Global Marine Assessments

A survey of global and regional assessments and related activities of the marine environment

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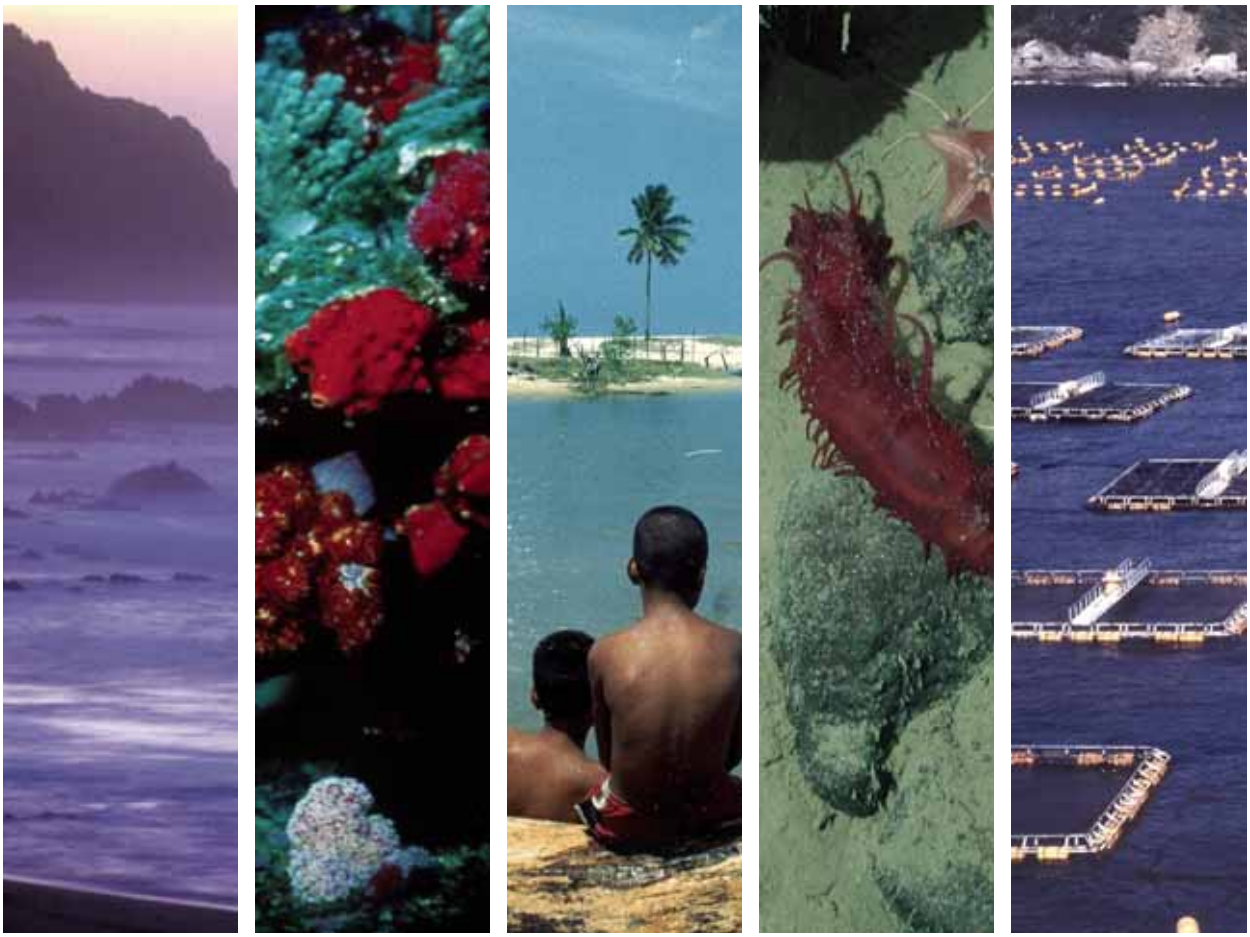
Global Marine Assessments: A survey of global and regional assessments and related activities of the marine environment

A joint publication of the United Nations Environment Programme (UNEP) and the Intergovernmental Oceanographic Commission of the United Nations Educational, Scientific and Cultural Organization (UNESCO-IOC) executed by UNEP-WCMC and supported by the Netherlands Ministry of Foreign Affairs, Development Cooperation.

Global Marine Assessments



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ISBN: 978-92-807-2800-2

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CITATION
UNEP (2007) *Global Marine Assessments: A survey of global and regional assessments and related activities of the marine environment*. UNEP/UNESCO-IOC/UNEP-WCMC.

This publication is available online at www.unep.org/dewa/assessments/EcoSystems/water/MarineAssessment/index.asp and at UNEP-WCMC publications www.unep-wcmc.org/resources/publications/UNEP_WCMC_bio_series/27.htm.

The database is accessible online at www.unep-wcmc.org/GRAMED.

PHOTOS
Front cover and title page (left to right): UNEP/Topham; Songpanich Pairat/UNEP/Topham; Dawee Chaikere/UNEP/Topham; NOAA/MBARI; Yoshiaki Kawachi/UNEP/Topham.
Back cover: Stephen Dalla Costa/UNEP/Topham.

A **Banson** production
Printed in the UK by The Lavenham Press

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Foreword

In 2003, UNEP and the Intergovernmental Oceanographic Commission (IOC) of UNESCO published *A survey of global and regional marine environmental assessments and related scientific activities* in response to the call of the United Nations General Assembly (Resolution 57/141) and the Heads of States and Governments at the World Summit on Sustainable Development to establish a regular process for the global reporting and assessment of the state of the marine environment.

Today, the urgency to understand the state and functioning of our oceans is greater than ever. The fact that water covers more than two-thirds of the Earth's surface (over 335 million square kilometres) is often quoted; the big question is why is the ocean so important? Not only does the ocean provide us with transportation routes, food, livelihoods, culture and recreation, but critically, the oceans play a crucial role in regulating our atmosphere and climate. The ways in which we use and manage the oceans will be a significant test of humankind's ability to steer a sustainable course for our collective future. With growing recognition of the urgency of addressing climate change, we need to improve our understanding of changes in the oceans, how the different living and non-living components are reacting to them, and how in turn humans are being affected. In December 2006, the 61st session of the United Nations General Assembly adopted a resolution on Oceans and the Law of the Sea, by which it renewed the commitment of Member States to support the implementation of the start-up phase – that is to say, the Assessment of Assessments of the Regular Process.

Sound information is critical to making decisions, ensuring the sustainable use of the marine environment, and enabling the continuing functioning of the several marine ecosystem services on which we all depend.

With this in mind, UNEP and UNESCO-IOC, as lead agencies designated by UN General Assembly resolution 60/30, requested UNEP-WCMC to produce, in support of the implementation of the Assessment of Assessments, this second report, building on the 2003 survey. This report is another example of interagency cooperation in the area of the environment. During its preparation, this report has been reviewed by the Ad Hoc Steering Group for the Assessment of Assessments as well as by the Joint Group of Experts on the Scientific Aspects of Marine Pollution (GESAMP), in order to maximize the saliency and credibility of the information presented.

The report is supported by an interactive online database tool (available at www.unep-wcmc.org/GRAMED) which enables the user to search through the assessments and activities relating to the marine environment. The information contained in the database forms the basis of the analysis in this report. The report lays out the components of an effective assessment and summarizes the key considerations for establishing an assessment process. It also includes the findings of this survey and an analysis of gaps and emerging issues, drawing on conclusions and lessons from completed assessments. All this material, together with a set of recommendations, is intended to inform and facilitate the task of the Assessment of Assessments Group of Experts.

The report provides a very useful starting point for conducting the Assessment of Assessments. It highlights the fact that the data available to assess the different ocean processes is patchy in both time and space. It defines the huge challenge that lies ahead in terms of capacity-building and information and knowledge gaps. The report recommends that, to improve this situation, new ways to address capacity-building, particularly in developing countries, are needed. It emphasizes the fact that a systematic effort to fill the information and knowledge gaps will be necessary in the future to support an effective decision-making process. The report was produced as a tool to make easily available essential background information for the assignment of the Group of Experts of the Assessment of Assessments. Standing on their own, the report and database are also extremely valuable resources for decision makers having to deal with marine environmental issues.

Koïchiro Matsuura
Director-General, United Nations Educational, Scientific and Cultural Organization (UNESCO)

Achim Steiner
United Nations Under-Secretary General and Executive Director, United Nations Environment Programme (UNEP)

Supporting organizations

The mission of the **United Nations Environment Programme** is to provide leadership and encourage partnership in caring for the environment by inspiring, informing and enabling nations and people to improve their quality of life without compromising that of future generations.

The Netherlands Ministry of Foreign Affairs, Development Cooperation, kindly provided financial support for the preparation and publication of this report.

The purpose of the **Intergovernmental Oceanographic Commission** (IOC) of UNESCO is to promote international cooperation and to coordinate programmes in research, services and capacity-building, in order to learn more about the nature and resources of the ocean and coastal areas and to apply that knowledge for the improvement of management, sustainable development, the protection of the marine environment and the decision-making processes of its Member States.

The IOC will collaborate with international organizations concerned with the work of the Commission, and especially with those organizations of the United Nations system that are willing and prepared to contribute to the purpose and functions of the Commission and/or to seek advice and cooperation in the field of ocean and coastal area scientific research, related services and capacity-building.

The UNEP World Conservation Monitoring Centre (UNEP-WCMC) is the biodiversity assessment and policy implementation arm of UNEP, the world's foremost intergovernmental environmental organization. UNEP-WCMC aims to help decision makers recognize the value of biodiversity to people everywhere, and to apply this knowledge to all that they do. The Centre's challenge is to transform complex data into policy-relevant information, to build tools and systems for analysis and integration, and to support the needs of nations and the international community as they engage in joint programmes of action. UNEP-WCMC provides objective, scientifically rigorous products and services that include ecosystem assessments, support for implementation of environmental agreements, regional and global biodiversity information, research on environmental threats and impacts, and development of future scenarios for the living world.

