodies, to identify and develop recommendations for statutory and regulatory changes to address inefficiencies, conflicts, and other potential obstacles to streamlined, well-coordinated federal decision making regarding renewable ocean energy and other development activities in the marine environment. Proactive preparation of this analysis is necessary for to regional planning bodies in developing realistic CMSPs. Needed improvements in the federal governance framework would facilitate their implementation and effectiveness.

Objective 4: "Coordinate and Support: Better coordinate and support Federal, State, tribal, local, and regional management of the ocean, our coasts, and the Great Lakes. Improve coordination and integration across the Federal Government and, as appropriate, engage with the international community."

Short term:

- Ensure interagency coordination and collaboration. Effective coordination and assurance of collaboration among federal agencies, states and statutorily mandated regional resource management bodies, and others participating in the CMSP, and all other NOC strategies, is a prerequisite for success. Without the presence at the decision making table - not just advisory boards - for states and statutorily established resource management bodies, this process will fail. Further, the NOC should emphasize the importance of and identify specific tools to authorize and facilitate a coordinated and integrated effort at both the field office and headquarters levels among federal agencies states statutorily mandated regional resource management bodies.

Medium term:

- Optimizing the utility of the NEPA process. The NEPA process offers opportunity for environmental review that supports decision-making by a variety of agencies, states and statutorily mandated regional resource management bodies. An agency's participation in the NEPA process as a cooperating agency (when it is not the lead agency for NEPA review) may ensure that issues are addressed as necessary to support and help streamline its own environmental review, leasing, or permitting decision. The NOC should explore and develop standardized practices for federal agencies' participation as cooperating agencies that are designed to streamline the overall federal environment review, leasing, and permitting process, and for comprehensive, transparent communication between federal agencies, states, statutorily mandated regional resource management bodies and other bodies. Such practices may include a schedule for early identification of all environmental approvals needed for the activity subject to NEPA review and agencies' related information needs, coordination or consolidation of agency review procedures, and development of a detailed schedule for completion of all requisite reviews. The National Marine Fisheries Service (NMFS), for example, has developed spatial planning concepts through the identification of Essential Fish Habitat (EFH). The EFH designations are currently in the final stages of approval at the NEFMC, but they will not be implemented before BOEMRE's offshore wind site identification. Nonetheless, the NEPA review process will rightly allow for the final EFH designations to be submitted as part of a "body of knowledge" in the final site selections for offshore wind, thus providing for a more informed decision making process as well as potentially reducing user-conflicts in the long run.

Objective 5: "Resiliency and Adaptation to Climate Change and Ocean Acidification: Strengthen resiliency of coastal communities and marine and Great Lakes environments and their abilities to adapt to climate change impacts and ocean acidification."

Short term:

- Support planning and action at all governmental levels. Coastal states are likely to address climate change adaptation issues in a variety of ways through statutorily mandated regional resource management bodies and other instruments at the regional, state, county, and local levels. Therefore, the NOC's strategic plan should recommend provision of available federal funding support for voluntary climate change adaptation-related planning and action at each of these jurisdictional levels as appropriate to meet coastal states' differing needs and approaches. In addition, in developing the plan, the NOC should inventory and ensure coordination among potential federal funding sources, particularly in light of prospects for reduced federal support for state efforts in this area as reflected in the current year federal budget's proposed elimination of EPA funding.

Medium term:

- Identify additional sources of funding. Climate change is driven by forces beyond the control of state, county, and local governments. If addressed ineffectually, its

consequences would manifest locally as loss or degradation of coastal infrastructure. As a whole, such loss and degradation would have significant adverse effects on our nation's economy and quality of life. The NOC should identify and call for provision of additional federal funds that may be used to ensure a well-coordinated and effective national response to this issue though implementation of its strategic plan.

- **Strengthen authorization in CZMA for climate change-related activities**. The NOC should recommend that as reauthorized the CZMA more clearly support provision of funding for voluntary development and implementation of coastal adaptation plans that recognize the individual needs of each state while building into a proactive national strategy. As noted above, such plans may be undertaken at the county or local level.

Objective 9: "Ocean, Coastal, and Great Lakes Observations, Mapping, and Infrastructure: Strengthen and integrate Federal and non-Federal ocean observing systems, sensors, data collection platforms, data management, and mapping capabilities into a national system and integrate that system into international observation efforts."

- Augment support for federal OCS-focused ocean observing, data collection, and management. Coastal states' ocean observing and related data collection and management efforts focus primarily on nearshore, state coastal waters. At current funding levels, the Integrated Ocean Observing System is not equipped to meet coastal managers' information needs, particularly as related to OCS areas. The NOC strategy should call for identification of coastal managers' current and projected OCS-oriented data and information needs and existing federal resources available to address those needs, and steps to address current or projected gaps in key information.

Thank you for the opportunity to comment, and your agency's on-going efforts to engage coastal states and other stakeholders in the development of these strategic plans. We appreciate the opportunities for and evident attention to comments and suggestions provided by Maine and other coastal states to date on related matters and look forward to continued constructive engagement on issues of concern to our state as this planning process moves forward.

Sincerely,

Darryl Brown
Director, Maine State Planning Office

cc: Carlisle McLean, Office of Maine Governor Paul LePage
Norman Olsen, Commissioner, Maine Department of Marine Resources
Patricia Aho, Deputy Commissioner Maine Department of Environmental Protection
Bill Beardsley, Commissioner, Maine Department of Conservation

April 29, 2011

Ms. Nancy Sutley, Council Chair
National Ocean Council
White House Council on Environmental Quality

Dear Chair Sutley,

On behalf of the Northeast Regional Ocean Council (NROC), the Northeast Regional Association of Coastal and Ocean Observation Systems (NERACOOS), and the Gulf of Maine Council on the Marine Environment (GOMC), we are pleased to provide comments on the National Ocean Council Strategic Action Plans. We applaud the Council for their work to forward the development of Strategic Action Plans for the nine priority objectives, following the guidance provided by the Interagency Ocean Policy Task Force in the July 2010 document *Final Recommendations of the Interagency Ocean Policy Task Force*.

Woven through our comments on the priorities and actions is a need to address clarity and understanding of issues. This includes support for the collection of data for scientists, development of tools for decision makers, and the need to engage stakeholders. An improved understanding of our appropriate management, science or engagement roles in advancing these priorities and actions will greatly enhance our ability to succeed.

NROC, NERACOOS, and GOMC members are available to provide additional information based on our state and regional experiences and expertise.

Respectfully,

Ted Diers, State Chair
Northeast Regional Ocean Council

J. Ru. Morrison, Ph.D., Executive Director
Northeast Regional Association of Coastal & Ocean Observing Systems

Kathleen Leyden, Chair
Gulf of Maine Council of the Marine Environment

The following are combined comments from the Northeast Regional Council on the Ocean (NROC), Northeast Regional Association of Coastal and Ocean Observation Systems (NERACOOS), and Gulf of Maine Council (GOMC) on the National Ocean Council's Strategic Action Plans.

Issue Area - Ecosystem-Based Management

Objective: Adopt ecosystem-based management as a foundational principle for the comprehensive management of the ocean, our coasts, and the Great Lakes.

