

Plenary lecture

Global marine assessment: The next phase

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Abstract

Recognition that environmental policy and management decisions should be based on the best available science is firmly entrenched in environmental governance at the national, regional, and global levels. Environmental assessments are a primary mechanism by which scientific information is communicated to and influences policy processes.

The first international assessments of the marine environment, undertaken at the beginning of the 20th century, aimed to understand fluctuations in fisheries stocks. Large-scale assessments of marine pollution began in the mid-20th century, partly in response to widespread concern about such incidents as the crash of certain seabird populations due to DDT pollution, the outbreak of Mimimata disease, and the Torrey Canyon oil spill. Over the last 3 decades there has been a trend toward holistic marine assessments that integrate not only different environmental aspects such as living resources, pollution, and biodiversity but also socioeconomic aspects, including both the drivers and the ultimate impacts of marine environmental change. The next phase of this trend came in 2002 when the UN General Assembly decided in its resolution 57/141 to establish a regular process for global reporting and assessment of the state of the marine environment, including socio-economic aspects, both current and foreseeable, which has come to be known as the Global Marine Assessment, or GMA.

Key words: global marine assessment

The principle that environmental policy should be based on the best available scientific information is entrenched in international policy instruments including the United Nations Convention on the Law of the Sea (UNCLOS), Agenda 21, and the Johannesburg Plan of Implementation. The importance of science to policy making has also been repeatedly recognized in the specific context of the marine environment, for example by the Commission on Sustainable Development [1]:

... scientific understanding of the marine environment, including marine living resources and the effects of pollution, is fundamental to sound decision making.

Global environmental assessments are an important mechanism by which scientific information, and ideally credible scientific consensus, is communicated to the international policy arena. The international community embarked on a new phase in the scientific assessment of the marine environment when the United Nations General Assembly [2] resolved to establish “*a regular process under the United Nations for the global reporting and assessment of the state of the marine environment, including socio-economic aspects, both current and foreseeable.*” This initiative has come to be known as the Global Marine Assessment, or GMA.

The origin of large-scale international assessments of the marine environment is often traced to 1902, when eight countries formed the International Council for Exploration of the Sea (ICES) to undertake regular studies of the North Sea, the North Atlantic Ocean, and the Baltic Sea. Although ICES was established primarily to understand fluctuations in fisheries yields and potential problems of overfishing, it adopted a holistic approach that took the then-unusual step of attempting to relate hydrography and plankton abundance to the status of fish stocks [3, 4]. Although certainly the early work of ICES had political implications related to the strong fishing interests in the founding countries and the desire of some governments to manage conflicts among competing interests (for example, between trawl and line fishermen in Britain [4]), ICES’ early work was primarily scientific.

Fisheries remained the primary focus of marine environmental assessments through the first half of the 20th century. Concerns about the impacts of pollution gained prominence in the 1960’s sparked by such events as the as the publication of Rachel Carson’s *Silent Spring* in 1962, the *Torrey Canyon* oil spill in 1967, and the outbreak of Minimata disease in Japan, which was first reported in 1956 but took several years to gain international attention. For the next several decades assessments of the global marine environment emphasised marine pollution.

Landmarks in global marine assessment since the mid-20th century include:

- 1970: *The Study of Critical Environmental Problems (SCEP)* [5] was undertaken in preparation for the 1972 United Nations Conference on the Human Environment (the “Stockholm Convention”). Its scope included the entire planet and was not limited to the marine environment, but SCEP was the most comprehensive assessment of the state of the marine environment that had been produced to that time. Although SCEP emphasized the effects of marine pollution, it recognised all of the other major issues – overexploitation of living resources, physical alteration and destruction of coastal habitats, and modification of natural sediment and nutrient fluxes – identified by more recent assessments.
- 1982: *The Review of the Health of the Oceans* [6] was the first dedicated assessment of the state of the global marine environment to be produced under the auspices of the United Nations. Focused entirely on marine pollution, the assessment was produced by the Joint Group of Experts on the Scientific Aspects of Marine Pollution (GESAMP). GESAMP is an independent scientific body that was established in 1969 to provide advice to UN agencies that have responsibilities related to marine environmental protection.