ACKNOWLEDGEMENTS

We gratefully acknowledge the financial support provided by the Netherlands Ministry of Foreign Affairs, Development Cooperation. The United Nations Environment Programme's Division of Early Warning and Assessment (UNEP-DEWA) and the Intergovernmental Oceanographic Commission of the United Nations Educational, Scientific and Cultural Organization (UNESCO-IOC) have provided guidance and support for the preparation of the publication of this report and database, in particular Salif Diop and Umit Unluata. We would also like to acknowledge the contribution of Mike Huber, Beth Ingraham, Holly Barclay, Matt Gifford, UNEP-WCMC colleagues, the members of the Ad Hoc Steering Group for the Assessment of Assessments process, and the huge efforts of the Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection (GESAMP) Review Team for their support and contributions in the development of this work: Joana Akrofi, Larry Awosika, Julian Barbière, Rick Boelens, Rene Coenen, Lee Kimball and John Morrison. Swedish International Development Agency (SIDA) through GESAMP provided funding for the review workshop, and the International Maritime Organization (IMO) hosted the meeting in London. Thanks are extended to all the organizations and partners that have provided us with information and guidance through this work.

Glossary of working definitions

Aquaculture The cultivation of the natural products of the water, such as fish, shellfish and plants, under controlled conditions.

Bathymetry The measurement of the depth of the ocean floor from the water surface.

Biological diversity/biodiversity The variability among living organisms from all sources including terrestrial, marine and other aquatic ecosystems, and the ecological complexes of which they are a part; this includes diversity within species, between species and of ecosystems.

Biosphere The part of the Earth and its atmosphere in which living organisms exist, or that is capable of supporting life.

Capacity-building Efforts aimed to develop human skills or societal infrastructures within a community or organization needed to reduce level of risk. In extended understanding, capacity-building also includes development of institutional, financial, political and other resources, such as technology at different levels and sectors of the society.

Cold-water corals In contrast to shallow warm-water coral reefs, which are structures built by hermatypic (reef-building) corals and other associated organisms containing zooxanthellae, deep/cold-water corals generally do not contain zooxanthellae and are regarded as ahermatypic.

Coral reef An erosion-resistant marine ridge or mound consisting chiefly of compacted coral together with algal material and biochemically deposited magnesium and calcium carbonates.

Ecoregions Relatively large units of land or water, containing a geographically distinct assemblage of natural communities and sharing a large majority of their species, dynamics and environmental conditions.

Ecosystem The complex of a community of organisms and its environment functioning as an ecological unit.

Ecosystem approach A strategy for the integrated management of land, water and living resources that promotes conservation and sustainable use in an equitable way (FAO).

Groundwater Water that exists beneath the Earth's surface in underground streams and aquifers.

High seas This term, in municipal and international law, denotes all that continuous body of salt water in the world that is navigable in its character and that lies outside territorial waters and maritime belts of the various countries; also called open sea.

Mangrove forest A community of salt-tolerant trees, with associated shrubs or vines and other organisms, that grows in a zone roughly coinciding with the intertidal zone along protected tropical and subtropical coasts.

Marine Environment Assessment The collection, analysis, and interpretation of information with the purpose of assessing the quality of marine areas (GESAMP).

Pelagic Of, relating to, or living in open oceans or seas rather than waters adjacent to land or inland waters.

Policy synthesis The combining of information and arguments to form a coherent rationalization of possible courses of action for decision makers.

River A natural stream of water of substantial volume.

Seamount An underwater mountain rising from the ocean floor and having a peaked or flat-topped summit below the surface of the sea.

Socio-economic monitoring Any study that focuses on social, cultural, economic and political processes in and around the marine environment. This may include studies that address such diverse issues as food security, livelihood opportunities, monetary and non-monetary benefits of marine resources and their equitable distribution, sustainable resource use, or local cultures' perceptions and awareness of marine resources and processes.

Sustainable development Development that ensures that the use of resources and the environment today does not restrict their use by future generations. Sustainable development is a process of developing (land, cities, business, communities and so on) that 'meets the needs of the present without compromising the ability of future generations to meet their own needs', according to the Brundtland Report.

Acronyms

ACOPS	Advisory Committee on Protection of the Sea
CCAMLR	Commission for the Conservation of Antarctic Marine Living Resources
CeDAMar	Census of the Diversity of Abyssal Marine Life
CenSeam	Global Census of Marine Life on Seamounts
CMarZ	Census of Marine Zooplankton
CoML	Census of Marine Life
EU	European Union
EU/WFD	EU Water Framework Directive (2000/60/EC)
FAO	Food and Agriculture Organization of the United Nations
GCRMN	Global Coral Reef Monitoring Network
GEF	Global Environment Facility
GEO	Global Environment Outlook
GESAMP	Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection
GIWA	Global International Waters Assessment
GloBallast	Global Ballast Water Management Programme
GPA	Global Programme of Action for the Protection of the Marine Environment from Land-Based Activities
HELCOM	Convention on the Protection of the Marine Environment of the Baltic Sea Area
IAEA	International Atomic Energy Agency
ICCAT	International Commission for the Conservation of Atlantic Tunas
ICES	International Council for the Exploration of the Seas
ICMM	International Census of Marine Microbes
ICRI	International Coral Reef Initiative
IMO	International Maritime Organization
IOC	Intergovernmental Oceanographic Commission
IPCC	Intergovernmental Panel on Climate Change
IPOA Sharks	International Plan of Action for Conservation and Management of Sharks
IUCN	The World Conservation Union
IWC	International Whaling Commission
LME	Large Marine Ecosystem (strategy for the assessment and management of international coastal waters)
MA	Millennium Ecosystem Assessment Programme
MAB	Man and the Biosphere Programme
NAFO	Northwest Atlantic Fisheries Organization
NASCO	North Atlantic Salmon Conservation Organization
NEAFC	North East Atlantic Fisheries Commission
OBIS	The Ocean Biogeographic Information System
OSPAR	Commission for the Protection of the Marine Environment of the North-East Atlantic
PEARL	Prototype Environmental Assessment and Reporting Landscape
QSR	Quality Status Report
UNDOALOS	United Nations Division of Ocean Affairs and the Law of the Sea
UNEP	United Nations Environment Programme
UNEP-WCMC	UNEP World Conservation Monitoring Centre
UNESCO	United Nations Educational, Scientific and Cultural Organization
WMO	World Meteorological Organization
WSSD	World Summit on Sustainable Development
WWF	World Wide Fund for Nature

Contents

1. Summary and conclusions

1. This survey was developed at the request of UNEP and UNESCO-IOC, as the lead agencies responsible for taking forward the Assessment of Assessments through the implementation of UN General Assembly Resolution 60/30. It aims to provide an understanding of global and regional assessments and other scientific activities concerning the marine environment, and the processes for undertaking these activities, as of October 2006.
2. The report identifies the primary considerations for both pre- and post-operational phases of environmental assessments, stressing the need for clear objectives and a structured process leading to properly validated conclusions and recommendations that will inform policy and point to various response options.
3. It highlights the need to identify gaps in assessment data, both geographic and thematic, the need to use established assessment methodologies and the importance of financial and political backing to ensure the regularity and sustainability of national, regional and global components of the Regular Progress and the capacity to support them. The elements of an effective assessment considered in the report should together ensure that assessments are scientifically credible, policy-relevant, legitimate and useful.
4. The compilation of reports, projects and programmes has been contained in an electronic online database that can be readily searched, updated and expanded, and thereby informs the Assessment of Assessments and the Regular Process for global reporting and assessment of the state of the marine environment.
5. The amount and detail of information on individual database entries is highly variable and in some cases quite limited. Nevertheless, it is clear that only a small proportion of entries could be regarded as broadly based assessments. A somewhat larger group comprises thematic (or narrow) assessments, focusing, for example, on particular features such as fisheries, biodiversity or specialized habitats. By far the largest category comprises research projects, monitoring and other data collection mechanisms.
6. While some assessments of marine environmental issues are broad in their coverage, a significant number are narrower, either thematically or geographically. At the same time, narrower assessments may contain information that is of considerable value in making broader assessments. It is vital that the Group of Experts recognizes and builds on these sources and that it draws the attention of the Regular Process to the links between issues, e.g. sewage inputs and biodiversity changes, or coastal erosion and habitat destruction. The Regular Process must convey to decision makers the importance of appreciating these links, otherwise the response measures may be limited in coverage and thus lack effectiveness.
7. A significant finding from the survey is that relatively few of the world's marine areas have been subject to broadly based assessments. Although there appears to be a range of thematic assessments either completed, under way or planned, these are limited in both temporal and spatial coverage.
8. A more in-depth analysis of selected assessments is needed to identify best practices and approaches with respect to several considerations in establishing an assessment process, such as defining objectives, organization, outputs, selecting the assessment team, and provision for review and evaluation; to identify assessment components on socio-economic aspects or on response measures from which lessons may be learned for the Regular Process; and to identify best practices and approaches to capacity-building.
9. A central consideration in planning assessments is the adequacy of available information in terms of thematic and spatial coverage as well as its relevance to current conditions. Information deficiencies have been the major constraint on global marine assessments undertaken to date. Although by no means definitive, the present survey does not indicate that there have been any major improvements in the overall information base that would enable a reliable wide-ranging assessment of the world's oceans in the immediate future. Such an assessment could, however, provide important baselines for judging progress in the future.
10. Accordingly, the Group of Experts established for the purposes of the Assessment of Assessments will need to consider ways in which critical information gaps might be filled. For those countries not party to regional programmes of monitoring and assessment, it may be helpful to identify priority themes and issues on which information concerning status and trends is required. These themes and issues might be linked to specific questions addressable by means of established and widely used methodologies.