Actions that would most effectively help the Nation achieve this national priority objectives associated with this issue area:

- Near-term:
    - Identify and engage the right social and natural scientists to uncover the most relevant data and latest thinking about ecosystem services science and resilience science
    - Develop an assessment of social science data gaps and needs – in addition to economics
- Mid-term:
    - Create a suite of decision-support tools for State managers to assess trade-offs and cumulative impacts
    - Provide tools to visualize user conflict scenarios – such as, tools with a gaming interface
    - Develop a suite of ecosystem indicators that can be used in a variety of planning contexts (current work of NCEAS working group, OHI, CI and others)
- Long-term:
    - Use resilience science as a conceptual framework for management and governance approaches
    - Develop evaluative tools to improve messaging of policy and management goals (i.e. how does audience hear the information given and what do they do with it once they hear it, etc)
    - Improve connection between regional partnerships and indicator and monitoring programs, to enable indicator measurement of ecosystem health (social and natural) at various scales

Major obstacles to achieving this objective **and opportunities** this objective can further, including transformative changes in how we address the stewardship of the oceans, coasts, and Great Lakes:

- Obstacles:
    - Complexity of EBM will hamper stakeholders' capabilities to understand approach in concept and apply the approach to their management strategies
    - Lack of social science on stakeholder perceptions, attitudes and behavior – beyond economics (e.g. psychology, sociology, communication, etc).
- Opportunities:

- Jane Lubchenco's recent lecture at Clark University and small-group discussions centered around the dire need to engage social scientists, perhaps starting with a relationship between NOAA and Clark
- Marine InVest as a tool to analyze trade-offs
- The extent to which regional governance partnerships can engage fisheries managers in discussions could lead to more integration and perhaps in the long-term additional policy measures toward resilient fisheries.

Milestones and performance measures that would be useful for measuring progress toward achieving this priority objective:

Milestones	**Performance measures**
All New England States are integrating EBM components into their management strategies and policy directives	This could include many different aspects of EBM or a select few – perhaps the region needs to decide whether there are particular aspects about the EBM approach that are of higher priority than others for States to embrace
The Regional partnership has strong relationships with key social scientists that cover a variety of disciplines	# of social scientists engaged in regional meetings
Regional CMSP plans are adaptive	Performance indicators written into the Plan and discussed in the planning process

Issue Area - Inform Decisions and Improve Understanding

Objective: Increase knowledge to continually inform and improve management and policy decisions and the capacity to respond to change and challenges. Better educate the public through formal and informal programs about the ocean, our coasts, and the Great Lakes.

Actions that would most effectively help the Nation achieve this national priority objectives associated with this issue area:

- Near-term:
  - Develop a nationally consistent framework to capture regional priority issues and information needs through engaging with the Regional Ocean Partnerships such as NROC.
  - Use the annual regional gap analysis that each IOOS region is required to perform as part of the ICOOS Act (2009) as a basis for identifying additional information capacity needed. This regional process, based on the input from the variety of regional

scientific and technical experts, managers, and other users would provide the detail needed to ensure that the national plan(s) addresses the scale and diversity of the nation's ecosystems.
    - Continue the development of a National Information Management System that ensures that diverse types and sources of information can be effectively and efficiently brought together. This needs to include geospatial, historical and real-time information and build on national efforts to develop standards. Regional scale implementation of information systems is the appropriate scale for connection to a number of management needs.
- Mid-term:
    - Empower regional educational collaboration through such organizations as the Northeast Ocean Sciences Education Collaborative (www.neosec.org).
    - Adopt the Ocean Literacy Principles to provide a consistent framework for engaging the public in the importance of the oceans.
    - Use distance learning techniques to bring the oceans to the country's interior and underserved populations.
- Long-term:
    - Provide sufficient funds to allow collection and delivery of regional scale ocean information to address priority needs.

Major obstacles to achieving this objective **and opportunities** this objective can further, including transformative changes in how we address the stewardship of the oceans, coasts, and Great Lakes:

- Obstacles:
    - Lack of communication and cooperation between and within agencies.
    - Lack of sufficient investment at appropriate scale to indentify and fill information gaps.
    - Fragmentation of efforts to provide ocean and coastal information and inform the public on the importance of the oceans
- Opportunities:
    - Regional Ocean Partnerships provide a unique opportunity to identify information needs and the necessary communication between interested parties to fulfill these needs.

Milestones and performance measures that would be useful for measuring progress toward achieving this priority objective:

Milestones	**Performance measures**
Nationally consistent synthesis of regional scale information needs assessments	Gaps analysis by IOOS regional associations
Regional Observing Systems operating a specified base capacity	50% of regional information needs delivered

Issue Area - Resiliency and Adaptation to Climate Change and Ocean Acidification

Objective: Strengthen resiliency of coastal communities and marine and Great Lakes environments and their abilities to adapt to climate change impacts and ocean acidification.

Actions that would most effectively help the Nation achieve this national priority objectives associated with this issue area:

- Near-term:
    - Follow the recommendations of the Ocean Acidification Strategy of the National Research Council and the ORRAP Ocean Acidification Task Force regarding research and monitoring needs. The council should develop a schedule for implementation of their recommendations.
    - Where possible existing observing assets operated by the IOOS Regional Associations should be used to deploy additional pH/pCO2 sensors across a representative diversity of coastal and estuarine locations, especially in areas of marine resource vulnerability (e.g., coral reefs, shellfish beds, etc.). This should build upon efforts such as those of NOAA's Pacific Marine Environmental Laboratory and regional ocean acidification plans.
    - Compile information at the scale not larger than a state to identify the known changes resulting from climate changes as a means to educate the public and decrease the number of skeptics.
- Mid-term:
    - Refine regional and subregional forecasts for key climate change parameters such as precipitation, sea level rise, and temperature for the use of use of different forecasts by states creates confusion for planners at all levels of government. Develop a standardized methodology for surge forecasting. In the Northeast, the U.S. Army Corps of Engineers should update the tidal flood profiles.
    - NOAA/USGS should continue to provide states with data and products to hindcast and forecast rates of shoreline change (e.g., 5-year interval for generation of new mean high water shorelines).
    - Develop more accurate models for flooding from storm surge.
    - Continue to develop federal assessments of coastal vulnerabilities for all regions of the nation (e.g., the U.S. DOT transportation assessments) to identify storm and inundation vulnerabilities that are critical to regional economies.
    - Conduct of investigations to identify offshore sand reservoirs that can be used for beach nourishment.
    - Provide technical and data support for each state to identify priorities that are vulnerable sea level rise/coastal storms and identify those that are regional priorities.
    - Provide adequate funding to the U.S. Army Corps of Engineers to support the survey of coastal erosion and flood control structures. NOAA/US Corps of Engineers/USGS develop models to identify how the level of protection changes with sea level rise.
- Long-term:

- Provide adequate levels of funding to allow the IOOS regional associations to implement coastal hazard observing priorities.
- Support each state in the formulation of a state adaptation plan.

Major obstacles to achieving this objective:

- Obstacles:
  - Federal and state governments support post disaster response and planning but not pre-disaster planning that is need for adaptation planning.
  - New England is a home rule region but adaptation planning requires all levels of government to work together.
  - Adaptation planning requires the conduct of expensive coastal process studies to evaluate the potential impact of potential flood and erosion control solutions.

Milestones and performance measures that would be useful for measuring progress toward achieving this priority objective:

Milestones	**Performance measures**
Data, tools and observations	# of data, tools and observations developed/implemented
	# of state fact sheets about climate changes
	# of ocean acidification recommendations implemented
Vulnerability Assessments	# of state assessments
Adaptation Plans	# of state plans
	# of regional plans
	# FEMA certified communities

Issue Area: Water Quality and Sustainable Practices on Land

Objective: Enhance water quality in the ocean, along our coasts, and in the Great Lakes by promoting and implementing sustainable practices on land.

Actions that would most effectively help the Nation achieve this national priority objectives associated with this issue area:

- Near-term:
  - Reduce of NOx gases in the atmosphere which contribute to eutrophication of estuaries, embayments and near shore waters.
  - Fund stormwater retrofits of outdated systems in coastal areas. Increase funding for CWA Section 319 and CZARA 6217 funding for state programs.
  - Develop and provide consistent funding for integrated coastal monitoring networks in near shore waters under the frameworks of the National Water Quality

Monitoring Council and the Integrated Ocean Observing System that focus on locally important issues.