- 1990: *The State of the Marine Environment* [7] was the second global marine environmental assessment produced by GESAMP. While still concentration on pollution, this assessment was more comprehensive and holistic than GESAMP's 1982 assessment and included topics such as coastal development, the exploitation of living resources, and economic considerations related to pollution.
- 2001: GESAMP, which had by now broadened its remit beyond marine pollution to encompass all aspects of marine environmental protection, produced two assessment reports in parallel. *Protecting the Oceans from Land-Based Activities* [8] was a technical assessment of the impacts of land-based activities on the oceans, and of strategies and measures to manage these impacts. It was produced as a contribution to the first intergovernmental review of the Global Programme of Action for the Protection of the Marine Environment from Land-Based Activities (widely known as the GPA). The assessment took a broader, more holistic approach than previous GESAMP assessments, addressing marine environmental issues in addition to pollution and giving more consideration to socioeconomic and policy aspects. The scope of the assessment, however, did not encompass sea-based activities including the exploitation of living resources. *A Sea of Troubles* [9] was a non-technical report drawing largely on the conclusions of *Protecting the Oceans from Land-Based Activities* but also addressing sea-based activities and in particular calling attention to the severity of overexploitation of the world's fisheries stocks.
- 2005: The two most ambitious assessments of the global status of marine ecosystems ever undertaken have been completed this year, and their final results are currently being published. The Global International Waters Assessment (GIWA) was undertaken primarily to establish a scientific basis for the Global Environment Facility (GEF) to set funding priorities for its International Waters portfolio [10]. GIWA's approach was to undertake a series of transboundary assessments, including fresh water basins as well as coastal marine areas, using a standard methodology to facilitate cross-comparability. The assessments included not only scaling and scoping of the severity of various key issues, but also in some cases the analysis of the causal chains leading to environmental degradation. GIWA was a bottom-up exercise of assessments in more than 50 regions around the world. The Millennium Ecosystem Assessment (MA) was designed to provide scientific information about the consequences of global environment change, including change in the marine environment, upon human well-being and the delivery of ecosystem services to society. The MA was undertaken primarily at the global level although it included some sub-global assessments at regional and national levels.

Several historical trends emerge from an examination of these and other marine assessments. One is that global and other large-scale marine assessments have

steadily become more integrated and holistic, moving away from a focus on single issues such as fisheries or pollution and increasingly addressing socioeconomic as well as natural scientific aspects of marine environmental protection and management. This reflects the recognition not only among scientists but also among policy makers of the many interlinkages among processes and issues in the ocean, that *“the problems of ocean space are closely interrelated and need to be considered as a whole”* [11].

A second trend in marine environmental assessment is an increasing attempt to be explicitly policy-relevant. In addition to describing the state of the marine environment, marine assessments now routinely address the human activities that ultimately exert pressure on marine ecosystems, or what are often called “drivers”, as well as the underlying motivations for people to act in certain ways, often called the “root causes” or “indirect drivers” of environmental change. Contemporary assessments often also include analysis of the policy options available to address marine environmental problems, and in many cases evaluate the effectiveness of past policy choices. Finally, many assessments now attempt to relate the state of the environment to economic and other human values. Indeed, the relationship between environmental goods and services and human well-being, a broad concept that encompasses many non-monetary considerations, was the organizing concept for the MA.

Finally, marine assessments have become increasingly participatory, involving large numbers of experts. Both GIWA and the MA involved thousands of experts from all parts of the world. Broadly participatory assessments require much greater financial and human resources, and take longer to produce, than assessments produced by a small expert group.

The participation of large numbers of natural and social scientists, however, greatly enhances the credibility of assessment results as reflecting broad expert consensus and a geographically and culturally representative perspective.

Despite the trends in global marine assessments towards holism, policy relevance, and participation, effective interaction between science and policy remains limited. GESAMP [8] concluded not only that *“Most of the problems identified decades ago have not been resolved, and many are worsening”* but also that one of the reasons for this is *“ineffective communication between scientists and government policy makers and the public alike”*. The goal of redressing this situation at the international level has been cited as a major reason for establishing the GMA [12, 13].

The GMA initiative can be traced to a suggestion made by the Government of Iceland at the 7th Session of the Commission on Sustainable Development in 1999, the International Year of the Oceans, to establish an intergovernmental panel on marine pollution along the lines of the Intergovernmental Panel on Climate Change [12, 14] In response to a similar proposal, the Governing Council of the United Nations Environment Programme (UNEP) requested UNEP in 2001 to study the feasibility of establishing a regular process for the assessment of the state of the marine environment, in cooperation with the Intergovernmental Oceanographic Commission of UNESCO (UNESCO-IOC) and other UN bodies with relevant interests and responsibilities.