11. There is no doubt that certain countries, in areas most affected by marine environmental degradation, have severely limited capacity to generate data for assessments. Adequate human and financial resources, including training and the provision of essential equipment and facilities, are prerequisites for producing the necessary information. The Group of Experts might consider how specific needs for capacity-building to support the Regular Process can be met, with advice from relevant international agencies and member governments.
12. Recognizing the need to detect and predict trends in environmental conditions, and the fact that trends are seldom detectable without time-series datasets of at least five years (depending on natural and/or man-made variability), the Group of Experts might develop strategies that would encourage coastal states to initiate trend monitoring of key parameters such as stocks of seafood species, loss of critical habitats (coral reefs, mangroves, seagrass beds and so on), sediment quality, incidence of fish diseases and land-based inputs of contaminants. Clearly, the sooner time-series measurements are initiated, the sooner trends will become discernible.
13. Taking into account the actual and potential effects of climate change on the marine environment, there is a growing realization that trend-monitoring programmes should include climate change indicators such as sea-surface temperatures, current patterns, wave height and shifts in the ranges of marine species. Changes in these parameters may have far-reaching effects on marine ecosystems. The difficulties of trend monitoring may be greatly increased by shifting baselines driven by climatic factors.
14. The Group of Experts will need to be mindful of the time required for the results of scientific investigations to become available for assessments; intervals of five years or more are not unusual. Furthermore, marine science projects around the world are seldom in phase. It is important that a regular process generates reports and other products in a timely manner reflecting, insofar as possible, recent conditions. Failure to do so may mean that decisions required on measures to address problems may be delayed to the point where their effectiveness is limited. The Group of Experts may wish to consider carefully the organization of the Regular Process so that the production and review of outputs do not unduly delay the completion of assessments.
15. In light of the above difficulties, an option the Group of Experts may wish to consider is that the Regular Process would not, at least initially, attempt to cover all themes and issues at the same time, but would instead adopt a sequential thematic approach whereby selected priority issues would be addressed in a concerted manner within a restricted time period. This latter approach would allow countries and regions to concentrate their scientific and other resources on particular data-gathering exercises.
16. In the process of preparing this survey and database, a number of suggestions were developed that the Group of Experts might wish to consider in its work on the Assessment of Assessments. These include concepts that the Expert Group may wish to follow up in more depth. They are outlined in the final chapter of this report.

UNEP/Topham

2. Introduction

Darren Defner/UNEP/Topham

A BRIEF HISTORY OF THE REGULAR PROCESS FOR GLOBAL REPORTING AND ASSESSMENT OF THE MARINE ENVIRONMENT

Marine and coastal ecosystems are amongst the most productive ecosystems in the world, providing a rich array of goods and services to human society. Their health and effective functioning are essential for human well-being and broader planetary life-support systems. Yet many of these ecosystems have become increasingly degraded. There is, though, a great deal of concern across the world as to how the goods and services that we depend on can be utilized in a sustainable manner. In light of this, the United Nations General Assembly in 2005 endorsed the need for a regular process for global reporting and assessment of the state of the marine environment, including socio-economic aspects, both current and foreseeable, and that the Regular Process should build on existing regional mechanisms.

The Regular Process has been discussed and developed by the international community over several years with significant input from both states and scientific and other experts. See Annex 2 for a chronology.

In November 2005, the UN General Assembly decided to launch the start-up phase, the Assessment of Assessments, as a preparatory stage towards the establishment of the Regular Process. It also established an organizational arrangement for the Assessment of Assessments. This includes an Ad Hoc Steering Group to oversee its execution, two UN agencies to co-lead the process, and a Group of Experts to undertake the Assessment of Assessments. Their respective functions are set forth in Annex 3 (Resolution 60/30).

In December 2006, the 61st session of the United Nations General Assembly adopted a draft resolution (A/61/L.30) on Oceans and the Law of the Sea as A/RES/61/222, renewing the commitment of Member States to support the implementation of the start-up, the Assessment of Assessments of the Regular Process. See Annex 4.

THE ASSESSMENT OF ASSESSMENTS

The features of the Assessment of Assessments are set out in two documents:

1. The conclusions of the second International Workshop on the Regular Process (June 2005) (Annex 5), endorsed by the UN General Assembly in Resolution 60/30.

2. The decision of the first meeting of the Ad Hoc Steering Group (AHSG) (June 2006), which provides further guidance for the Group of Experts on these features (Annex 6).

These decisions specify that the Assessment of Assessments should assemble information about assessments relevant to the Regular Process and appraise their potential contributions to it. The Assessment of Assessments should be based on existing scientific and technical information and existing assessments, drawing them together and reviewing them. The evaluation by the Group of Experts should identify:

- Gaps in data availability.
- Gaps in geographic coverage of existing assessments.
- Gaps in the scope (thematic coverage) of existing assessments.
- Critical knowledge uncertainties where further research is needed.

In considering questions of scope (thematic coverage), the Assessment of Assessments should address the extent to which existing assessments cover:

- Status and trends in the marine environment, including the goods and services provided by marine ecosystems.
- The human causes [drivers] of environmental/ecosystem change (direct and indirect).
- Impacts on environmental goods and services and consequently on human health, food security and well-being, identifying the most vulnerable groups and areas.
- Responses to these changes and impacts, including the effectiveness of existing policies.

Socio-economic aspects would be covered under 'causes' and 'impacts' of change and might also be addressed under 'responses'.

In addition, the Assessment of Assessments should consider the usefulness and constraints for the Regular Process of assessments of varying scope and carried out at different scales (global, regional, national), and how they could contribute to integrated assessments. It should identify best practices and approaches, including assessment methodologies and the best means to make the Regular Process relevant to policy without prescribing management or policy responses.

The Assessment of Assessments should identify the need for networking and capacity-building in developing countries and economies in transition to support the Regular Process, and the extent to which these activities are associated with existing assessments.

Addressing these issues will highlight how assessments can provide for scientific credibility, legitimacy, policy relevance and usefulness. Based on these, the Group of Experts should identify a framework and options for the Regular Process. In doing so, it should keep in mind existing internationally agreed goals and targets that relate to marine environmental challenges and how to measure progress toward them.

THE SURVEY IN THE CONTEXT OF THE ASSESSMENT OF ASSESSMENTS

This survey was developed at the request of UNEP and UNESCO-IOC, as the lead agencies responsible for taking forward the Assessment of Assessments through the implementation of UN General Assembly Resolution 60/30. The survey is a collaboration of UNEP-WCMC, UNEP and UNESCO-IOC which builds on the 2003 *Global Marine Assessments: A survey of global and regional marine environmental assessments and related scientific activities* to provide an understanding of global and regional assessments and other scientific activities in the marine environment, and the processes for undertaking these activities, as of October 2006.

Scope of the survey

The primary objective of the survey is to support the Group of Experts charged with carrying out the Assessment of Assessments. Two products have been produced: this survey report and a database. The survey report aims to consider the requirements of a successful assessment and the elements of effective assessment (Chapter 3), followed by the actual analysis of the survey undertaken (Chapter 4). The database is available online in a Web-based format at www.unep-wcmc.org/GRAMED and a user guide is presented as Annex 7. The two in conjunction are designed to:

- Provide information on a range of assessments as well as research activities, monitoring and data collection activities that may be able to contribute to a regular assessment.
- Identify assessments for further analysis in the Assessment of Assessments that could contribute to the Regular Process.
- Enable the Regular Process to benefit from the lessons learned by other assessments in terms of process and outcomes.

The methodology used to undertake the survey is provided in Annex 8. This current survey report covers several topics noted below. It is not a comprehensive analysis but serves as a synthesis of available factual information, to assist in the establishment of the work programme of the Group of Experts for the Regular Process. The report information includes:

- Information on 130 assessments and related activities taking place in the marine environment.

- Links to outputs, data (including spatial) and other resources that may be pertinent to the Assessment of Assessments process.
- Analysis of thematic and geographic gaps in the current set of assessments and related activities.
- Lessons learned.
- Recommendations for further analysis.

For the purposes of this survey, the marine environment included areas within and beyond national jurisdiction, from coastal areas and estuaries to the high seas, covering the sea floor and the water column together with the ocean-atmosphere interface and the land-sea interface.

In total, 130 activities carried out by 73 organizations were included in this survey, and form the first version of the database used for this analysis. Sixty-five activities were undertaken on a regional level and 56 on a global level. A further five can be considered as global but implemented at the regional level, e.g. the Global International Waters Assessment (GIWA). Four national-scale examples have also been included.

Thirteen activities surveyed are considered broad-scope assessments according to the definition adopted for the purpose of this survey (see Annex 8, page 44); 36 are assessments with a very specific scope. The remainder of the activities surveyed cannot be considered assessments, but nonetheless provide important information and experiences that may be of interest to the Group of Experts in their Assessment of Assessments.

Of the activities included in this survey, half are in progress and one eighth are planned or completed. Since 2003 (UNEP 2003), 22 new activities have been initiated and six have been completed. Twenty-five per cent of all activities are repeated with some regularity.

Richard Khouri/UNEP/Topham

Of particular note to the Group of Experts are the assessment structures for the Regional Fisheries Management Organizations (RFMOs), some of which are incorporated into the first version of the Global and Regional Assessments of the Marine Environment Database (GRAMED). These assessments are deliberately structured to respond to questions developed by fisheries managers and decision makers in consultation with the assessment scientists, and the outputs can therefore be used directly to guide decision-making.

Limitations of the survey

While the survey aims to be as comprehensive as possible, the coverage of assessments and related activities is not exhaustive. The focus of the survey is on assessments and related scientific activities (e.g. research projects, monitoring projects and data holdings) predominantly at the regional and global scale, using a limited number of national-level assessments which could provide the Group of Experts with particular lessons or information on process or outputs.

The categorization of information gathered has a degree of subjectivity. Value judgements were unavoidably included in several fields of the database, including the classification of activities as assessment or other types, the role of experts, and thematic focus of the activity. This was minimized through use of consensus of the research team and expert review group. The complexity of the assessment processes examined was difficult to capture in the identified thematic categories, which may have resulted in a degree of simplification of thematic coverage. There are also limitations regarding the geographic coverage component field within the database. Efforts were made to minimize subjectivity of the researchers by ensuring regular communication and development of standard definitions.

This process has highlighted the limitations of using Web-based operations to gather information on and for assessments. These include the absence on the Internet of information that may be available in hard copy only, the fact that websites are not updated in a timely fashion and often not at all after projects are completed, and that some of the information is open to subjective interpretation. There is a need for an ongoing process to collate pertinent information as it is published to ensure that the Group of Experts and the Assessment of Assessments continue to receive the most relevant information, for example ensuring that recent publications such as UNEP-GPA's *The State of the Marine Environment* in October 2006 can be incorporated, and others that follow. In addition, there is a need to ground-truth the data included in the database. A proposal for addressing both of these concerns is included as Annex 9 to invite feedback from the organizations and assessments that are currently included in the database.

3. Effective assessment

HS Hystek/UNEP/Topham

WHAT MAKES A SUCCESSFUL ASSESSMENT?

Environmental assessments can be defined in a number of ways depending, *inter alia*, on their scope and purpose. However, the key ingredients of assessment are the appraisal of information gathered and the provision of analysis and guidance for management, policy decisions and performance evaluations of existing programmes and response measures.

A clearly stated definition of assessment for the purposes of the Regular Process is fundamental to the design, scope and resource implications of the Process itself. Thus, it is important that the Group of Experts, at an early stage, devote particular attention to developing a definition of assessment that is clearly indicative of the principal objectives of the Regular Process.