- Mid-term:
  - Improve outreach and education about sustainable land use practices via national campaigns.
  - Strengthen state Coastal Zone Management Act programs' ability to work on watershed-wide water quality issues.
- Long-term:
  - Align federal policy and funding to focus on sustainable development practices, limiting sprawl and decreasing the impacts of transportation-related pollution.
  - Develop more cost effective water quality treatment processes, especially focused on distributed, low-maintenance systems

Major obstacles to achieving this objective **and opportunities** this objective can further, including transformative changes in how we address the stewardship of the oceans, coasts, and Great Lakes:

- Obstacles:
  - Decreased funding for addressing non-point source related pollution, both CZMA Section 6217 and CWA Section 319 have been reduced.
  - Public perceptions about the importance of water quality given competing social and economic problems.
- Opportunities:
  - Ability to build on existing programs such as EPA's work on nutrient pollution, MS4 permits and other NPDES activities
  - Trend towards increased coordination on data sharing and management at all levels of government and academia.

Milestones and performance measures that would be useful for measuring progress toward achieving this priority objective:

Milestones	**Performance measures**
Decreased eutrophication in estuaries, embayments and near shore waters.	Impaired waters
	BMPs installed
Public is aware of importance of water quality	Increased incorporation of BMPs in local and state regulations; increased use of BMPs by homeowners and developers
	Public perception surveys
	Academic research on social and economic costs of impaired water quality.
Decreased trend in the amount of imperviousness in coastal	Mapping of impervious surfaces by coastal watershed

watersheds.	Increased use of infiltration and treatment technologies

Issue Area: Ocean, Coastal, and Great Lakes Observations, Mapping and Infrastructure

Objective: Strengthen and integrate Federal and non-Federal ocean observing systems, sensors, data collection platforms, data management, and mapping capabilities into a national system and integrate that system into international observation efforts.

General comment: The goal of this issue area to "*Strengthen and integrate Federal and non-Federal ocean observing systems, sensors, data collection platforms, data management, and mapping capabilities into a national system and integrate that system into international observation effort"* is essentially a reiteration of the purposes and intent of the Integrated Coastal Ocean Observing System Act (ICOOS) of 2009. The ICOOS act codified the United States Integrated Ocean Observing System (IOOS) as a partnership of Federal agencies (with a lead at the National Oceanic and Atmospheric Administration) and Regional Associations (RAs) to integrate Federal and non-Federal systems. IOOS provides a stakeholder driven end-to-end mechanism to supply key ocean, coastal, and Great Lakes information to meet regional and national needs including the areas of special interest. NROC, NERACOOS and GOMC have Memoranda Of Understanding to work collaboratively to address regional needs.

Actions that would most effectively help the Nation achieve this national priority objectives associated with this issue area:

- Near-term:
    - Endorse the full implementation of IOOS as the mechanism for achieving this goal. The NOC should work closely with the Integrated Ocean Observing Committee (IOOC), established as part of the ICOOS Act, to ensure that the IOOS program priorities align with the NOC priorities and that the limited resources are allocated in the most productive and effective manner.
    - Develop a National and Regional Observation Plans. The need for observations has long been recognized; but the nation still lacks a cohesive plan that describes what observations are needed. The NOC should engage the IOOC, the IOOS Program Office, and the IOOS RAs to develop a national plan from individual regional plans for observations, modeling, mapping, and data management to fulfill user needs. This effort is already underway as part of the implementation of the ICOOS Act.
    - Build off the IOOS Data Management and Communication (DMAC) and modeling systems *"for the timely integration and dissemination of data and information products".*
- Mid-term:
    - Commitment to achieve necessary capacity to inform areas of special interest.
    - Alignment of federal activities into a single coordinated integrated ocean observing system, one federated system to inform multiple needs and mandates.
- Long-term:

- Continual evaluation of system capacity and functionality to allow adaptation to novel issues, concerns and technologies.

Major obstacles to achieving this objective **and opportunities** this objective can further, including transformative changes in how we address the stewardship of the oceans, coasts, and Great Lakes:

- Obstacles:
  - A lack of understanding of and engagement with the IOOS program at the national level.
  - Lack of resources for implementation of a truly effective system.
- Opportunities:
  - A national stakeholder and issue driven program with both regional and national level implementation (IOOS) exists to achieve this goal.

Milestones and performance measures that would be useful for measuring progress toward achieving this priority objective:

Milestones	**Performance measures**
National and Regional Observations Plans	National and Regional Capacity Assessments (Gaps Analysis)
Data Management Integration	Efficiency of integrating disparate data sets.

Clean Ocean Action

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Ocean Advocacy Since 1984

April 29, 2011

Chairwoman Nancy Sutley
Council on Environmental Quality
Executive Office of the President

Director John Holdren
Office of Science and Technology Policy
Executive Office of the President

Re: Comments on Strategic Action Plans for the Priority Objectives for the National Ocean Council

Dear Chairwoman Sutley and Director Holdren;

The National Ocean Council (NOC) announced its intent to prepare strategic action plans for nine priority objectives for National Ocean Policy goal implementation and solicited comments from the public on January 24, 2011. *See* 76 F.R. 4139. These public comments should, according to the announcement, inform the preparation of the strategic action plans. Clean Ocean Action has prepared the following comments in response to that request.

Clean Ocean Action (COA) is a regional, broad-based coalition of 125 conservation, environmental, fishing, boating, diving, student, surfing, women's, business, service, and community groups with a mission to improve the degraded water quality of the marine waters of the New Jersey/New York coast. For over 25 years, COA has been actively engaged in ocean management to ensure a vibrant, diverse, economically robust ecosystem. From successfully closing eight ocean dumpsites and thwarting offshore drilling and exploration to promoting clean beaches, citizens have worked hard to ensure a clean ocean economy. Clean Ocean Action has, in addition to this letter, signed onto two other comments for this notice, one general comment and one comment on strategy item five.

Framework

In the announcement requesting comments for the strategic action plan development phase of the National Ocean Policy Framework, the NOC requested that for each of nine priority areas, we (broadly) answer these questions:

- What near-term, mid-term, and long-term actions would most effectively help the Nation achieve this policy objective?
- What are some of the major obstacles to achieving this objective; are there opportunities this objective can further, including transformative changes in how we address the stewardship of the oceans, coasts, and Great Lakes?
- What milestones and performance measures would be most useful for measuring progress toward achieving this priority objective?

Data and Mapping

Priority areas:
(3) Inform Decisions and Improve Understanding
(9) Ocean, Coastal, and Great Lakes Observations, Mapping, and Infrastructure

One Action that needs to be taken immediately is an across-the-board expansion of data collection– we simply do not know enough about many parts and aspects of the ocean environment, and we don't know enough about the industries that are operating within this environment. This broad data collection initiative should be done in an environmentally-unobtrusive manner. Furthermore, ecosystem and socioeconomic data should not be used to inform only a select few researchers or institutions, but should be available to all agencies and institutions and should be publically accessible.

The NOC should undertake an assessment of the state of the science in each "area" of the ocean and attempt to coordinate research to systematically fill gaps in knowledge, eliminate redundant research projects, and encourage more ecosystem-wide studies. Part of this initiative should be to develop, again for each marine area, one clearinghouse of coastal and ocean knowledge where methodologies, research projects, and data can all be accessed by any interested individual. Regional monitoring programs that have long-term funding are needed – especially for areas such as the Mid-Atlantic Bight which currently lacks a comprehensive regional program.

