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COMPILATION AND ANALYSIS OF ECONOMIC DATA IN SUPPORT OF
UNEP'S REGIONAL SEAS PROGRAMME
AND THE
REGIONAL SEAS CONVENTIONS AND ACTION PLANS

(rev. 1; October 14, 2005)



WOODS HOLE OCEANOGRAPHIC INSTITUTION

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EXECUTIVE SUMMARY

Sixty-four large marine ecosystems (LMEs) have been identified around the world's coastal margins. The LMEs are encompassed within 18 regional seas programs (RSPs). These large ecological zones are economically important, producing 95 percent of the world's marine fisheries biomass, among other goods and services valued at many trillions of dollars each year. Counterbalancing these economic benefits is the fact that pollution is more severe in LMEs than in other ocean areas, and some LME coastal habitats are among the most seriously degraded on earth. It is in the collective interest of a civil society to ensure that those marine resources and habitats at risk are protected and managed sustainably for both present and future generations.

A pragmatic approach to the sustainable management of LMEs is now being implemented by nations in Africa, Asia, Latin America, and Eastern Europe, supported by \$650 million in start-up funds from the Global Environment Facility (GEF) and other international donors. This approach uses suites of environmental indicators to assess the physical, biological, and human forcings on ecosystem productivity, fish and fisheries, pollution and ecosystem health, economic development, and governance.

There is a growing literature on LME studies, focused mostly on issues of biological conservation; the sources, transport, and fate of pollutants; and regional governance. In sharp contrast, analysis of the socio-economic characteristics of LMEs has received relatively little attention to date. Although a general framework for monitoring and assessing the socio-economic aspects of LMEs has been developed, few detailed studies grounded in empirical data have been undertaken. In this report, we take an initial step toward the development of a global overview of the socio-economic aspects of LMEs and RSPs.

We focus on the following two broad questions regarding the sustainable management of the marine environments of these two regions.

1. Can the level of economic development in a LME region be considered to be sustainable?
2. Are the nations participating in the relevant region capable of financing programs of sustainable management themselves?

In order to begin to address the first question, we develop a measure of marine industry activities for each LME and RSP. Given the nature of the data on economic activity that is available on a consistent basis across nations, our preferred measures of marine activities are sets of indexes. We expect that higher levels of industrial activity exert greater pressure on the ecosystem, say, through pollution or resource depletion, and that lower activity levels exert less pressure.

For a given activity level, however, the scale of negative ecological impacts may not be the same for coastal nations in different stages of economic development, as measured by income levels or some other metric. For example, the environmental Kuznets hypothesis suggests that there exists an inverted U-shape relationship in an economy between pollution intensity and income per capita. At low levels of income, economic development would lead to increasing levels of pollution emissions. As economic growth leads to income levels that exceed a threshold, however, a society's demand for environmental quality increases, and its pollution emissions decline.

In order to begin to address the second question, we examine the relationship between a measure of socio-economic development, namely UNDP's human development index (HDI), and measures of marine activity. The HDI measure is useful in thinking about the second question, because we expect that developed nations that exhibit higher levels of income are more likely to be capable of financing programs of sustainable LME management themselves.

We develop a ranking of LMEs and RSPs by various measures of marine activity and by socio-economic development. This ranking process should assist responsible international organizations and donors in developing funding and assistance priorities based upon the revealed characteristics of LMEs.

Our study results include the following:

- the compilation of data and the construction of an international database on marine activities for all coastal nations relating to fish landings, aquaculture production, shipbuilding orders, cargo traffic, merchant fleet size, oil production, oil rig counts, and tourism;
- the development of indexes for each of these marine activities, and the aggregation of sets of activities into industry sector indexes;
- the adaptation of these indexes and a separate socio-economic index to characterize the marine activity levels of LMEs and RSPs;
- the development of a ranking of LMEs and RSPs according to total marine activity levels, industry sectoral activity levels, and socio-economic status;
- a graphical presentation of the rankings to facilitate the identification of international management and development assistance priorities;
- the development of a case study exploring the scale of economic rents in the Benguela Current LME and the management issues and sustainable development priorities of the region;
- the development of a case study exploring the scale of direct output impacts in the Yellow Sea LME and the regional management issues and sustainable development priorities.