For the purpose of this survey, an assessment was taken to be 'a scientific evaluation of an aspect of the marine ecosystem, environment, group of organisms or an associated process.' An assessment of the marine environment could also include socio-economic aspects (such as interactions between stakeholders and the marine environment through such activities as tourism, diving and fisheries). The assessment may be conducted through the collection of primary data or analysis of secondary data. An assessment with a regular process is characterized by repeating the assessment methodology through time to detect changes.

ELEMENTS OF EFFECTIVE ASSESSMENT

Considerations in establishing an assessment process

Effective provision for the following considerations is necessary to ensure the legitimacy, policy relevance, scientific credibility and usefulness of an assessment.

Pre-assessment stage

In the pre-assessment stage, it is necessary to agree clearly on:

(a) *Objectives and scope, in consultation with decision makers and other stakeholders*

Following the definition of assessment for purposes of the Regular Process, the Group of Experts could prepare a set of specific objectives, consistent with the definition, to guide the design and conduct of the Process. The definition of assessment and the objectives are, therefore, closely interrelated. The

objectives might, for example, be structured in a manner similar to the following:

- To provide an overview of the current condition of the world's marine ecosystems and resources, identifying any apparent patterns and trends.
- To identify the nature, extent and severity of marine environmental degradation, its causes and its implications for human health and social and economic welfare, with particular attention to regional variability.
- To advise governments, policy makers, scientists and other stakeholders of the ecological and socio-economic significance of marine environmental changes and response options that may reduce or reverse marine environmental degradation.

(b) *Geographic coverage*

(c) *Target audience(s)*
The Group of Experts could suggest that the Regular Process consider at the outset which national policy makers constitute the audience for the assessment and identify other stakeholders, such as relevant industries and non-governmental organizations (NGOs), and/or the need for general public education/awareness. With regard to policy makers, it could suggest that the Regular Process identify the relevant international bodies (regional and global) that should be targeted, including those with a relevant specialized or sectoral focus, such as the International Maritime Organization (IMO), Regional Fisheries Management Organizations (RFMOs) and the Food and Agriculture Organization (FAO).

(d) *Outputs/products, including the best means to communicate findings to the target audience(s)*
The Group of Experts could suggest that the Regular Process consider at the outset whether different reports should be produced for different audiences, such as scientific and technical reports, a summary for policy makers and/or outputs for a general public audience. It could suggest that the Regular Process also consider the value of utilizing user-friendly formats such as spatial and graphic representations and/or scenarios for different audiences, and that it also consider whether different reports are needed to distinguish analysis of scientific, socio-economic and technical/policy response options.

(e) *Organization*
Once the objectives, scope, audience, output and methodologies of an assessment have been agreed, there are different ways to develop the desired outputs, including the formation of working groups and identification of lead authors and substantive editors. It is also necessary to provide for broad sourcing of background materials and to develop a work plan/schedule for production and review of outputs.

(f) *Criteria/qualifications for selection of assessment team*
The criteria for and qualifications of those responsible for producing and reviewing the assessment are critical to its scientific credibility and its legitimacy. They should be transparent. It is important to provide for a broad range of disciplinary and geographic experience, balanced between experts from developed and developing countries and experts drawn from users and other stakeholders. In order to insulate the assessment process from political and other biases, the experts should serve in their personal (independent) capacity and disclose any ties to potentially affected industries or other possible sources of influence.

(g) *Procedures for dealing with uncertainty and disagreement*
It must be recognized that there may be situations where uncertainty and disagreement may arise, and it is important that the Group of Experts consider developing a process as a means for dealing with this.

(h) *Budget and funding*

(i) *Peer review*

(j) *Timing and nature of intergovernmental review*
As ocean problems and impacts intensify, it is important to bear in mind that lengthy review processes may delay the release of findings that need urgent attention and the necessary response actions. The Group of Experts could suggest procedures to avoid delays in the review process.

(k) *Provision for review and evaluation of the effectiveness of the assessment [including cost-effectiveness].*

Post-assessment stage

In the post-assessment stage, the following should be undertaken:

(a) *Communications with target audience(s)*

(b) *Ensuring the availability of reports and, where appropriate, access to the data*

(c) *Review and evaluation of the effectiveness of the assessment*

(d) *Evaluation of the effectiveness of response measures that have been adopted by decision makers.*

Data and knowledge

The Regular Process will require adequate information to assess the current status of ecosystems globally, and also to detect, assess and evaluate trends. Points that will need consideration with regard to this are:

- ❑ Is the information base adequate? What are the major geographic and thematic gaps?
- ❑ What degree of confidence is there in the available data (quality requirements)?
- ❑ What degree of confidence is there that at each stage of data utilization, there have been appropriate verification procedures?
- ❑ What are the data needs to determine trends? The determination of trends in important environmental features such as species diversity, population size, habitat area, and water and seafood quality is a primary aim of most environmental assessments. In principle, an identification of trends may facilitate prediction of the rate, direction and magnitude of future change. In order to accurately measure and predict trends, the data needed will have to have been collected over a reasonable time frame using a consistent, standardized, repeatable methodology, in a programme designed to allow appropriate statistical analysis. The nature and extent of natural variability need to be properly identified.
- ❑ How will the Regular Process deal with data/knowledge uncertainties?
- ❑ The grey literature is rarely available on the Web/electronic media.

Geographic coverage and gaps

The Regular Process is intended to have a global coverage that makes use of regional assessments. At the regional level, it is important to take into account transboundary issues and problems and to reflect the relative importance of particular threats and impacts at that level. It is important that the Group of Experts identify regions where existing assessments do not provide adequate guidance for decision makers and pinpoint these constraints so that the assessments can be made more relevant.

At the global level, the design of the assessment can promote a framework for regional assessments that facilitates comparability and a global synthesis. It is important for outputs to identify large-scale changes and trends and to extrapolate any common patterns and trends among the regions and emerging issues. It is also important for the Assessment of Assessments to identify and suggest how to ensure coverage of areas not included in regional assessments, notably areas beyond national jurisdiction. A broad global assessment can encompass an overview of regional conditions (status), threats, impacts and response measures, and the assessment of global phenomena *per se* like the effects of climate change. A thematic global assessment may also cover issues common to many if not all regions, such as resource over-exploitation, sewage pollution or policy options to address an emerging issue.

Scope (thematic coverage)

Themes

Assessments can be broad-based – covering a range of issues over a wide geographic area – or they can be more limited, either in terms of the thematic coverage (e.g. coral reefs, cetaceans, contaminated sediments) or in geographic coverage (e.g. Arctic Ocean, West Africa), or both. Both broad-based and thematic assessments will be important for the Regular Process, provided that they have been produced using well-established procedures.

Status

This should be a statement of the current situation, and will include coverage of, for example, extent of habitats, populations of organisms and water quality, plus information on processes (fluxes, chemical transformations, mechanisms of habitat loss) that are likely to cause change, and on trends (e.g. patterns of changes in chemical composition, changes in species numbers and populations). As noted above, it is difficult to obtain the data to identify trends, particularly long-term quality information.

The status of habitats, potential environmental hazards and socio-economic infrastructure contribute to the basic

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quantification of environmental auditing. Quantification of environmental status ensures availability of data and information on which ongoing and future assessments can build.

Various aspects of trends in ecosystem components and dynamics, climate processes and change, biodiversity and human dimensions contribute to an understanding of environmental changes. Such understanding of trends should form an important aspect of status coverage.

Threats

Threats to the marine environment/ecosystems include broad problems such as nutrient pollution, chemical contamination, or habitat loss/degradation. This should include an analysis of the individual human activities causing the problems and their relative importance at a geographic scale useful to decision makers. At the same time, it is important to evaluate links between these problems and activities, to be able to analyse possible policy responses.

Impacts

An analysis of impacts includes a scientific assessment of changes in the marine environment/ecosystems and how these affect human health, food security and well-being. As with status, long-term collection of quality data is essential for these analyses. As with threats, the analysis should address the relative importance of impacts in different regions so that it is useful to decision makers.

Response measures

Response measures generally consist of legal requirements, management decisions or non-binding goals and policies that may include technical, economic and other aspects. These measures are meant to alleviate or minimize the adverse effects of environmental changes due to human or natural causes. Implementation of any of these measures requires effective management, enforcement and coordination. It also requires follow-up review and evaluation of the effectiveness of any response measures subsequently adopted by decision makers.

An effective assessment should evaluate possible options for changes in management, new or modified legal instruments, and/or alternative mechanisms to integrate or coordinate response measures.

Methodologies

Assessments must be completed using internationally accepted procedures. It is critical that the actual procedures used in assessments are clearly described in the documentation to allow for future evaluation and also to facilitate comparison between assessments. In order for an assessment to be of appropriate quality for use in the Regular Process, information should be available, as appropriate, on the methods used for sampling, data collection, statistical analysis and modelling procedures, data storage and reporting. Other information of particular value would be details on whether primary or secondary data were used, the use of metadata and case studies, the involvement of expert opinion in situations where insufficient quantitative information is available, selection of indicators, establishment of baselines, and the spatial data system.

The use of established assessment methods should be subject to regular updating and quality control as best practices evolve.

Regularity and sustainability

Availability of adequate funds is fundamental to the successful implementation of an assessment. Funding either in cash or kind should be guaranteed from governments, international agencies, financial institutions or other stakeholders to implement the various components of an assessment.

Capacity-building

Capacity-building forms an integral component of a successful assessment. It must be adequately funded. National participation, continuity of the process and overall achievement of essential goals all require a fully funded and pragmatic capacity-building programme. Participation in international assessment processes (regional, global) is in itself a form of capacity-building. Involvement in cooperative international programmes at all levels also builds capacity.

In addition, capacity-building contributes to broader international understanding and consensus-building on problem definition and responses.

4. Results of the survey

This section of the report uses the elements for an effective assessment described in Chapter 3 to consider the 130 activities included in the survey. The database contains a dynamic data analysis tool, which will amend the results as new activities are added.

STRUCTURING THE ASSESSMENT

The survey gathered information on some of the structural aspects of assessments. These are presented below with the detail being provided in GRAMED.

Information was collected on the following pre-assessment stage criteria:

- ❑ Objectives
- ❑ Scope
- ❑ Justification
- ❑ Identification of target audience
- ❑ Outputs/products
- ❑ Budget and funding
- ❑ Review and evaluation.