Obstacles to sharing data and informing decisions are plentiful, but not unresolvable. First, data collected by one agency or institution (the EPA, for example), may be in a form that doesn't comport with the needs of local decision-makers or state agencies. Second, collection methods that one agency uses may not be, by regulation, guidance, or policy, "admitted" by other agencies. Third, priorities in data collection vary by program and geographic location. Fourth, different research methods and tools may be used by different researchers. Fifth, technological and methodological innovation can result in differences within the same type of data collected over time – in other words, trends and time series might not mean that situations are changing, just that we've learned how to better measure a variable.

These challenges, and more, can be addressed through data collection standardization. If all agencies at all levels of government are working from the same methods documents and datasheets, we will improve our collective understanding of the state of our marine ecosystems. However, the process of data standardization needs to integrate some flexibility in order to avoid stifling innovation in scientific research.

Another impediment to informing decisions and improving mapping, infrastructure, and ecosystem understanding is the disconnect between the lay-public and expert scientists. Politics and communication play an important role in the implementation of the National Ocean Policy; if the public cannot understand why they need to protect these ecosystems, regional ocean managers will face an uphill battle in trying to convince people otherwise.

Many aspects of the National Ocean Policy itself (including associated frameworks, regulations, and policies) are not written in an easily-understandable form for public education. The NOC should try to distill and re-frame its mission and the steps it will be taking into a message easily transmitted to the public. Regulations and policies developed as a result of this process should also be communicated in "plain" English.

Coordination and the Decision-Making Processes

Priority areas:
(1) Ecosystem-Based Management (EBM)
(2) Coastal and Marine Spatial Planning (CMSP)

Actions that immediately need to be taken include data collection and information dissemination. EBM and CMSP implementation will (and should) rely heavily on baseline studies, pilot programs, and cumulative impact analyses. No decisions should be made to approve new uses of the coastal and ocean zone (including Outer Continental Shelf energy production, exploration, or siting), or to affect existing uses, without these pre-planning studies and research projects. The NOC should also advocate for legislation and regulations to prohibit programs from allowing ecological harm to the ocean – all too often discretion is given, under the guise of flexibility, to damage resources.

Aside from data collection and research studies, the NOC should also take immediate steps to require that EBM principles and policies are implemented across the nation in land use, environmental, and energy decisions. Decisions are now being made, daily, which should take EBM and scientific knowledge into account but do not. From stormwater permits to development plans and mitigation banks, incorporating understanding of ecosystems is critical to prevent and minimize impacts from actions taken.

While a top-down approach to managing the ocean and coastal zone (which is much of what the NOC will be doing) is needed, so too is a bottom-up approach. Requiring regular, sustained inclusion of the interested public at all stages of the process leads to stronger, more resilient plans and policies by identifying conflicts, providing knowledge about issues/problems present at all scales (national, regional and local) and allowing for the development of common solutions that lead to public support and ownership of policies, programs and activities. Getting the public to *"buy in"* to a policy developed from the top down is often not successful. Instead, the best public policies start from the grass-roots up. The interested public must *"be in"* on policy development early at the most local level, often and sustained, including regular and continuous communication and dialogue. Ultimately, determinations regarding appropriate ocean uses, allocation of space and resources, and protection of those resources will be based on societal choice. Public support for the preservation and protection of environmental resources is based on their understanding of environmental issues and their active role in developing management solutions. Therefore, the development and implementation of a National Policy must continue to include an explicit requirement for robust and ongoing public participation.

Obstacles may arise in implementing EBM and CMSP where the NOC tries to make ocean maps and use-plans without a truly comprehensive understanding of the ecosystem, where local managers make decisions that do not comport with the needs of the ecosystem, where state-by-state goals and uses are not aligned, and where there is not public support for the "hard" decisions that will need to be made. To overcome these obstacles, science and communication are key – especially where there are social and economic pressures that conflict with ecosystem needs or where there are overlapping and contradictory governance systems.

Implementing a National Ocean Policy

Priority areas:
(5) Resiliency and Adaptation to Climate Change and Ocean Acidification
(6) Regional Ecosystem Protection and Restoration
(7) Water Quality and Sustainable Practices on Land

Action that needs to be taken by the NOC include empowering localities to make politically challenging decisions on coastal watershed uses and plans and developing toolkits and funding sources to enable coastal managers to encourage that these tough decisions are environmentally protective. Adaptation, resiliency, and sustainable practices, for ocean and coastal ecosystem management, tend to require local efforts more than national efforts. One major problem that towns and counties run into when, for example, they try to preserve wetlands, limit development in flood zones, de-harden coastlines, track pollution and sewage sources, or fix and upgrade water and wastewater infrastructure, is a lack of financial and technical support. Citizens need to be informed that adaption will mean accepting the loss of land due to sea level in certain areas. Data standardization, public disclosure, and inter-agency collaboration and coordination can all be conditions to financial and technical NOC support for these local programs – doing so would tie local actions to the NOC's national strategy and allow all stakeholders to play a part in protecting, restoring, and adapting coastal ecosystems.

Obstacles for each of these priority areas (resilient coasts, ecosystems, and water quality) arise because most of these require local and state-level agencies expand their permitting, enforcing, monitoring, and regulating departments and may also require regulatory changes. The NOC can (and should) develop model programs and guidance for local and regional regulators, but many of the changes needed under these program areas can only be accomplished by local action. Local action, in turn, requires a renewed nation-wide investment in environmental programs – something the NOC must make a priority.

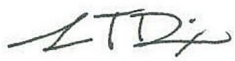
Conclusions

In general, regarding the NOC strategy for implementing the National Ocean Policy, Clean Ocean Action opposes regional governance systems that lack a public connection, accountability, and meaningful involvement in decision-making. Most of the decisions that will be required by the NOC's plans depend on public support, so the NOC needs to ensure there is public accountability and involvement in actual, implementation and regulatory decisions – not just for purposes like this comment solicitation (public comment on strategy development). Along this vein, citizens, states, and regions have already begun ocean policy changes – and the NOC should inventory, analyze, and work within the goals these planners and managers have set for their own ecosystems.

As the NOC moves to develop strategies for National Ocean Policy implementation, priority should be given to (1) building a robust system of data standardization and dissemination, and (2) funding regional clearinghouses of information and policy discussion. The NOC should refrain from making conclusions as to coast-wide "use" maps or CMSP systems until baseline studies and ecological performance indices can be developed. Finally, because most of the changes called for in the National Ocean Policy will rely on local support and local change, the NOC should work, at state and federal levels, to secure more funding and support for local environmental programs – from enforcement to planning and research.

Sincerely,

Cindy Zipf
Executive Director



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April 29, 2011

National Ocean Council
722 Jackson Place, NW.
Washington, DC 20503.

Re: Comments on the National Ocean Council's Nine Strategic Action Plans

National Ocean Council Representatives:

The Coastal Treaty Tribes (CTT's), Hoh, Makah, and Quileute Tribes and the Quinault Indian Nation, of the Olympic Coast submit for your consideration comments and recommendations regarding the development of the National Ocean Council's Nine Strategic Action Plans.

We have individually and collectively been consistent in our messages that ocean management in the Pacific Northwest must be inclusive of the four coastal treaty tribes. Our concerns extend to all Nine Priority Objectives as not only does our usual and accustomed fishing grounds in marine waters, but our reservations and communities border the open ocean as well.We have been stewards of our land and waters since time immemorial. Preserving our fish and wildlife resources, as well as access to them, is essential to our economic, cultural, and spiritual well being.

Our legal standing and management status regarding ocean resources and governance is unique. Each of our tribes' has treaty secured hunting and fishing rights with the United States. These treaties retained rights to protect our way of life and reserved rights of hunting, fishing and gathering and are inclusive of our rights to manage and utilize marine resources in perpetuity. We are co-owners with the United States of these marine resources, and our co-management authority is legally recognized to include both state and federal waters. The development of a National Ocean Policy and Strategic Actions Plans must acknowledge and accommodate tribal values and activities with our usual and accustomed areas.