As part of this feasibility study UNEP convened a consultative meeting in Reykjavik, Iceland in September 2001 [15] and a technical workshop in Bremen,

Germany in March 2002 [16]. These meetings reached consensus that the GMA should have a number of general characteristics, including that it should:

- be a cyclic process producing a series of assessments at regular intervals;
- be in-depth and comprehensive, and include socioeconomic considerations;
- be scientifically credible, policy-relevant, and politically legitimate;
- adopt a two-tier reporting approach, with a scientific/technical assessment report and a summary for policy makers;
- build upon existing assessment mechanisms; and
- be fundamentally based upon integrated regional and sub-regional assessments.

In September, 2002 the GMA moved from the purview of UNEP to that of the UN General Assembly when the Johannesburg Plan of Implementation [17] called for the establishment by 2004 of

a regular process under the United Nations for global reporting and assessment of the state of the marine environment, including socio-economic aspects, both current and foreseeable, building on existing regional assessments.

In December 2002 governments re-affirmed this call when the General Assembly formally decided to establish the GMA in its Resolution 57/141 [2].

Following a further period of consultation with governments, scientific bodies, non-governmental organisations, and other stakeholders, an international workshop was convened in conjunction with the United Nations Open-ended Informal Consultative Process on Oceans and Law of the Sea (ICP) in June, 2004. The workshop [18] generally accepted the consensus reached at the earlier meetings in Reykjavik and Bremen, and additionally agreed that the GMA process should:

- adopt a five-year assessment and reporting cycle;
- involve formal mechanisms for consultation with governments and other stakeholders;
- establish a Global Scientific Assessment Panel to coordinate the scientific aspects of the process; and
- include a two-year preparatory phase to assess past and existing marine assessment processes and how they might contribute to the GMA; this phase became known as the "Assessment of Assessments."

Unfortunately, the workshop reached an impasse over the issue of whether or not the scope of the GMA should include any assessment of the state of living marine resources. Some governments held strong positions that they would not support the GMA if it failed to include living marine resources, because the assessment would not be credible. Other governments, however, would not support the GMA if it did address living resources. As a result the workshop, which was expected to lead to the formal establishment of the GMA at an intergovernmental meeting later in 2004, was unable to agree on text for the report of the workshop to the General Assembly, and establishment of the GMA was postponed.

A second international workshop on the GMA [19] largely avoided the contentious issue of living marine resources by concentrating on the preparatory phase of the GMA, the Assessment of Assessments. The workshop agreed that the goals of the Assessment of Assessments would be to:

- assemble information about existing assessments;
- identify best practice, gaps, and uncertainties;
- establish how existing activities can contribute to the GMA;
- determine how assessment results have been communicated to policy makers; and
- propose a framework and options for the regular process.

At its 60th session in late 2005 the General Assembly is expected to formally establish the Assessment of Assessments as a two-year process under the joint leadership of UNEP and UNESCO-IOC. It is expected that an *ad hoc* steering group composed of representatives of governments and UN bodies will oversee the process, and that the Assessment itself will be conducted by an expert group to be established by the process. The Assessment of Assessments may also include the preparation of thematic assessments and other background studies to support the work of the expert group.

The exact composition of the expert group that will conduct the Assessment of Assessments will be determined once the process commences, with approval by the steering group. The group is envisioned as being made up of approximately 20 experts including:

- experts who have been involved in major regional, global, and thematic marine assessments, with a mix of experts from scientific and policy backgrounds;
- analysts of the use of science in policy formulation;
- independent senior scientists including both natural and social scientists; and
- representatives of UN and regional organisations.

Both the Assessment of Assessments and the regular process of the GMA itself will face a number of challenges. One of these is to achieve a balance between scientific credibility and political legitimacy, which are inherently in conflict [20, 21]. The credibility of an assessment to the scientific community depends to a large extent upon the perceived independence of the experts who produce it. Governments, on the other hand, tend not to accept the legitimacy of assessment processes, or to take ownership of the results, unless they have been directly involved in the process. Governments are inherently wary of the potential political power of effective assessments [22].