We reach five general conclusions relating to the potential for the sustainable management of marine environments in LMEs or RSPs:

- Our examination of the two cases—one of an upwelling, the other of a continental shelf LME—have reinforced our original opinions as to the benefit of the GEF-sponsored efforts to encourage sustainable management. In particular, the detailed studies, capacity building, and reorientation of the policy focus from resource exploitation to sustainable management have been the most positive effects in these two cases. Based upon what we have been able to learn about these two cases, we expect that the nations of the region will be fully capable and willing to continue their programs of sustainable development in the future.
- The compilation of data and the development of an international database on marine activity levels in coastal nations, LMEs, and RSPs is likely to be of considerable value

for conducting preliminary screening and prioritization of marine regions that are in need of international attention and support for organizing programs of sustainable development.

- For those LMEs or RSPs that are identified as priorities from the marine activity and socio-economic development rankings, detailed case studies should be conducted.
- Case studies should focus on the following:
 - characterizing marine activities at the sub-national level within the LMEs (RSPs);
 - estimating the scale of economic rents that could obtain from the efficient management of the marine resources of the LME (RSP);
 - clarifying, where relevant and necessary, the need for and the costs involved in the international regulation of natural resources or the management of transboundary environmental degradations;
 - identifying the set of sustainable development policy priorities in each of the nations of the region (keeping in mind that these priorities may be unrelated to the marine environment); and
 - the motivations of the nations participating in the region to devote some fraction of rents from marine resources to sustainable management of their shared ecosystem.
- The efforts of international organizations to encourage the sustainable development of LMEs and RSPs is obviously an important goal. We recognize, however, that decisions about sustainable development are policy decisions that must be made by each coastal nation independently and, where feasible, in concert with the other nations of the region. Whether coastal nations will work together to solve the issues that pervade LMEs or RSPs will depend upon the benefits that each nation expects from its cooperation with others. Clarifying in detail the nature of the benefits to individual nations of international cooperation for LMEs and RSPs is of fundamental importance.

ACCOUNTING FOR MARINE ECONOMIC ACTIVITIES IN LARGE MARINE ECOSYSTEMS AND REGIONAL SEAS PROGRAMS

I. Introduction and Purpose

There is a growing literature on LME studies, focused mostly on issues of biological conservation; the sources, transport, and fate of pollutants; and regional governance (Duda and Sherman 2002; Sherman *et al.* 1996). In sharp contrast, analysis of the socio-economic characteristics has received relatively little attention to date.¹ Although a general framework for monitoring and assessing the socio-economic aspects of LMEs has been developed (*viz.*, Sutinen 2000), few detailed studies grounded in empirical data have been undertaken. In this report, we take an initial step toward the development of a global overview of the socio-economic aspects of LMEs and RSPs.

We focus on the following two broad questions regarding the sustainable management of the marine environments of these two regions.

1. Can the level of economic development in an LME region be considered to be sustainable?
2. Are the nations participating in the relevant region capable of financing programs of sustainable management themselves?

In order to begin to address the first question, we develop a measure of marine industry activities for each LME and RSP. Given the nature of the data on economic activity that is available on a consistent basis across nations, our preferred measures of marine activities are sets of indexes. We expect that higher levels of industrial activity exert greater pressure on the ecosystem, say, through pollution or resource depletion, and *vice versa*.

¹ One exception is a calculation of the direct, indirect, and economic impacts of the marine sector in the Northeast Shelf LME (Hoagland *et al.* 2005).

For a given activity level, however, the scale of negative ecological impacts may not be the same across different stages of economic development, as measured by income levels or some other metric. For example, the environmental Kuznets hypothesis suggests that there exists an inverted U-shape relationship in an economy between pollution intensity and income per capita. At low levels of income, economic development would lead to increasing levels of pollution emissions. As economic growth leads to income levels that exceed a threshold, however, a society's demand for environmental quality increases, and its pollution emissions decline (Tisdell 2001; Grossman and Krueger 1995).

In order to begin to address the second question, we examine the relationship between a measure of socio-economic development, namely UNDP's human development index (HDI) and marine activity. The HDI measure is useful in answering the second question, because we expect that developed nations that exhibit higher levels of income are more likely to be capable of financing programs of sustainable LME management themselves.

We develop a ranking of LMEs and RSPs by various measures of marine activity and by socio-economic development. This ranking process should prove useful for responsible international organizations and donors in developing funding and assistance

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