We are encouraged that the inaugural meeting of the Governance Coordinating Committee included identification of the tribes along with the state and federal representatives as co-leads in the Regional Planning bodies. We strongly urge the National Ocean Council to ensure (through communication and funding venues) that tribal participation is a high priority in the development and implementation of the National Ocean Policy. We expect that the Regional Planning Body for the West Coast will be created in keeping with the expressed intent of Executive Order 13547. Furthermore, it is our expectation that our

tribal governments will each have designated seats at the table given our status as sovereigns with treaty resources and management authority in ocean waters.

Specific and dedicated funding will be needed for the CTT's to engage at all levels of the National Ocean Policy. As sovereigns, the CTT's will need to be fully engaged due to their role as managers of the marine resources in order for the Nine Priority Objectives to successfully move forward. Dedicated funding for the CTT's will be especially important within the areas of CMSP, mapping and infrastructure, and resiliency and adaptation to climate change and ocean acidification. Funding is needed for education as well, both to get tribal knowledge out to educators, managers, scientists, and policy experts and to bring education opportunities to tribal communities.

The CTT submit the following for your consideration as the NOC develops the Nine Strategic Action Plans):

Coordinate and Support:

- Proper consultation with tribes is vital to the success of implementing the Action Plan and the National Ocean Policy in the northwest as tribal Usual and Accustomed Areas (U & A's) occupy the marine waters north of Point Chehalis to the U.S. Canadian border. We strongly suggest that this action plan will benefit from establishing a formal policy and protocol for consultation and consideration of the tribes at the NOC level. A couple of examples are:

    1. Coordination and Consultation Policy Plan of Action developed by the Environmental Protection Agency http://www.epa.gov/indian/consultation/index.htm or:
    2. Work done by National Marine Fisheries Service, Alaska Region at http://www.fakr.noaa.gov/tc/

- All of the action plans need to have a common theme that is in support of the United States governments' responsibility to uphold the treaties established between the federal government and the Coastal Treaty Tribes.

Ecosystem-Based Management:

- As stewards of ocean resources for thousands of years, the mainstream shift of marine resource management from single species to ecosystem-based is not a new principle in the management strategies of the coastal tribes. However, in order for Ecosystem-based management to become a fully integrated part of the National Ocean Policy there will need to be the establishment of the following:
    1. Creation of secure financial resources;
    2. The development of standards for data acquisition and processing
    3. Protocols for data and report availability

- In addition, we encourage the NOC to work with the regional fishery management councils and appropriate management authorities to ensure coordination with their existing efforts.

Ocean, Coastal, and Great Lakes Observations, Mapping, and Infrastructure:

- This will need to include a strong research component that identifies gaps in data that hinder or limit resource management decisions. With shifts in climate already a reality, it is critical to include a long term monitoring element that will establish both baseline conditions of ocean ecosystems as well as documenting the changes over time. Finally there are numerous assessments and inventories that in the short term can assist in guiding management decisions. Some examples of short term programs are:

1. Complete a data GAP analysis to identify the data needed to bring coastal waters off of Washington to an equal level of available data in Oregon and California coasts.
2. Conduct habitat and coastal current mapping.
3. Develop and complete stock assessments that forward understanding of important stocks at a regional scales.

Coastal and Marine Spatial Planning:

- The Regional Planning Bodies for the West Coast Region must include seats for tribal representatives as the CTT will be directly affected by CMSP. In short, planning for implementation of NOP or CMSP cannot occur off the Olympic Peninsula without each of the 4 coastal sovereign tribes being part of the discussion and planning.
- Currently, it appears that the NOC views the West Coast Governors Agreement on Ocean Health (WCGAOH) as the potential entity for the regional ocean partnership for the west coast region. This is not acceptable because WCGAOH does not satisfy the terms of a ROP as described by the NOC and most importantly, because the tribes are not part of the WCGAOH.
- As with the west coast states the CTT will require dedicated funding for the duration of the planning effort for coastal and marine spatial planning. Expecting the tribes to access funding through a competitive grant process wrongly puts the needs of tribal ocean policy and management as sovereigns in competition with stakeholders who already have a voice through their state elected officials.

Resiliency and Adaptation to Climate Change and Ocean Acidification:

- Tribes and coastal communities are experiencing climate change now, not only are resources affected by climate change but also the characteristics of the regions culture as well. Tribes can offer a unique perspective to how the NOC addresses Climate Change within the National Ocean Policy for our region.
- The effects of ocean acidification on the exercise of treaty rights to harvest marine resources both commercially and for subsistence are largely unknown. Tribal communities rely on these resources for our cultural and economic wellbeing. The potential changes or impacts as a result ocean acidification is beyond comprehension.

Regional Ecosystem Protection and Restoration:

- The large size of each of the regions indentified by NOC must be taken into consideration. As we stated in earlier correspondence: the "West Coast Region" may be too large; we must remember that the "large California current ecosystem" is the result of multiple smaller systems that function with some independence.
- Dedicated financial support for understanding the chemical and biological relevance of these sub-systems would help ensure that conservation and restoration efforts are effectively distributed. Effective distribution must be based on sound science so that areas of low population and high need do not lose out to areas of high population.

Inform Decisions and Improve Understanding:

- While not always considered, local knowledge such as that preserved in Tribal cultures can provide information that is not available elsewhere, to inform management decisions

The CTT would like to reiterate their support for the National Ocean Council and its critical role in implementing the National Ocean Policy. Thank you for this opportunity to comment and we look forward to working with the Council as you draft the Strategic Action Plans.

Sincerely,

Coastal Treaty Tribes of the Olympic Coast

Hoh Indian Tribe

David Hudson

David Hudson

Makah Tribe

Micah McCarty

Quileute Tribe

Lonnie Foster

Lonnie Foster

Quinault Indian Nation

Ed Johnstone

Ed Johnstone

COMMENTS SUBMITTED TO THE NATIONAL OCEAN COUNCIL ON STRATEGIES FOR IMPLEMENTING THE PRIORITY OBJECTIVES OF THE NATIONAL OCEAN POLICY
April 29, 2011

Dear Council Members:

The undersigned include fishermen, representatives of coastal fishing communities, scientists, environmental organizations, farmers, farming community organizations, seafood distributors, and food sovereignty organizations. We appreciate the opportunity to make recommendations regarding some of the nine priority objectives of the National Ocean Policy in addressing some of the most pressing challenges facing the ocean, our coasts, the Great Lakes and the food we get from these waters.

Objectives 1 & 2 & 6

Ecosystem-Based Management (EBM): *Adopt ecosystem-based management as a foundational principle for the comprehensive management of the ocean, our coasts, and the Great Lakes.*
Coastal and Marine Spatial Planning (CMSP): *Implement comprehensive, integrated, ecosystem-based coastal and marine spatial planning and management in the United States.*
Regional Ecosystem Protection and Restoration: *Establish and implement an integrated ecosystem protection and restoration strategy that is science-based and aligns conservation and restoration goals at the Federal, State, Tribal, local, and regional levels.*

Ecosystem Based Management and Coastal and Marine Spatial Planning are fundamentally linked and should not be considered separately from each other. Similarly, ecosystem protection and restoration are not separate decisions but fully integrated with EBM and CMSP. That different governmental bodies are responsible for their implementation should not prevent or impede the planning, restoration and management plans from being integrated.

RECOMMENDED ACTIONS
Near-term:

- EBM that includes humans as an integral part of ecosystems should be adopted in principal by all federal agencies whose activities affect marine, estuarine, and Great Lakes environments including management agencies and programs, e.g. among others: National Marine Fisheries Service (NMFS), NOAA Office of Ocean and Coastal Resources Management and the Coastal Zone Management program it administers through states, National Marine Sanctuary programs, Bureau of Ocean Energy Management, Regulations, and Enforcement (BOEMRE), Department of Agriculture, and Environmental Protection Agency, Army Corps of Engineers and Forest Service.
- Relative to CMSP, regional oversight structures and operational menus for more local implementation should be developed. The structure should incorporate governmental, tribal, community, and non-governmental

participants concerned with public welfare, including all those along the seafood production food chain from fishermen to processors to consumers, and those representing environmental, human health and sociological interests that function at a variety of scales.