It was not, however, possible to identify how many of these aspects were taken into account prior to the undertaking of the activities. For this reason the results will be considered in the relevant chapters below.

With respect to the post-assessment stage, whilst 126, or 97 per cent, of surveyed activities have some degree of information available on the World Wide Web, there is a huge variation in the level of detail provided, the confidence that can be had in the information provided, and also in level of relevance. This survey showed that many pages on these websites had not been updated regularly.

The most common outputs of activities surveyed were datasets (56 per cent), technical reports (32 per cent), the creation of databases (22 per cent) and policy syntheses (22 per cent). Other outputs included manuals, websites, newsletters or bulletins, and maps. Just 8 per cent of the activities surveyed produced spatial data in the form of maps. It should be noted that many of the activities produced multiple outputs.

Only 17 of the activities surveyed were found to have a mechanism established to review or evaluate their own process. More than half of these are freely accessible through the respective websites.

DATA AND KNOWLEDGE

An effective Regular Process will need to consider how data is generated or derived. This survey found that 63 per cent of all activities collect primary data; outputs of 51 activities (39 per cent) are based on the analysis of secondary data.

The survey revealed 43 Web-based data portals of relevance to the assessment of the marine environment. These sites provide access to a wide range of data holdings and literature that may be of relevance to the Group of Experts. A list of these data portals and links to their URLs are provided in the database at www.unep-wcmc.org/GRAMED.

A separate issue is how the data and knowledge generated by a regular process will be disseminated and to whom. The survey looked at the target audience as well as the outreach activities and capacity-building initiatives of the 130 activities (also reported on below).

In general, most of the assessments have a target audience identified either explicitly or implicitly through the products and information dissemination plans. Decision makers and scientists are the largest primary target groups; civil society, teachers, students and practitioners together represent less than a third of the primary target groups: 115, or 88 per cent, target scientists/researchers; 80 activities, or 62 per cent, target decision makers; 47 activities, or 36 per cent, target civil society; 16 activities, or 12 per cent, target students; and 13 activities, or 10 per cent, target teachers.

Information dissemination clearly forms a vital component of regional and global assessments. Within this survey 97 activities (75 per cent) reported outreach programmes planned or in progress. Examples of outreach that have been undertaken by surveyed activities are listed in Table 4.1 below. Sixty per cent of activities identified information dissemination as part of the outreach, 54 per cent of surveyed activities identified various capacity-building efforts as part of their outreach programme.

GEOGRAPHIC COVERAGE AND GAPS

In order for a global regular process to make use of regional assessments at a regional level, it is important to ascertain not only where assessments are being carried out but also where they are currently not being undertaken, and consequently where information is lacking. Geographic descriptions were found for 58 of the activities surveyed.

It is a difficult task to provide a substantiated statement on geographic coverage gaps of marine assessment, for four reasons:

1. The use of different terms to describe geographic regions (e.g. Europe, or Mediterranean, Black Sea, North Sea).
2. Poor geographic description of the region covered by the activity (e.g. if described as 'global' it might actually only cover several sites in different regions of the world, but could not be considered truly global; or an activity described as 'African' only covers part of the continent).
3. The limited availability of easily accessed spatial data for activities.
4. Thematic focus of some assessments means that there is a diffuse geographic coverage (e.g. coral reef monitoring; sea mammal surveys).

However, two observations can be made from the information collected (see Table 4.2):

1. The seas within and around Europe (Mediterranean, East Atlantic, Baltic and North Sea) as well as the Northern Atlantic and the polar regions (Arctic and Antarctic Oceans) exhibit the highest abundance of activities undertaken.
2. The high seas and the oceans of the Southern Hemisphere (except the Antarctic Ocean) exhibit a low abundance of environmental assessment activities.

SCOPE (THEMATIC COVERAGE)

Based on the descriptions of theme, status, threat, impact and response measures stated in Chapter 3 and the list of parameters found in Annex 10, the survey shows that: most of the activities in the database (88 per cent) consider the status of the marine environment; a third look at impacts of change; 16 per cent look at the threats to the marine environment; and just over a quarter (27 per cent) consider response measures.

In particular, 33 per cent of all assessments have some kind of socio-economic focus, including pollution impact on people; capacity-building goals; raising awareness and education of stakeholders; human vulnerability; poverty; lifestyle; demographic, social and economic driving forces; training, assistance and technical advice; and management or conservation aspects. Twenty-four per cent of activities surveyed provide information online on the socio-economic components of their work.

ASSESSMENT METHODOLOGIES

The methodologies of activities surveyed were not always easy to find during the survey. In consideration of an effective assessment, it might be deemed important to establish the following information when developing a methodolgy. Would the assessment:

(a) Use primary data
(b) Use secondary data, including case studies
(c) Establish metadata
(d) Create spatial data
(e) Undertake statistical analysis and modelling
(f) Seek expert opinion in regions where there is insufficient quantitative data (combined with qualitative indicators)
(g) Look at ecosystems

Table 4.1: Summary of outreach activities implemented by surveyed activities
The figure to the right of the column indicates the numbers of activities reporting that particular method of outreach.

Disseminating information	
Published reports	16
Website	10
Newsletters	7
Database/metadatabase	5
Meetings and conferences/talks	5
Information dissemination through universities	4
Producing maps, models and visual outputs	4
Materials for the non-scientist	2
Policy recommendations	2
Press releases/media	2
Audiovisual library	1
Internal dissemination	1

Capacity-building	
Fostering collaboration	9
Networking	9
Capacity-building and training	5
Engaging communities	5
Workshops	5
Engaging stakeholders in process	4
Production of educational materials	4
Educational cruises	2
Method transfer/exchange	2
Production of training manuals	2
Developing standard techniques	1
Engaging volunteers	1
Local information forum	1
Student exchanges	1
Student research opportunities	1
Summer school	1

(h) Establish indicators
(i) Pay attention to the assessment unit (regional definitions applied to the activity)
(j) Pay attention to shifting baselines
(k) Develop scenarios?

The survey of activities that was undertaken showed: 63 per cent of all activities collect primary data, but the remaining activities' outputs (39 per cent) are based on the analysis of secondary data; 18 per cent undertake some level of spatial analysis; 16 per cent create metadata; 10 per cent undertake statistical analysis; 3 per cent undertake modelling to consider future scenarios. Case studies are developed by 12 per cent of activities surveyed.

Experts are widely used in activities and assessment processes – particularly where data is limited – and are engaged in different ways at different stages of the process, whether as a peer-review mechanism, in the interpretation of secondary data, or through working groups, scientific committees or advisory boards. This use of expertise is critical, and is something that should be considered in the development of any process.

This survey and the 2003 report found that consideration of the units of assessment for the marine environment is of critical importance. Annex 11 presents a short review of biogeographical classification schemes for the marine biome and gives examples of six that have been applied (Table A11.1). It also discusses research into new methods for devising assessment units through the use of adaptive algorithms. This survey found that there is wide variation in the assessment units and regional definitions that are being used.

REGULARITY AND SUSTAINABILITY

A clearly defined objective and underlying mandate for an activity are two important criteria for sustainability. Objectives were identified for all of the activities identified. Twenty-six per cent of assessments had objectives that were underpinned by, or responded to, international agreements or conventions. Governments requested a further 17 per cent of the activities surveyed.

Availability of funds also constitutes a major factor in the sustainability or repeatability of assessments. The funding resources for global and regional assessments come from a variety of sources. Only 54 (42 per cent) of all investigated activities provide information about their funding arrangements and/or budgets.

The list below highlights the main funding sources for global and regional assessments. There is a high level of similarity between sources of funding for both regional and global scales.

- National governments
- National organizations
- Private foundations
- Regional organizations
- Intergovernmental organizations.

As previously indicated, 25 per cent of activities were repeated on a regular basis. It would be interesting to investigate further the financing mechanisms for these activities to inform the Assessment of Assessments.

CAPACITY-BUILDING

The term capacity-building is broad, covering many concepts. Simply in the process of undertaking an activity it is likely that some kind of capacity-building will take place. However, as indicated in Chapter 3, it is important that building capacity is taken on board by assessments as an important part of the process, and an output.

Building capacity can be achieved through learning lessons from activities that have been completed. This survey found that only 17 of the activities showed evidence of a review or evaluation phase, and only half of these made the results of these reviews available in the public domain.

Table 4.2: Summary of the geographic coverage of regional activities included in the survey

Location	Sub-location	Nº of regional assessments
Africa (4)		3
	East coast of Africa	1
Europe (11)		1
	Northwest Europe	1
	Baltic	2
	North Sea	3
	Mediterranean/Black Sea	4
Antarctica (3)		3
Arctic Region (4)		4
Atlantic Ocean (17)		4
	North Atlantic East and West	6
	Caribbean	3
	South East	1
	Sargasso Sea	1
	Tropical Atlantic	1
	South America	1
Indian Ocean (6)		3
	Monsoonal Asia	3
Southeast Asia (3)		3
Pacific (9)		6
	Northeast	1
	East	1
	Northwest	1
Global high seas (1)		1
TOTAL		**58**

5. Recognized gaps and emerging issues

Over time, the state of the marine environment will change, and new issues requiring action on the part of the global community will be identified. Ideally these issues should be identified as early as possible so that action can be initiated before major impacts are encountered. A key question is: how will the Regular Process deal with recognized existing knowledge gaps and especially with emerging issues so that the international community can address these concerns in a timely and effective manner?

Previous reports, particularly the 2003 UNEP *Global Marine Assessments* (GMA) report, have identified key knowledge gaps, including:

- The high seas and deep/open oceans.
- The marine environment in developing nations and small island states.
- The interactions between marine and freshwater systems.

Emerging issues identified since the UNEP GMA in 2003 include:

- The impact of lowering pH of the oceans as a result of increasing atmospheric CO_2 and the additional impact of carbon sequestration in the oceans.
- The greatly expanded knowledge of deep-sea environments and habitat diversity has led to an urgent call for conservation and sustainable use of these ecosystems.
- The need to look at ecosystem-wide interactions, and interactions between the land, ocean and atmosphere to better understand the marine environment.
- Research on the use of algorithms in order to model natural processes and categorize how the oceans could be better divided into assessment units (Annex 11).

These issues are not prioritized, and it is important to provide a balanced approach between addressing recognized existing problems and emerging issues.

Since the UNEP GMA 2003 report was published, there has been significant discussion of the three knowledge gaps listed above. This survey has found that there has been some progress towards increasing knowledge in the areas identified, but these gaps still exist.