This caution is already apparent in some anticipated features of the Assessment of Assessments. While the group that will produce the Assessment is envisioned as approximately 20 experts, it is expected that the steering group that will oversee their work will be at least 23 people, most of whom will be nominated representatives of governments. Similarly, while the original proposal to undertake an Assessment of Assessment from an expert advisory meeting preparatory to the 1st international GMA workshop recommended that one of the goals of the GMA should be to examine "*how well previous assessments have been communicated to and been used by policy makers*", the goal adopted by the 2nd international workshop [19] reads "*examine*

how previous assessments have been communicated to policy makers" (emphases mine). This reflected the discomfort of many governments with the prospect of an independent view of their use of assessments.

Another challenge for the GMA will be to develop an effective regional framework to underpin the global process. Sophisticated, mature marine assessment programs exist in only a few regions of the world, and assessment capacity in most regions is very limited [23]. A GMA process predicated on regional and sub-regional assessments will therefore require major investment in capacity building. Governments, however, have thus far been reluctant to establish concrete budgetary links between the GMA and investment in the necessary capacity building. Nonetheless, the GMA could provide a useful framework and catalyst for developing national and regional capacities for marine environmental monitoring and assessment.

At least as importantly, the institutional sustainability of the GMA as a regular, long-term process will require that the necessary monitoring and assessment activities in the various regions of the world eventually become embedded within the operational routines of national and regional institutions. This institutional buy-in will only happen if governments perceive the process to be politically legitimate and relevant to national and regional policy formulation, rather than a top-down global process removed from the needs of local decision-makers.

The GMA will also meet technical challenges. One of these will be to find a way to harmonise and analyse data sets derived from inconsistently delineated geographical areas. Ideally, different types of information from a given region (e.g., information about fisheries, pollution, and habitat status) would all be collected from a single geographic area with a common defined boundary. Unfortunately, regional institutions presently engaged in various aspects of marine environmental assessments, for example regional seas organisations, regional fisheries bodies, and large marine ecosystem (LME) projects and programs established by the GEF International Waters portfolio and other institutions, often do not share common boundaries [23]. Many of these organisations are intergovernmental or otherwise politically recognised institutions, and their development has usually been a long and politically complex process. In the long term the GMA may help encourage the harmonisation of regional structures in an evolutionary way, but for the foreseeable future it will need to proceed on the basis of existing institutions. That will require a strategy for aggregating, managing, and analysing data collected from different, often overlapping, geographical units.

Finally, the GMA will need to mobilise the scientific community for ongoing participation in the process. While in the long term marine monitoring and assessment should become part of the routine operational activities of government departments and other institutions, the GMA will also require, especially at the beginning, extensive participation by academic, research, and other independent scientists. This is likely to raise the issue of what might be called "assessment fatigue". Scientific capacity for marine assessment is limited in most regions of the world. One result of this is that the same individuals are called upon to contribute to one assessment after another, usually without remuneration, prospects for authorship of peer-reviewed publications, or other professional benefits. It is therefore not surprising that in discussing the GMA many scientists ask "why

another assessment”, and more importantly “what will another assessment accomplish?”

Scepticism about the value of assessments in protecting the marine environment and reversing its degradation is not unreasonable. The parlous state of world fisheries does not speak well for the effectiveness of more than a century of stock assessments in achieving the sustainable use of living marine resources. GESAMP’s [8] conclusion that problems identified by assessments decades ago not only persist but have often worsened (see quotation above) is seen by many as another indictment of the value of assessments.

There are counter-arguments, however, to support a less pessimistic view of global marine assessments. For one thing, assessments often play an important role in framing the policy debate [21]. The early assessment of ICES, for example, helped call into question prevailing views that fisheries resources are essentially inexhaustible and that catch fluctuations were primarily due to stock migrations [3, 24]. SCEP’s [5] conclusion that it is possible for humans to effect global alterations in biogeochemical fluxes and GESAMP’s 1990 estimate that some three-quarters of the inputs of pollutants to the sea are from land-based runoff and discharges and atmospheric inputs (themselves mostly derived from land-based activities) are similar examples of assessment results that contributed to sea changes in the global discourse about marine environmental issues.

It is also useful to recognise that the establishment of assessment processes is sometimes an early political response that marks the elevation of an issue on the political agenda [21]. Major assessments are also often associated with an increase in the attention given to the issue in both the scientific community and civil society (Figure 1). Thus, in some cases global assessments can be viewed as an important component of a broader social response to environmental issues.

The GMA as currently envisaged has several key features that could contribute to its eventual effectiveness in contributing to the protection and sustainable use of the marine environment. One of these is that it had been created by and will retain direct links to governments. That in itself could improve the prospects for creating government “ownership” of GMA results and strengthening the scientific basis for the development of international marine environmental policy, provided of course that the scientific integrity of the process can also be maintained.