- Guidelines and structures should be developed for establishing truly collaborative decision-making and adaptive management that gives weight to: restoring and maintaining diverse and resilient ecosystems; sustaining healthy living resources; and revitalizing coastal communities closely linked to those marine and Great Lakes resources and ecosystem services through such activities as fishing).
- The National Ocean Council should review existing legislation governing the management of marine and Great Lakes ecosystems and resources and alert Congress if changes are needed to accommodate full implementation of collaborative and adaptive EBM and CMSP at various ecosystem scales.
- The importance of living marine and aquatic resources to local, regional, and national food sovereignty should be recognized and given weight in the CMSP and EBM decision-making processes.
- The roles and responsibilities of the existing regional bodies important to implementing EBM, such as Fisheries Management Councils (which has management powers) and the International Joint Commission (US and Canada Great Lakes advisory body), should be integrated into NOP stategies.

Long-term:

- EBM, including Ecosystem Based Fisheries Management, should be fully implemented in management plans that are integrated on multiple scales consistent with ecosystem processes and integrate local participatory governance with regional oversight.
- EBM must be scientifically based and promote the long-term health and diversity of ecosystems, living resources, and ecosystem services. As a subset of this, Ecosystem Based Fisheries Management, must include fishermen as part of the ecosystem.
- EBM should be spatially based and coordinated with CMSP based on collaborative bottom-up decision-making and adaptive management that integrates ecological, sociological, and economic objectives.
- CMSP should begin with collaborative visioning processes with outcomes incorporating socio-economic elements on spatial scales that are well matched to the ecosystem, consistent with the goals of EBM. The outcomes of visioning should guide future decision-making and establish measuring posts for assessing progress.
- Food sovereignty should be incorporated into the vision guiding CMSP, so that in planning for activities in the marine and Great Lakes environment, fisheries and local and regional markets and food systems are supported and protected.
- Restoration of critical habitats and ecosystem diversity, including fisheries diversity, should be integral to CMSP.
- Monitoring should be keyed to vision milestones and spatial planning should

be adaptive to the results of monitoring, to unexpected changes, and to the evaluation of progress toward the guiding vision.

- The incorporation of local knowledge into CMSP is critical and should be part of planning and woven into the monitoring programs. Collaboration among scientists, users, local communities, and managers is critical to doing this effectively.

IDENTIFYING CHALLENGES

Obstacles and Opportunities:

Adaptive management. None of this is easy and it requires repeated exchange of information and discussion of adaptive measures. Ecosystems are complex so management that truly addresses the ecosystem is also complex. That is why the adaptive aspect is so important and should be addressed more seriously in the National Ocean Policy. Many monitoring and research programs would have to be revamped and augmented to enable adaptive management. Data for different types of management (e.g. fisheries, water quality, aquaculture, energy exploitation) would have to be detailed and coordinated at multiple scales. Monitoring must at the same time be individualized to capture critical scales of ecosystem variables and be common enough to be used in combination with other monitoring programs. This difficult coordination of data collection could be aided by effective and well funded regional plans.

Existing models. Agencies such as National Marine Fisheries Service (NMFS), have been actively discussing and developing scientific protocols for ecosystem-based fisheries management and EBM in general. While the need to include fishermen in these EBFM management plans persist, there is still not a good model for how this can be most effectively done. Recommendations from fishing communities for area-based management are promising but have yet to be accepted by regional management. In other EBM efforts on land, some agencies have model collaborative processes that include community participation in planning and have had some notable successes on local scales. We believe these processes can be translated for the ocean and Great Lakes.

Relevant programs. Existing collaborative research programs take advantage of smaller vessels and their operators, both scientists and fishermen who are knowledgeable about marine ecosystems. These could be improved with more participation and compensation, better coordination, and better use of the information in management decisions and adaptive management. This smaller scale research has been undervalued in the past. Ironically it is generally far less expensive to acquire abundant information this way and it reveals important ecosystem patchiness. It also offers more rapid assessment of data to enable adaptive management in real time.

Multi-scale management. Long-term management decisions should meld fine scale with regional scale information; and management structures should reflect multiple scales of ecosystems. This presents challenges to simplified management that

averages over large areas and considers species separately from each other.

Transformations:

The issue of scale in fisheries. We strongly recommend a major transformation in scales of monitoring and management, particularly in fisheries management:

- *From* top-down, broad brush management that encourages fishermen to pursue fish over distances that require larger boats; *to* bottom-up, spatial and community-based management that encourages cooperation and stewardship among groups of fishermen
- *From* scale blind management of fishing operations; *to* scale sensitive management consistent with ecosystem processes and distributions. At a minimum this would divide management of inshore fleets from management of offshore, larger boat fleets, and would match fishing scales and diversity to scales and diversity in ecosystems.

The issue of scale in general. For all uses of marine and Great Lakes environments, it is important that scales of monitoring and management as well as scales of activities themselves match ecosystems and ecosystem processes.

Bottom-up decision making. We recommend transforming decision-making processes from strictly top down regulation and management in which stakeholder comments and advice are heard but rarely incorporated; to bottom-up collaborative processes in which agreement, consistent with regulatory requirements, is reached by all participants from individual stakeholders to government officials. By nature the bottom up processes tend to be more local and thus more diverse but better adapted to specific ecosystem traits. Polarized controversy is often avoided.

Application of the Public Trust Doctrine. All private industry operating in marine and Great Lakes waters, which are public, must be open to scrutiny by the public and allowed to operate only if and under conditions agreed through collaboration with the public.

We encourage the recognition and incorporation of fisheries diversity and food sovereignty objectives into CMSP. The provision of healthful and diverse local sea-foods from healthy ecosystems is critical to the welfare of coastal communities and regions depending on them. We believe:

- Fisheries should maintain diversity in the fleet and in the ecosystem.
- Ecosystems should be protected from degradation by all causes so they may continue to support diverse fisheries.
- Fisheries should be executed by coastal communities and operated according to strict codes of stewardship.
- Seafood markets should prioritize local consumption of seafood and minimize exports.
- Fair and equitable distribution of fishing rights and fair compensation for fishermen should be objectives.

- The farming of seafood should be consistent with ecosystem objectives, maintenance of wild species and populations, diverse food production, aversion to non-native species, and prohibition of manufactured species (i.e. genetically engineered).

IMPORTANT PERFORMANCE MEASURES

It is essential that monitoring be directly relevant to the goals and objectives of management and policy decisions and tied to visioning processes.

- There must be a way of gauging management effectiveness and trade-offs between uses and ecosystem services so that adaptive management can be implemented. Outcomes of initial visioning will give end-points toward which progress can be measured by monitoring key indicators.
- Performance measures should be determined at the beginning when management decisions are first implemented.
- The US needs integrated, ecological-economic visualization, analysis, and forecasting in the coastal zone.