Activities in the area of the high seas and seas beyond national jurisdiction have increased rapidly. The last three years have led to massive developments in understanding deep-sea environments, their complexity, and their diversity in terms of topography, chemistry and biodiversity (e.g. seeps, hydrothermal vents, cold-water coral reefs, seamounts and so on). There has also been much discussion about the severe and immediate threats facing the deep seas, and possible actions for their conservation and sustainable use (marine protected areas in waters beyond national jurisdiction). The survey has highlighted a few activities that are active in the high and deep seas, including those undertaken by the Census of Marine Life (CoML), fisheries assessments and some research activities. However these are rather patchy and still far from providing sufficient information for informed decisions, considering that the high and deep seas comprise the majority of the Earth's surface.

Gap analysis in this current survey confirms the finding of 2003 that the marine waters of the Southern Hemisphere are less well covered than those of the Northern Hemisphere and the poles, and activities tend to be concentrated within 200 nautical miles of the coast. No specific information was available regarding activities targeted to small islands, which suggests this gap still remains, despite high-level discussion regarding small island developing states (SIDS) at the Small Island Developing States, Barbados + 10 meeting held in Mauritius in January 2005.

The impact of freshwater/marine interactions is an area of growing discussion in the international community, including with regard to rivers, drainage groundwaters and aquifers. Activities carried out under the Global Programme of Action for the Protection of the Marine Environment from Land-Based Activities (GPA) have been particularly important in this field with the promotion of *Hilltops2Oceans*, a documentary shown on BBC World in 2004. The Global International Waters Assessment (GIWA) has now concluded and its outcomes are currently being disseminated. It would be expected that increased awareness of these issues will stimulate the request for continued assessment and understanding of these linkages. Less is known about the impacts of groundwater and aquifers, and these remain as a gap in assessments, although a major recent review has addressed some of the issues surrounding groundwater/marine system interactions (Burnett et al 2006).

6. Learning from existing assessments

A total of 130 activities consisting of broad-scope assessments, assessments that are narrow in scope, research programmes, data collections/holdings and indeterminate activities were consulted to provide insights and lessons that could be useful in the development of the Regular Process. In this chapter, general and specific lessons have been identified from the broad- and narrow-scope assessments. A list of the broad- and narrow-scope assessments included in the survey is provided as Annex 12.

ADDRESSING GLOBAL INFORMATION GAPS BY DEVELOPING FAMILIES OF PROJECTS WITHIN A GLOBAL INITIATIVE

CASE STUDY: *Census of Marine Life*

The Census of Marine Life (CoML) was initiated in 2000 for a 10-year period to assess and explain the diversity, distribution and abundance of marine life. CoML relies on a global network of researchers from more than 70 nations. Sub-projects have been established, to focus either on different groups of organisms (e.g. Census of Marine Zooplankton, or CMarZ, and International Census of Marine Microbes, or ICMM) or on oceanic compartments (e.g. Census of the Diversity of Abyssal Marine Life, or CeDAMar, and Global Census of Marine Life on Seamounts, or CenSeam). Data from these studies is deposited in the Ocean Biogeographic Information System (OBIS), a Web-based catalogue of global geo-referenced information on marine species, with online tools for visualizing relationships between species and their environment.

This assessment is an example of an activity addressing one of the key emerging global issues, monitoring the change of biodiversity in the oceans through small-scale, narrow but specific assessments. CoML attempts to bridge some major gaps that haven't been covered by other assessments. This initiative, which has strong financial support from several countries, has the potential to become a main diversity assessment that could potentially feed into the Regular Process.

USING THE EXPERIENCE OF NOW COMPLETED, LARGE MULTI-LEVEL ASSESSMENT PROCESSES TO INFORM THE DEVELOPMENT OF THE REGULAR PROCESS

CASE STUDY: *The Global International Waters Assessment*

The Global International Waters Assessment (GIWA) was conducted from 1999 to 2005. It provides a useful example of a global assessment using a regional approach (Large

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Marine Ecosystem approach). The aim of GIWA was to produce a comprehensive and integrated global assessment of international waters. GIWA included the ecological status of these ecosystems, the causes of environmental problems in 66 sub-regions in the world, and the key issues and problems facing the aquatic environment in transboundary waters. The ultimate goal was to provide sound scientific advice to decision makers and managers concerned with water resources and dealing with environmental problems and threats to transboundary water bodies. Information was communicated through a series of regional metadata reports and a final synthesis report. All documentation relating to GIWA is available online at www.unep.org/dewa/giwa.

Regional teams of local experts led by a focal point were formed for each of the GIWA regions; 1 500 experts contributed from the various regions, creating a strong ownership of the assessment. This approach may aid in increasing saliency of the report in the various regions it aims to target. The GIWA also integrated environmental and socio-economic data at the national scale within each region in an attempt to determine the severity of impacts for the specified concerns of individual countries.

The following lessons learned were presented in the final evaluation report:

1. Staffing: where possible staff should be encouraged to stay with the project team and turnover be minimized; sufficient time should be given to recruitment of project teams; use of volunteers proved beneficial in this process.
2. Timing: although the GIWA has provided a sound and workable methodology for Global Environment Facility (GEF) International Waters projects, sufficient time is required for methodological development and testing.
3. Identification of issues/focus of the assessment: a challenge due to the huge scope of international waters and their transboundary nature; the objective of the assessment should be clearly defined and remain clear throughout the process to assist focus.
4. Clear definition of client and end users.
5. Engagement of client and end users in the project to maximize uptake of the activities outputs; while GIWA was accepted in some regions, other areas were not aware of the project.

CASE STUDY: *The Millennium Ecosystem Assessment*

The Millennium Ecosystem Assessment (MA) was carried out between 2002 and 2005 to assess the consequences of changes in ecosystem services on human well-being and to analyse the options available to enhance the conservation and sustainable use of ecosystems. The MA analyses ecosystem services at global and sub-global (local or regional) scales in terms of current conditions and trends, plausible future scenarios and possible responses for sustainable resource use.

While initially the MA ran for a four-year fixed term, potential follow-up assessments and activities are actively being discussed within the biodiversity community. Further information about the MA can be accessed from www.maweb.org. The terminal evaluation of this project is available online at www.unep.org/EOU/Pdfs/Millennium%20Eco%20Assessment%20Report%20unedited.pdf.

Lessons learned show that a future process should ensure that:

1. Broad consultations are conducted during the design phase.
2. Project objectives are consistent with the availability of time and resources.
3. Decision and policy makers are involved from an early stage if they are expected to act on the results.
4. If sub-global assessments are included, adequate resources and time are budgeted for their design and implementation.
5. Activities best carried out in sequence are not forced into parallel implementation by timing or resource constraints.
6. Honorariums are provided for developing country participants if possible.
7. A capacity-building programme for junior scientists is included.
8. Allowances are made for specific capacity-building to engage government staff who are expected to ultimately implement the approaches developed.
9. Government participation goes beyond environment ministries to involve key decision makers in national planning and finance as well as all sectors with an impact on ecosystem management.
10. Project staff are exceptionally able.
11. Effective use is made of the global community of scientists that emerged as a result of the MA process.

USING REGIONAL NODES TO COORDINATE COLLECTION OF REGIONAL INFORMATION INTO A REGULAR GLOBAL ASSESSMENT ON A THEMATIC ISSUE

CASE STUDY: *Global Coral Reef Monitoring Network (GCRMN)*

The report *Status of Coral Reefs of the World* of the Global Coral Reef Monitoring Network (GCRMN) is an example of a successful existing regular assessment process. GCRMN was established in 1995 as one of the operating units of the International Coral Reef Initiative (ICRI) and operates through 17 regional networks of countries and states, called nodes. The primary aim of GCRMN is to improve management and sustainable conservation of coral reefs by assessing the status of and trends in the reefs and how people use and value these resources.

Since 1998, GCRMN has published the *Status of Coral Reefs of the World* every two years. The report primarily consists of new data, generated from the field through standardized Reef Check methods, thus ensuring comparability and reliability of data. This approach enables GCRMN and the target groups to follow changes in coral diversity, distribution and response to environmental stress. The report also contains an extensive collection of publications, reports and other documents related to coral reef monitoring.

Lessons to be learned from this process include:

- ❑ How to undertake and produce regular assessment reports.
- ❑ How to conduct such activities on a restricted budget.
- ❑ How to achieve global coordination with regional activity coordinated through decentralized and functioning nodes throughout all relevant regions.

ARE REGULAR ASSESSMENT REPORTS FEASIBLE?

CASE STUDY: *HELCOM Quality Status Reports*

One of the longest-running assessments occurring at the regional level is the Quality Status Report (QSR) conducted by the Helsinki Commission (HELCOM). The assessment was repeated on a five-year basis until 2002. The main objective of the HELCOM assessment products was to provide timely, policy-relevant information for targeted users at national and Baltic-wide level as well as to provide input to pan-European and global fora (EU, UNEP, IMO). A lead country was identified and each chapter or aspect of the assessment was then coordinated by a focal point, who in turn invited scientists from all the Baltic countries to participate. In addition to marine environmental assessments, compilations of land-based inputs of contaminants and nutrients were prepared every fifth year and contributed to the overall analysis.

The Secretariat for the Helsinki Convention supports the HELCOM assessment, which is funded by the signatory parties. Since 2002, HELCOM has stopped the five-year reporting cycle, moving in favour of smaller but more frequent thematic assessments and annual indicator fact sheets, although there are plans for a holistic assessment in 2010, to be repeated periodically. Assessments are guided by the Driving force, Pressure, State, Impact, Response (DPSIR) scheme as well as using Quality Objectives and linked performance indicators as central tools.

These assessments may prove valuable to the development of the Regular Process as they not only provide a long series of data and assessment but also place emphasis on targeting policy makers as an important audience.

Lessons learned:

1. The assessment cycle was changed in 2002 to enable the process to become more continuous, and the procedure more operational. Previously, the process had to be reinitiated every five years.
2. The new assessment process is tiered. Annual Fact Sheets provide the skeleton structure for thematic assessments, which in turn provide the basis for less-frequent holistic assessments (in effect the HELCOM version of the Assessment of Assessments). The Monitoring and Assessment strategy is available at www.helcom.fi/groups/

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monas/en_GB/monitoring_strategy. (NB: HELCOM have not released an evaluation or lessons learned report from their assessment experiences.)