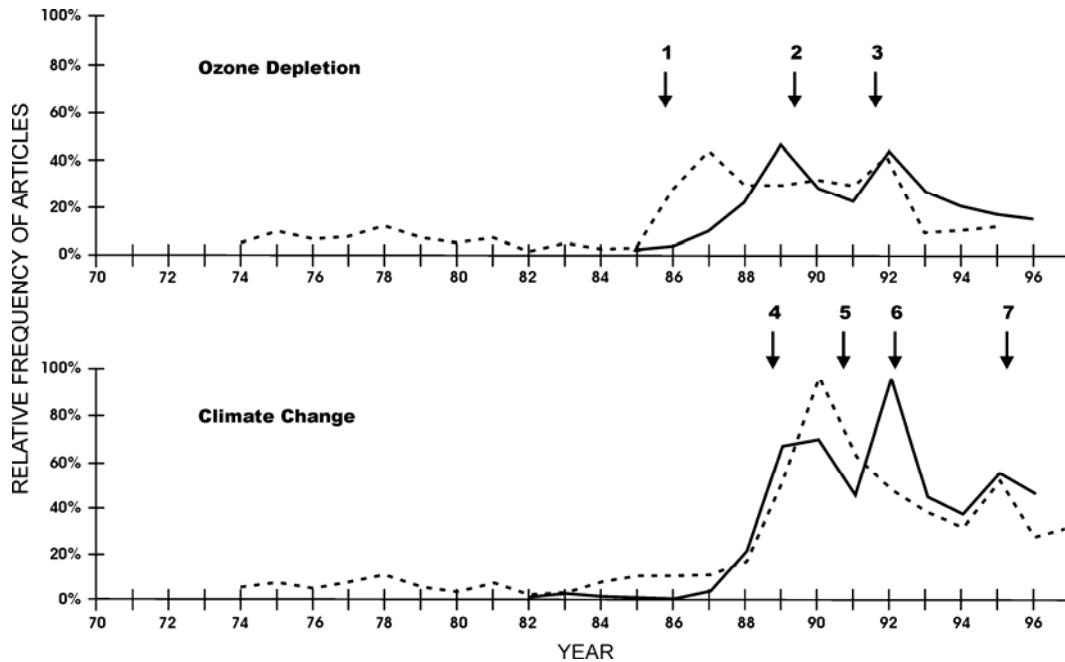


Figure 1. International attention to stratospheric ozone depletion and global climate change in relation to major assessment processes. Attention is plotted as the frequency of articles on the issue appearing in *Nature* (dashed line) and the Reuters World Newswire (solid line), scaled as a proportion of the number of articles appearing in the year of maximum citations. Assessment events: 1: World Meteorological Organization (WMO) circulates *Atmospheric Ozone: 1985* (published January 1986); 2: Establishment of assessment panels under the Montreal Protocol, WMO *et al.* release *Scientific Assessment of Stratospheric Ozone: 1989*; 3: WMO *et al.* release *Scientific Assessment of Ozone Depletion: 1989*; 4: Intergovernmental Panel on Climate Change (IPCC) established; 5: 1st IPCC climate change assessment released; 6: IPCC supplementary scientific assessment released; 7: 2nd IPCC assessment released. Graph of article frequencies is re-drawn from Clark *et al.* 2001 [25].

A second feature of the GMA that is favourable to its eventual impact on policy is that it is being established as a regular process rather than a time-bounded single assessment project. The iterative nature of the GMA will allow the process to learn from experience, and to evolve and grow over time. Furthermore, producing regular periodic assessments should enhance the GMA's effectiveness in and of itself. In their analysis of global environmental assessments, Clark *et al.* [21] concluded that

we found little evidence that ad-hoc, one-time scientific assessments exert much influence on transnational environmental affairs. In contrast, many of the most clearly influential assessment processes we studied were long-lived iterative affairs, with reports issued at periodic intervals.

In summary, the GMA will face major challenges, and observers who expect it to have immediate effects on international marine environmental policy are likely to be disappointed. Those who instead view the GMA as an evolutionary process that can support improvements in ocean governance by providing a platform for capacity building and thereby improved monitoring and assessment at sub-global levels, and by strengthening the dialogue between scientists and policy makers, have more grounds for optimism.

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