Objectives 5 & 7

Resiliency and Adaptation to Climate Change and Ocean Acidification*: Strengthen resiliency of coastal communities and marine and Great Lakes environments and their abilities to adapt to climate change impacts and ocean acidification.*

Water Quality and Sustainable Practices on Land: *Enhance water quality in the ocean, along our coasts, and in the Great Lakes by promoting and implementing sustainable practices on land.*

Both these objectives address impacts on marine and Great Lakes ecosystems from land-based activities – impacts that can fundamentally alter ecosystems, including their diversity of species, their resiliency, and their ability to provide ecosystem services. Climate Change and Ocean Acidification are caused on global scales but they affect ecosystems on all scales. Land based source of water pollution are caused by direct emissions or runoff and have impacts in local marine and Great Lakes ecosystems or may be carried by air and water currents to create impacts in remote locations. We recommend:

- Any national level planning should include measures to minimize and prevent land-based sources of negative impacts on marine and Great Lakes ecosystems; and they should coordinate with local plans to do the same.
- Synergistic and cumulative impacts of these effects from land plus those of at-sea activities must be taken into account and monitored in conjunction with CMS Planning.
- Strong, swift and effective regulations and measures to continuously reduce US generated causes of climate change and ocean acidification are essential.
- Similarly, improved enforcement of water and air quality laws and standards is needed.
- The objectives of coastal and port community plans to mitigate land-based sources of impacts to marine and Great Lakes ecosystems should be supported by national actions and monetary and technical support.

Objectives 3 & 9

Inform Decisions and Improve Understanding*: Increase knowledge to continually inform and improve management and policy decisions and the capacity to respond to change and challenges. Better educate the public through formal and informal programs about the ocean, our coasts, and the Great Lakes.*

Ocean, Coastal, and Great Lakes Observations, Mapping, and Infrastructure: *Strengthen and integrate Federal and non-Federal ocean observing systems, sensors, data collection platforms, data management, and mapping capabilities into a national system and integrate that system into international observation efforts.*

Some monitoring and research needs have already been mentioned in conjunction with regional and smaller scale management. We support as well the development and improvement of national research and monitoring systems that would provide a basis for overlaying and integrating finer scale research and monitoring significant to local and regional decisions but comparable across large marine and Great Lakes ecosystems for the purpose of national coordination.

We encourage basic research on ecosystem functions, interactions among species, effects of changing marine and Great Lakes environments, the human role in ecosystems, important scales of ecological processes, and other areas where more knowledge would enhance the effectiveness of ecosystem based management. It would enable identification of key indicators for measuring progress in achieving goals.

We encourage the incorporation of sociological research that sheds light on and enables measurement of the social and economic impacts caused by management actions as well as such impacts caused by human-induced changes in ecosystems. The relatively new science of ecological-economic visualization, analysis, and forecasting in the coastal zone is not widely known or acknowledged. We encourage the recognition and funding of this important line of research.

Sharing information with the public is critical to successful collaborative management. The development of user-friendly templates should be a priority for regional ocean councils. It is critical that the public be informed at the initial stages of producing management plans (both EBM and CMSP), and that they receive information and data used throughout the adaptive management process.

Summary

We offer the following summary of key strategies we have recommended and explained above:

- Collaborative management at local scales;
- Adaptive management and monitoring;
- Visioning processes at various levels of management;

- Accounting for humans as part of the ecosystem;
- Monitoring to measure achievement of objectives;
- Scale-sensitive matching of activities with ecosystem processes in ocean, coastal, and Great Lakes environments;
- Multi-scale spatially based management;
- Protection of food sovereignty and marine-based food systems;
- Bottom up decision-making;
- Management for the public good and with public oversight;
- Protection of food sovereignty in context of CMSP;
- Pollution prevention;
- Ecological-economic visualization, analysis, and forecasting;
- Integration of local knowledge with sound science; and
- Sharing of knowledge and data effectively with public in a timely manner.

Yours truly,

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National Ocean Council
Priority Objectives for Implementation of the National Ocean Policy
Public Comment Letter
Todd A. Harwell

To Whom It May Concern:

Thank you for the opportunity to provide public comments in regards to the nine priority objectives of the National Ocean Policy proposed by the National Ocean Council. This comment letter will address four of the nine objectives, presented in the order of perceived priority.

I. *Objective 3: Inform Decisions and Improve Understanding*
   a. Actions that would most effectively help the Nation achieve this policy objective
      i. Near-Term:
         1. Identify and prioritize the most important issues and topics that are influencing coastal zones the most in the United States. This should not be limited to those that are most apparent or immediate, but also those that will have a large and significant impact over time, such as sea level rise and climate change.
         2. Formal and non-formal curriculum should be developed and implemented to better educate youth as well as the general public about scientific and environmental information pertaining to climate change and the current environmental state of not only the United State but also globally.
         3. Develop and implement educational programs to be delivered in K-12 classrooms throughout the United States. Attention should be given to adhering to national and/or state science curriculum standards.
      ii. Mid-Term:
         1. Develop and provide a more comprehensive awareness of environmental conditions and trends, as well as human impacts and activities that affect the coastal zones. This awareness and educational information needs to be developed and presented for specific audiences in both formal and informal settings, whether it be school children, young adults, baby boomers, senior citizens, potential stakeholders, businessmen and women, blue-collar individuals, or any other demographic.
         2. Continued education curriculum should be delivered to more isolated audiences that are unknowledgeable of climate change.
      iii. Long-Term:
         1. Implement routine integrated ecosystem assessments and forecasts involving a collaborative and comprehensive approach. The assessments should include impacts related to climate change and areas of vulnerability, risks, and resiliency.
         2. Continued delivery of formal and non-formal educational programs.
   b. Major obstacles to achieving this objective
      i. Funding to develop and introduce educational programs.
      ii. Difficulty in reaching isolated or smaller populations that are unfamiliar with scientific evidence related to climate change.
      iii. Lack of basic scientific and environmental knowledge and understanding by the general public audiences.
      iv. Gaps in linking ecosystem conditions to human health.

v. Ignorance or indifference of audiences to understand the importance of coastal, marine, and Great Lakes health, and how these ecosystems impact human life and well-being.
vi. Funding and nationwide adoption of formal and informal educational programs that provide awareness of the current state of our coastal ecosystems, as well as the current work being done to improve coastal areas.

c. Milestones and performance measures most useful for measuring progress toward achieving this priority objective
    i. Immediate implementation of the National Ocean Policy and the Nine Priority Objectives.
    ii. Creating, delivering, and evaluating assessments related to the knowledge currently held by the public in terms of coastal zone health and the impacts of global climate change.
    iii. Creating and delivering awareness and education programs related to coastal zones and ecosystem health, tailored to specific audiences based on the previous knowledge assessments.
    iv. Establishing a visible web-based platform for the importance and significance of the health of coastal ecosystems, and how it can be linked to human life.
    v. Using widespread and varied techniques to gather information related to the current state of the nation's coastal zones, including new technologies of remote sensing and unmanned aerial vehicles in addition to the latest scientific data available.
    vi. Assessing and analyzing the effectiveness of the educational programs after they have been developed and delivered by distributing surveys to those who participated.
    vii. Revising educational programs and information based on assessment feedback, and delivery of new programs developed from public input.