DRAWING FROM NATIONAL-LEVEL ASSESSMENTS

Although national-level assessments are beyond the scope of this study, it is necessary to point out that there are a number of national activities that might be able to assist in the development of the Regular Process. The assessments illustrated below are included in GRAMED.

CASE STUDY: *Charting Progress – An integrated assessment of the state of UK seas*

The government of the United Kingdom prepared a report to highlight gaps in knowledge and coordination, identifying steps to address these and for forming a basis from which to take forward the ecosystem approach to management of the seas.

CASE STUDY: *National Coastal Conditions Report (United States Environmental Protection Agency)*

National Coastal Conditions Reports (NCCRs) describe the ecological and environmental conditions in the United States' coastal waters. They summarize the condition of ecological resources in these waters and highlight several exemplary federal, state, tribal and local programmes that assess coastal ecological and water-quality conditions.

CASE STUDY: *Ireland Quality Status Report 1999*

Produced by the Commission for the Protection of the Marine Environment of the Northeast Atlantic (OSPAR), the 1999 report for Ireland spawned an 'Experienced gained – lessons learned' supplement and also detailes challenges islands face. With highlighted sections like 'Ten steps towards improved marine environmental assessments', it offers a clear, succinct and salient example of marine environmental reporting to consider while designing reporting mechanisms for varied audiences such as policy makers.

CASE STUDY: *State of the Environment – New Zealand*

This report highlights some interesting institutional functions in the country. The purpose of these tools and guidelines is to facilitate consistent collection of environmental data and provide values and targets for environmental agencies to use in their management strategies in the absence of environmental monitoring capability within the Ministry. There is also an Environmental Metadata Framework resulting in metadata standards of consistent methodology and improved quality in monitoring the information gathered. Whether this hierarchy of organizing could be scaled up to a larger geographic scale should be considered.

CASE STUDY: *Development and Protection of the Coastal and Marine Environment in Sub-Saharan Africa – Nigeria National Report*

This comprehensive report utilized available data and information and did not involve any field data collection. The methodology follows GIWA and takes into account anthropogenic activities, including poor agricultural practices, oil exploration, and indiscriminate disposal of industrial and domestic waste resulting in pollution, flooding and erosion. The challenges of relying on expert opinion are detailed, as the study faced difficulties representative of those working in data-sparse regions.

7. Suggestions of further issues to be considered by the Group of Experts

In the process of preparing this survey and database, the following additional suggestions were developed, which the Group of Experts might wish to consider in its work on the Assessment of Assessments. Five broad suggestions emerged. The Group of Experts could consider the development of the following:

- A procedure for the Regular Process to ensure that the international community is aware of emerging issues in a timely fashion.
- Precise questions about the condition of marine features and processes to promote the generation of relevant data and information.
- A way to promote the application of the ecosystem approach in assessments. Consideration could be given to investigating processes for identifying assessment units delimited by natural processes. The Group of Experts could also explore whether there is any guidance in existing assessments on application of an ecosystem approach.
- The potential of the survey database (GRAMED) as an ongoing tool for the Assessment of Assessments and Regular Process. To remain pertinent, the database should be updated on a regular basis to ensure that accurate and timely information is available for use by the Assessment of Assessments and the Regular Process as well as other scientists, policy makers and stakeholders. The database should be expanded to encompass a select list of additional assessments, specifically those that incorporate assessments on employment trends and economic evaluation related to human activities (such as diving, coastal tourism, cruising, offshore oil and gas, shipping, pleasure boating, fishing and coastal aquaculture). The database should be further expanded to include assessments of response measures (technical and policy options) that reduce threats and impacts from particular human activities. In addition, further national assessments from which important lessons can be learned could be included in the database. A proposal for activities that would be required in order to implement these developments is incorporated in Annex 9.
- PEARL (see Annex 13) is an activity of the UNEP Science Initiative to document environmental assessment activities. It is suggested that the survey database (GRAMED) could feed into PEARL to ensure streamlining of these two processes.

A number of the suggestions address further evaluation of selected assessments that may provide useful guidance for the Group of Experts. Specifically, it may be useful for the Assessment of Assessments to consider in more depth:

- How previous broad assessments have defined objectives.
- Any evaluations of socio-economic aspects in previous assessments (e.g. GIWA).
- Any evaluations of response options in existing assessments (e.g. GIWA, MA), including possible socio-economic effects.
- Any evaluations of the methodologies used by different assessments (e.g. North Sea Task Force).
- How particular considerations have been addressed by the following assessments in establishing an assessment process:
  - organization – e.g. CoML, ICES, IPCC, OSPAR, GESAMP, GIWA, MA;
  - outputs – e.g. IPCC, MA, OSPAR, HELCOM;

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- selection of assessment teams – e.g. IPCC, GESAMP;
- procedures for dealing with uncertainty and disagreement – e.g. CCAMLR, IPCC;
- timing and nature of intergovernmental review – e.g. IPCC, ICES;
- assessment methodologies – e.g. GIWA, MA, OSPAR, EU/WFD;
- post-assessment evaluation – e.g. GIWA, MA.

- The capacity-building elements of the CoML and IPCC.

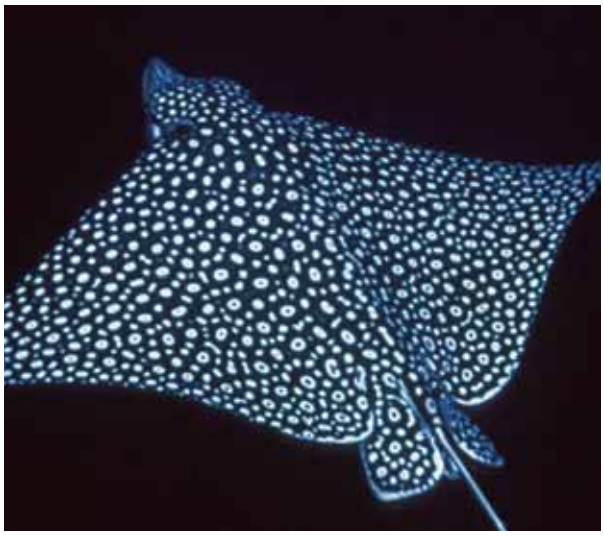
A second series of suggestions addresses gaps in the geographic and thematic coverage of previous assessments. In this respect, it may be useful for the Assessment of Assessments to consider in more depth:

- How data that is already routinely collected by international (global, regional) bodies, or data that could easily be collected by them, could contribute to the Regular Process.
- How existing datasets might be better utilized in the global and regional components of the Regular Process.
- How existing assessments of varying geographic coverage and thematic scope can be integrated into the regional and global components of the Regular Process, and how to identify linkages between issues and regions.
- In relation to identified gaps, the prioritization of issues that represent common, serious problems around the world requiring further data collection and assessment.
- How to provide for assessment of areas not included in regional assessments, notably the open oceans and deep-sea environments.
- With respect to capacity-building, the threshold requirements for data collection and assessment at the national level sufficient to support a broad assessment of the national marine environment/ecosystems. This would allow individual governments to evaluate ongoing activities within the country against this threshold. National programmes could then be designed to support national, regional and global assessments.

This survey has identified a number of broad and narrow marine environmental assessments, but it has been noted that other information sources are available. These include national assessments and their underlying data, and inputs from ongoing international/regional/national agency activities/data/assessments (e.g. GESAMP, MA, GIWA, IMO, IPCC, ICES, IWC and WWF/IUCN and other NGOs). Much could be gained from identifying where each programme/assessment might contribute to the Regular Process in terms of establishing status (including processes/trends), threats/impacts and response measures.

There will be a need for improved data availability in the future. To achieve this, a greater mobilization of effort by all sectors of the community interested in the marine environment will be required. The Group of Experts should indicate to the Ad Hoc Steering Group and General Assembly that there needs to be a consideration of how to get governments to fill critical gaps in information on the most common global marine environmental problems, e.g. fisheries, sewage and destruction of habitats, including reefs and mangroves. New mechanisms to achieve this goal must be sought. Appropriate incentives, including support for greater capacity-building in all facets of marine environmental assessment, must be provided and investments made in initiatives that address critical gaps in knowledge.

Deborah Fueitt/UNEP/Topham



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Annexes

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OTHER USEFUL LINKS/ONLINE RESOURCES

1. **Deep Sea Conservation Coalition (DSCC)**
   www.savethehighseas.org/pubs_other.cfm
   Resources of interest: Publications on deep-sea habitats
2. **Man and the Biosphere Programme (MAB)**
   www.unesco.org/mab/mabProg.shtml
   Resources of interest: Many coastal sites included in the MAB Programme
3. **International Plan of Action for Conservation and Management of Sharks (IPOA Sharks)**
   www.fao.org/figis/servlet/static?dom=org&xml=ipoa_sharks.xml
   Resources of interest: One of the few websites concerned solely with the conservation and management of sharks
4. **UN Atlas of the Oceans**
   www.oceansatlas.com/index.jsp
   Resources of interest: Comprehensive treatment of ocean-related issues

Annex 2: Timeline of major meetings and events in the establishment of the Regular Process, 1999-2006

DATE	EVENT	OUTCOMES
April 1999	Commission on Sustainable Development Report on the Seventh Session Document: E/1999/29-E/CN.17/1999/20 www.un.org/esa/sustdev/documents/docs_csd7.htm	❑ Paragraph 20: *'With regard to the ongoing efforts to enhance the effectiveness of [...] GESAMP as a source of independent scientific advice on oceans and coastal issues, participants suggested that consideration be given to establishing an international panel on marine pollution, along the lines of the Intergovernmental Panel on Climate Change (IPCC)'.* ❑ Paragraph 21: *'... priority to the identification of coherent, comprehensive and consistent approaches to sustainable development questions in relation to oceans and seas'.*
February 2001	21st session of the UNEP Governing Council and Second Global Ministerial Environment Forum, Nairobi, Kenya, 5-9 February 2001 www.unep.org/GC/GC21/K0100272-DECISIONs.doc	❑ Iceland proposed the need for a global marine assessment (GMA). ❑ UNEP GC Decision 21/13 adopted to *'explore the feasibility of establishing a regular process for the assessment of the state of the marine environment'.*
September 2001	Feasibility Study for Establishing a Regular Process for the Assessment of the State of the Marine Environment, Reykjavik, Iceland, 12-14 September 2001. Also referred to as the 'Iceland Meeting'. unesdoc.unesco.org/images/0012/001254/125477e.pdf (page 17) This information is also available at: www.unep.org/dewa/assessments/EcoSystems/water/MarineAssessment/reports/iceland_report/FinalReport November2001a.pdf	❑ Agreed that developing a GMA process is both desirable and urgently needed. ❑ Recommended that the process should be aimed at policy makers providing advice and guidance to mitigate environmental impacts and changes based on science. ❑ Recommended the organization of a technical workshop to establish a blueprint for the process.
March 2002	Technical Workshop on the Feasibility of Establishing a Regular Process for the Global Assessment of the State of the Marine Environment'. Bremen, Germany, 18-20 March 2002. Also referred to as the 'Bremen Meeting'. http://unesdoc.unesco.org/images/0013/001300/130019e.pdf Also available at: www.unep.org/dewa/assessments/EcoSystems/water/MarineAssessment/reports/germany_report/Final-GMA-Workshop-Proceedings.pdf	❑ Achieved a consensus about a regular process and how it might be set up. ❑ Endorsed a general outline of the assessment process and its components. ❑ Recommended a survey of current and future marine environmental assessments and related scientific activities.

