Contents lists available at ScienceDirect

Environmental Development

journal homepage: www.elsevier.com/locate/envdev

Intergovernmental Oceanographic Commission – UNESCO's support for management of Large Marine Ecosystems

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ARTICLE INFO

Article history: Received 3 August 2015 Accepted 4 August 2015

Keywords: Large Marine Ecosystem IOC-UNESCO Assessment TWAP LME:LEARN

ABSTRACT

Over the past two decades the Intergovernmental Oceanographic Commission (IOC) of the United Nations Education, Scientific and Cultural Organization (UNESCO) has been a key actor in the global effort to promote sustainable use and management of Large Marine Ecosystems (LMEs). Among the Commission's LME initiatives are a global comparative assessment of LMEs under the Transboundary Waters Assessment Programme and the LME: Learning Exchange and Resources Network project, both supported by the Global Environment Facility, and annual meetings of the LME Consultative Committee. A brief description of each of these initiatives is given in this commentary.

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1. LME initiatives

1.1. Transboundary Waters Assessment Programme: Large Marine Ecosystems component

Since the mid-1990s, 110 developing countries in Africa, Asia, Latin America, the Pacific, Arctic and eastern Europe, have been provided with over US\$3 billion, principally by the Global Environment Facility (GEF) but also other financial institutions including the World Bank, to advance toward ecosystem-based management (EBM) in 22 Large Marine Ecosystems (LMEs). Despite these efforts, however, the need remained for a global comparative assessment of LMEs and other transboundary water systems (Open Ocean, River Basins, Groundwater Aquifers, and Lakes and Reservoirs) that would assist GEF, policy makers, and the international community to set priorities for the management of transboundary waters, and provide a baseline for monitoring future changes in the condition of these systems. Thus, in 2009, the GEF-supported Transboundary Waters Assessment Programme (TWAP) was initiated, with the United Nations Environment Programme (UNEP) as the implementing agency and the Intergovernmental Oceanographic Commission (IOC) of UNESCO the executing agency of the LMEs and Open Ocean components. Other executing partners are UNEP-DHI (River Basins), the International Hydrological Programme of UNESCO (Groundwater Aquifers), and the International Lake Environment Committee (Lakes and Reservoirs). Each executing agency convened a working group of international experts and institutional partners who possess the required data and expertize to contribute to the TWAP.

The first TWAP project (2009–2010) focused on the development of scientifically robust, indicator-based methodologies and institutional arrangements for assessment of the five transboundary waters systems. The LMEs assessment methodology is available at (http://www.geftwap.org/publications). A central theme of the LMEs assessment is the vulnerability of ecosystems and human communities to natural and anthropogenic stressors, and impairment of ecosystem services and

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http://dx.doi.org/10.1016/j.envdev.2015.08.001 2211-4645/© 2016 Published by Elsevier B.V.









Fig. 1. TWAP LMEs assessment conceptual framework depicting interactions between human and natural systems.

consequences for humans. These links (with governance as an overarching concept) are illustrated in a conceptual framework (Fig. 1), which builds on the five LME modules (Productivity, Fish and Fisheries, Pollution and Ecosystem Health, Socio-economics, and Governance).

The second TWAP project, conducted from 2013–2015, has two major objectives:

- 1. To conduct a global baseline comparative assessment of the status and changing condition of transboundary water systems resulting from human and natural causes, which will allow the GEF, policy makers and international organizations to set science-based priorities for financial resource allocation; and
- 2. To establish the institutional arrangements for conducting periodic future assessments of transboundary water systems to allow the GEF and others to track the results of their interventions.

The TWAP LMEs assessment, which is the first indicator-based global comparative assessment of all 66 LMEs, seeks to identify LMEs that are most impacted by human and natural stressors. Projections to years 2030 and 2050 under different scenarios are given for several of the indicators. An assessment of the Western Pacific Warm Pool (WPWP), based on a subset of the indicators is also included. Because the assessment is a global comparative assessment, the selection of indicators was constrained by the availability of globally available datasets. Indicators in each of the five LME modules that are used in the current assessment are shown in Table 1.

To facilitate a comparative assessment, a consistent indicator scoring system with a sufficient number of categories to identify patterns of risk among LMEs (i.e., LMEs at different levels of risk or degradation) is required. A five-point system was developed, with 1–5 corresponding to lowest, low, medium, high and highest risk or level of degradation, respectively. This approach, however, is not suitable for indicators without clear directionality in terms of what could be considered "good" or "bad" (such as primary productivity and sea surface temperature); the interpretation of such indicators is context-specific. LMEs were placed into the five categories based on single indicators and on multivariate statistical analyses of multiple indicators with clear directionality.

Using the selected indicators, key questions that the comparative assessment seeks to answer are:

- Which LMEs are most heavily impacted for each issue?
- What are the current trends in LMEs and main drivers?
- Which ecosystem services are most at risk?

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