II. *Objective 5: Resiliency and Adaptation to Climate Change and Ocean Acidification*

a. Actions that would most effectively help the Nation achieve this policy objective
    i. Near-Term: Routine integrated ecosystem assessments and forecasts of factors and activities contributing to climate change should be implemented and conducted, including briefings delivered to Congress. This will allow the National Ocean Council to determine the areas or entities most prominently contributing to climate change that should be addressed on a priority level.
    ii. Mid-Term: Make efforts to transition to more renewable energy practices that will ultimately reduce greenhouse gas emissions. Such practices have been introduced in the Report to Congress by the EISA in 2009. Introducing more renewable energy practices, such as marine hydrokinetic energy in the form of offshore wind farms, will not only allow the United States to become more energy independent, but it will also reduce greenhouse gas emissions and the level of carbon dioxide in the atmosphere.
    iii. Long-Term: Institute and enforce stricter regulations on humans to protect the environmental health of our ecosystems. Some of these regulations may include introducing more National Marine Sanctuaries and reserves, stricter fishing regulations and enforcement to reduce overfishing, reduction of fertilizer use in commercial and residential coastal areas, and ultimately limiting and reducing the carbon dioxide amounts released in the atmosphere by businesses and industries.

b. Major obstacles to achieving this objective
    i. The numerous, widespread, and various impacts of climate change may be difficult to monitor, especially in collaboration with other agencies and organizations.

ii. Media, politicians, and stakeholder groups that strongly oppose and refute the validity of climate change and the scientific evidence that supports it.
iii. Increasing human impacts on our ecosystems and the increasing contributions to perpetuating climate change such as greenhouse gas emissions.

c. Milestones and performance measures most useful for measuring progress toward achieving this priority objective
   i. Immediate implementation of the National Ocean Policy and the Nine Priority Objectives.
   ii. Continued support and reporting of climate change-related findings from NASA.
   iii. Assessments and updates on the level of carbon dioxide in the atmosphere.
   iv. Assessments of industrial greenhouse gas emissions.
   v. Monitoring and reporting of continued climate change evidence such as sea surface temperatures, sea level, ice sheets in the Arctic, and levels of carbon dioxide in the atmosphere.

III. Objective 2: Coastal and Marine Spatial Planning

a. Actions that would most effectively help the Nation achieve this policy objective
   i. Near-Term: The establishment of nine regional planning areas that mirror those of the Regional Fishery Management Councils. This will allow for relief from the sector-by-sector approach to management that has been practiced in the past, as well as reduce any previous overlap or ambiguity in management jurisdictions.
   ii. Mid-Term: Improve ecosystem health and services of coastal zones by planning human uses on conjunction with conservation of important ecological areas. These improvements would lead to the protection of areas that are vital for the resiliency and maintenance of healthy ecosystems services and biological diversity, as well as providing marine resources and supporting human use.
   iii. Long-Term:
      1. Facilitate sustainable economic growth in coastal communities by introducing projects for economic investments related to coastal and marine industries.
      2. Economic incentives should be established for both public and private entities that choose to sustainably develop and manage their use of the coastal zone.

b. Major obstacles to achieving this objective
   i. Preexisting agencies and management jurisdictions that may unenthusiastic about adhering to the new federal regions and policies.
   ii. Unwillingness of agencies and governments to form cohesive partnerships and cooperation that support the Council.
   iii. Stakeholder groups that are unsupportive of the new regions, policies, and partnerships, and the impacts that each will have on their industry or cause
   iv. Possible hesitation or unwillingness of individual coastal communities to adapt to the proposed policies, and lack of support for sustainable economic growth and incentives.

c. Milestones and performance measures most useful for measuring progress toward achieving this priority objective
   i. Immediate implementation of the National Ocean Policy and the Nine Priority Objectives.
   ii. Establishment of the nine regional planning areas.
   iii. Introduction of economic incentives.
   iv. Formed partnerships and cooperation among agencies and governances.

v. Observed and measured improvement of ecosystem health based on environmental assessments and monitoring.

IV. Objective 9: Ocean, Coastal, and Great Lakes Observations, Mapping, and Infrastructure

a. Actions that would most effectively help the Nation achieve this policy objective
   i. Near-Term:
      1. Establish and maintain a national integrated network of ocean, coastal, and Great Lakes observing systems, allowing agencies and organizations to compile and share observations, data, and information. Cooperating international partners and organizations may also access this network.
      2. Formal technology training programs should be created and delivered for governmental and environmental agency employees. This will ensure that new technologies are not only accessible, but also able to be used properly in order to observe and monitor coastal areas.
   ii. Mid-Term: Introducing and integrating new technologies and techniques of monitoring and collecting coastal information, such as unmanned autonomous vehicles (UAVs) and remote sensing satellites and technology. Using sophisticated forms of data collection, the Council would be able to monitor the health and productivity of coastal zones, and address any potential threats as they are discovered.
   iii. Long-Term:
      1. Development and launching of more satellites that measure and record environmental and geographical data. This data should be linked and shared on an accessible national or global network as previously mentioned.
      2. Expansion of the National Oceanographic fleet of ships and facilities. More vessels should be added to the fleet in order to monitor and manage for coastal areas.
      3. Facilities and laboratories should be expanded and updated so that they are equipped to address any potentially hazardous threats to the health of our ecosystems as they are discovered.

b. Major obstacles to achieving this objective
   i. Cooperation among agencies and organizations to share observations among the coastal systems network.
   ii. Funding and maintenance of proposed new monitoring technologies in the form of UAVs and remote sensing satellites.
   iii. Full and complete integration of ocean, coastal, and Great Lakes observations and data.
   iv. Cohesive and well-coordinated infrastructure related to the national observing systems integrated network.

c. Milestones and performance measures most useful for measuring progress toward achieving this priority objective
   i. Immediate implementation of the National Ocean Policy and the Nine Priority Objectives.
   ii. Willingness and agreement from agencies and organizations to participate in the observing systems network.
   iii. Implementation of UAV and remote sensing technologies in coastal monitoring.
   iv. Assessment and evaluation of the effectiveness and efficiency of the new monitoring technologies.
   v. Creation of an accessible database of observations and recorded data related to coastal monitoring.

I would like to thank you again for the opportunity to provide comments on the National Ocean Policy and these Priority Objectives.

Regards,
Todd A. Harwell

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April 25, 2011

National Ocean Council
722 Jackson Place, NW
Washington, DC 20503

Subject: Comments from Fort Bragg City Council on Strategic Action Plans

Fort Bragg is a coastal city in northern California that is located midway between San Francisco and the Oregon border. Our City has a port, Noyo Harbor, that shelters commercial and sport fish fishing boats, whale watch tour boats and recreational boats. Commercial and recreational uses of the ocean are an important component of our local and regional economy. Recreational use of the ocean is important to our citizens. The ecological health of the ocean is important to all of us.

The North Coast region of California has recently engaged in extensive public discussion of ocean issues during the California Marine Life Protection Act implementation process to establish marine reserves in this region. The following comments on the National Ocean Council's Strategic Action Plans are informed by that discussion:

1. **Ecosystem-Based Management:**
   The tribal communities, fisherman and other ocean users of the North Coast of California stand ready to participate in management of our ocean resources. Please include co-management by these groups in your management strategy.

2. **Coastal and Marine Spatial Planning (CMSP):**
   Much of the ocean resource is currently utilized. Please take full account of existing uses as a baseline for CMSP. The tribal and non-tribal local jurisdictions of the North Coast have experience with planning and vast knowledge of existing uses. Please consult our local jurisdictions early in the CMSP process. Local and tribal jurisdictions should be represented on the Regional CMSP recommending group.

3. **Inform Decisions and Improve Understanding; and 4. Coordinate and Support:** The tribal and non-tribal local jurisdictions of the North Coast have vast experience and knowledge of our Ocean resource. Please consult our local jurisdictions. Local and tribal jurisdictions should be represented on any Regional recommending group.

5. **Resiliency and Adaptation to Climate Change and Ocean Acidification; 6. Regional Ecosystem Protection and Restoration; 7. Water Quality and Sustainable Practices on Land; and 8. Changing Conditions in the Arctic:** We agree with the above four items as objectives, but have no specific comments. We stand ready to cooperate on these goals as they apply to our City.

9. **Ocean, Coastal, and Great Lakes Observations, Mapping, and Infrastructure:** Much more information and mapping is needed to characterize the ocean resource in the North Coast area of California sufficiently to establish good policy. Please do all that you can to direct resources to our area for further mapping and scientific study. Further knowledge is a pre-condition to the establishment of good policy for our ocean resource.

Sincerely,

Dave Turner
Mayor

Meg Courtney
Vice Mayor

Dan Gjerde
Councilmember

Doug Hammerstrom
Councilmember

Jere Melo
Councilmember