Coordinated Regional Benefit Studies of Coastal Ocean Observing Systems

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Award Number: *N00014-02-1-1037*
http://www.whoi.edu/science/MPC/dept/reserach/NOPP%20project.html

LONG-TERM GOALS

The long-term goal supported by this project is the development and sustained support of coastal ocean observing systems for the waters of the United States.

OBJECTIVES

We will first produce regional "inventories" of ocean observation user sectors, including information about the physical and economic scale of their activities, how products from improved ocean observation might be incorporated into their decisions, and a rough estimate of the potential value of improved decisions. Once the inventories are complete, we will select sectors with significant expected benefits for more detailed analysis.

APPROACH

Ocean observation has economic benefits because the data are used to derive products, such as forecasts, that are used by decision makers to make choices that affect economic well-being. To estimate the benefits that may accrue from an investment in ocean observation, it is necessary to compare the outcome of these decisions under two scenarios: the baseline situation (currently available information and products) and the hypothetical future situation with new and improved data and products. The new information products enabled by the new ocean data will alter decisions made in industry, recreation, and public administration, changing the economic outcome from these activities, and thereby affecting economic well-being. The difference in outcome under the two scenarios is the benefit derived from the new investment in ocean observation.

The most accurate measure of this benefit is the marginal increase in consumer and producer surplus. Consumer surplus is the difference between what consumers are willing to pay and what they actually pay. Producer surplus is the difference between the price received for a good or service sold and the costs of producing that good or service. Because this surplus is often difficult to estimate, we also use other measures of benefit, such as the change in value added, or reduction in cost to achieve the same level of output, although these are less precise estimates of true social surplus. Usually, these measures are estimated as annual values at the level of a firm or other economic unit, and then aggregated over geographic regions and industries to estimate total annual benefits.

Our work will proceed in four phases:

- development of a common framework for benefit studies,
- development of an "inventory" of the relevant ocean observation user sectors for each region,
- detailed regional studies of the most significant sources of potential benefits, and
- synthesis and benefit/cost analysis.

The regional inventories of ocean observing system user sectors will include information about:

- the physical and economic scale of their activities, measures by the number of persons engaged, the size of the capital stock utilized the activity, and/or sales and expenditures on the activity,
- a qualitative description of how they use or may use ocean observation data or products,

- a qualitative description of how improved ocean observation products might be incorporated into their decisions, and
- an "order of magnitude" estimate of the potential value of improved ocean observation.

The 2001 overview of possible benefits from improved ocean observation in the US Gulf of Maine by Kite-Powell and Colgan (2001) will serve as a baseline example for the inventories. For the purpose of this project, we have defined the following regions (key personnel, as listed on the title page of this report, responsible for each regional study are indicated in [brackets]: Gulf of Maine/New England [Kite-Powell/Colgan], Mid-Atlantic [Kite-Powell], Southeast (Virginia to Georgia) [Luger], Florida (east and west coasts) [Wieand], Gulf of Mexico (west of Florida) [Pulsipher], California [Pendleton], Pacific Northwest [Wellman], Alaska [Kite-Powell], Hawaii [Kite-Powell], and the Great Lakes [Pelsoci].

Once the inventories are complete, we will select one or two user sectors within each region for more detailed analysis. In most regions, we will select the user sector that promises, based on the inventories, to generate the most significant benefits; but in selecting the sectors for detailed analysis we will also take into account the usefulness for the purpose of a national assessment of covering in some detail as many different user sectors as possible. An example of a more detailed sector analysis is a recent study by Kite-Powell (2000) of the benefits of polar satellite observations for commercial ship routing. In this study, Kite-Powell estimates the transit time savings achieved by commercial ships with conventional (present day) ship routing products and services, and contrasts these with transit time savings that could be realized with the improved routing products made possible by additional satellite data on ocean winds/currents. Similarly, the more detailed analyses we propose here will examine specific applications of ocean observing systems by:

- extrapolating benefits from observing systems that are already in existence and providing information to existing users, and/or
- specifying more detailed models of prospective user benefits than those produced at the inventory stage.

The final product of this work will be a set of internally consistent inventories that together cover the major uses of ocean observing information for the nation as a whole, plus a set of region- and sector-specific studies that quantify likely benefits in some detail and will permit more reliable estimates of quantitative benefits for ocean observation at the regional and national scales.

WORK COMPLETED

We completed the development of the common framework in the fall of 2002 and conducted the inventory phase of the regional studies in 2003. Results of the inventories are now under review. Revisions of the inventories and initial drafts of the detailed regional sector studies will be completed by early 2004, and a preliminary report containing all inventories and detailed user studies will be assembled and released in early 2004.

RESULTS

Table 1 summarizes the preliminary regional inventory results assembled to date.

	GoME	mid-A	FLA	GoMex	CAL	PNW	AK	HI	GL

Beach recreation, increased expenditures, $m (fewer lost beach days, improved safety)			50		234				16
Recreational fishing increased expenditures, $m	11	30	8	7	2	2	6	6	
Recreational boating increased expenditures, $m	23	49			16		6	9	37
Maritime transport/shipping operating cost savings, $m	1	2	256[1]	31[2]	34[2]	1	1		1
Commercial fishing improved management/landings, $m	4	3	2		1	3	10		1
Search and Rescue value of additional lives saved, $m	24	16	11	28	19	10	12	6	19
Offshore energy cost savings, $m				15-24					
Electric utilities cost savings, $m									56

[1]Large potential benefits to the cruise industry.
[2]Numbers subject to review for procedural consistency with estimates for other regions.

Table 1: Preliminary estimates of regional benefits, $m/year

Table 1 shows annual potential benefits from improved coastal ocean observing activities in millions of dollars per year for the Gulf of Maine (GoME), mid-Atlantic (mid-A), Florida (FLA), Gulf of Mexico (GoMex), California (CAL), Pacific Northwest (PNW), Alaska (AK), Hawaii (HI), and Great Lakes (GL) regions. Data for the southeast Atlantic region are not yet available. Please note that all of these numbers are preliminary at this time and currently undergoing review for accuracy and consistency across regions. These numbers should not be quoted or cited until they have been confirmed.

The results to date are largely in keeping with expectations set by the earlier study of Gulf of Maine benefits by Kite-Powell and Colgan (2001). Two interesting and perhaps unexpected results from the inventories concern the large potential benefits to the cruise ship industry in Florida and to electric power generation in the Great Lakes region. If these preliminary numbers are confirmed by the ongoing review process, they may influence our choice of focal sectors for the detailed studies and lead to additional "inventory" work in other regions (particularly in the case of electric power generation).

IMPACT/APPLICATIONS

National Security: The work under this project will contribute to the implementation of regional ocean observing systems that can contribute to national security through better information about marine conditions for coastal operations, monitoring biological and chemical parameters, etc.

Economic Development: Better information about marine conditions in US waters will potentially improve the safety and efficiency of maritime transportation, commercial fishing, and recreational activities in these waters.

Quality of Life: Coastal ecosystem health and the management of coastal resources require information about physical, biological, and geochemical conditions of coastal waters and their resource stocks. Ocean observing systems are a primary source of this information.

Science Education and Communication: Real-time data from ocean observing systems can be used to enhance science education in the classroom and can bring benefits directly to users of ocean observing information, such as recreational boaters, surfers, beachgoers, and fishers.

RELATED PROJECTS

None.

REFERENCES

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PUBLICATIONS

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