DATE	EVENT	OUTCOMES
August/ September 2002	World Summit on Sustainable Development, Johannesburg, South Africa, 26 August–4 September 2002 www.un.org/esa/sustdev/documents/ WSSD_POI_PD/English/POIToc.htm	❑ Commitment to *'establish by 2004 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'* (Paragraph 36b of the Johannesburg Plan of Implementation (JPOI), adopted by the World Summit on Sustainable Development).
December 2002	57th session of the UN General Assembly A/RES/57/141 www.un.org/depts/los/general_assembly/ general_assembly_resolutions.htm	❑ UN General Assembly Resolution 57/141 on Oceans and the Law of the Sea. ❑ Reflecting the request of GC Decision 21/13 in 2001, the Resolution calls to *'establish by 2004 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, building on existing regional assessments'*. ❑ The General Assembly welcomed the previous work of the Consultative Process, extended it for an additional three years, and decided to review the Consultative Process' effectiveness and utility at its 60th session. In response to paragraph 36b of the JPOI, the General Assembly also requested the Secretary-General to prepare proposals on modalities for the GMA, drawing upon the work of UNEP pursuant to Decision GC 21/13.
February 2003	22nd session of the UNEP Governing Council www.unep.org/gc/gc22/Document/k02634 82.pdf	❑ UNEP Governing Council Decision 22/1. ❑ Requests the active participation and contribution of UNEP to the preparatory process for the GMA, as called for in UN General Assembly Resolution 57/141.
September 2003	Report of the Secretary-General on modalities of the GMA A/58/423 www.un.org/Depts/los/global_reporting/ global_reporting.htm	❑ In response to UN General Assembly Resolution 57/141, the Secretary-General prepared a report containing proposals on modalities for a regular process for the GMA (A/58/423). The report reflects discussions held at an inter-agency consultative meeting at the headquarters of the Intergovernmental Oceanographic Commission of the United Nations Educational, Scientific and Cultural Organization (UNESCO-IOC).
December 2003	58th session of the UN General Assembly A/RES/58/240 www.un.org/depts/los/general_assembly/ general_assembly_resolutions.htm	❑ UN General Assembly Resolution 58/240 takes further steps to push establishment of a regular process, including convening international workshops. ❑ Specifically, under paragraph 64, it will be required to *'convene an international workshop with representatives from all interested parties, in conjunction with the fifth meeting of the Consultative Process, to further consider and review the draft document; (e) Convene an intergovernmental meeting to finalize and adopt the document and to formally establish the regular process; 65. Accepts the offer of the Government of Iceland to host this intergovernmental meeting in Reykjavik in 2004, in accordance with paragraph 17 of resolution 47/202 A of 22 December 1992; 66. Requests the Secretary-General to report to the General Assembly at its fifty-ninth session on the development of the regular process'*.

Global Marine Assessments

DATE	EVENT	OUTCOMES
March 2004	In response to General Assembly Resolution 58/240, the Secretary-General convened a Group of Experts on the GMA. The Group, chaired by UNESCO-IOC, was composed of representatives from states, intergovernmental organizations (IGOs) and non-governmental organizations (NGOs). A/AC.271/WP.1 www.un.org/Depts/los/global_reporting/global_reporting.htm	❑ Draft issued detailing the scope, general framework and outline of the Regular Process for the GMA, as well as issues pertaining to quality assurance, institutional arrangements, capacity-building and funding.
June 2004	First GMA International Workshop convened by the UN Informal Consultative Process on Oceans and the Law of the Sea (Consultative Process), New York A/59/126 www.un.org/Depts/los/global_reporting/global_reporting.htm	❑ Recommended that the General Assembly invite the Secretary-General to establish a task force to oversee the next stage of preparatory work for the GMA.
November 2004	59th session of the UN General Assembly A/RES/59/24 www.un.org/depts/los/general_assembly/general_assembly_resolutions.htm	❑ *'recognizes the urgent need to initiate a start-up phase, the "Assessment of Assessments", as a preparatory stage towards the establishment of the regular process provided for in the Johannesburg Plan of Implementation and resolutions 57/141 and 58/240'* (Article XII, paragraph 85); and ❑ UN General Assembly Resolution 59/24 *'requests the Secretary-General to convene the second International Workshop on the regular process for global reporting and assessment of the state of the marine environment, including socio-economic aspects, from 13 to 15 June 2005'* (Article XII, paragraph 86).
June 2005	Second GMA International Workshop convened by the UN Informal Consultative Process on Oceans and the Law of the Sea (Consultative Process) and UNDOALOS, New York A/60/91 www.un.org/Depts/los/global_reporting/global_reporting.htm	❑ Set in place the first building blocks of the Assessment of Assessments, the start-up phase of the GMA process, stock-taking and gap analysis of existing assessments of the state of the marine environment.
November 2005	60th session of the UN General Assembly A/RES/60/30 www.un.org/depts/los/general_assembly/general_assembly_resolutions.htm	❑ UN General Assembly Resolution 60/30 *'decides to launch the start-up phase, the 'assessment of assessments', to be completed within two years as a preparatory stage towards the establishment of the regular process'* (Article XI, paragraphs 89-96); and ❑ *'decides also to establish an organizational arrangement that includes an ad hoc steering group to oversee the execution of the "assessment of assessments"'* (paragraph 91).

DATE	EVENT	OUTCOMES
June 2006	First Ad Hoc Steering Group meeting for the Regular Process, New York www.unep.org/dewa/assessments/EcoSystems/water/MarineAssessment/reports/Final_report_AHSG1_June_2006.doc	❑ Review of the updated survey on regional and global assessments by UNEP-WCMC. ❑ Considers the profile of experts and criteria for their selection. ❑ Drafts recommendations to the Group of Experts. ❑ Details a budget and resource mobilization strategy for the Regular Process.
December 2006	61st session of the UN General Assembly draft resolution A /61/L.30 adopted as A/RES/61/222 www.un.org/depts/los/general_assembly/general_assembly_resolutions.htm	❑ Recalls Resolution 60/30 and urges the Ad Hoc Steering Group to complete the 'assessment of assessments' within two years. ❑ Takes note of the report of the first meeting of the Ad Hoc Steering Group in New York in June 2006.

Annex 3: UN General Assembly Resolution 60/30 adopted by the General Assembly at the 60th session, November 2005, on Oceans and the Law of the Sea (A/RES/60/30)

Section XI, Paragraphs 89-96: Regular process for global reporting and assessment of the state of the marine environment, including socio-economic aspects
Full text available at: http://ioc.unesco.org/iocms/files/UNGA%20RES%2060_30_e.pdf#search=%22UNGA%20resolution%2060%2F30%22 or www.unep.org/dewa/assessments/EcoSystems/water/MarineAssessment/reports/A-RES-60-30.pdf

89. ***Endorses*** the conclusions of the second International Workshop on the regular process for global reporting and assessment of the state of the marine environment, including socio-economic aspects ('the regular process');

90. ***Decides*** to launch the start-up phase, the 'assessment of assessments', to be completed within two years, as a preparatory stage towards the establishment of the regular process;

91. ***Decides*** also to establish an organizational arrangement that includes an ad hoc steering group to oversee the execution of the 'assessment of assessments', two United Nations agencies to co-lead the process, and a group of experts;

92. ***Establishes*** the Ad Hoc Steering Group with the following composition:

(a) One representative from each Member State to be appointed by the President of the General Assembly, in consultation with Member States and regional groups, ensuring an adequate range of expertise, and on an equitable geographical basis as follows: five Member States from the African Group, five Member States from the Asian Group, two Member States from the Eastern European Group, three Member States from the Latin American and Caribbean Group, and three Member States from the Western European and other States Group, with the understanding that agency funding support for such experts is subject to availability of funds;

(b) One representative from each of the following United Nations bodies and related international organizations: the Food and Agriculture Organization of the United Nations, the World Meteorological Organization, the International Maritime Organization, the Intergovernmental Oceanographic Commission and the United Nations Environment Programme, as well as the International Seabed Authority;

93. ***Sets forth*** the following functions to be performed by the Ad Hoc Steering Group:

(a) To approve the composition of the group of experts to be proposed by the lead agencies and communicate this composition to the States Members of the United Nations;

(b) To decide on a work programme for the 'assessment of assessments', to be proposed by the group of experts through the lead agencies, and to distribute it to the States Members of the United Nations;

(c) To provide for an open-ended mid-term review of the work and progress made so far, in order to give all States Members of the United Nations an opportunity to comment on and contribute to the development of the ongoing work carried out under the 'assessment of assessments';

(d) To give guidance, consistent with the conclusions of the second International Workshop, to the lead agencies and the group of experts, if required;

94. ***Determines*** that the lead agencies shall undertake the following actions, under the guidance of the Ad Hoc Steering Group, in addition to contributing to the work in accordance with their own mandate:

(a) To provide secretariat services to the Ad Hoc Steering Group;

(b) To coordinate the work in collaboration with relevant United Nations bodies, organizations and programmes and related international organizations;

(c) To establish a group of experts, upon approval by the Ad Hoc Steering Group, to undertake the actual work of assessing the various assessments, taking into account the importance of adequate participation of experts from developing countries within this group;

(d) To prepare a report on the results of the 'assessment of assessments' for the General Assembly;

95. ***Invites*** the United Nations Environment Programme and the Intergovernmental Oceanographic Commission to jointly undertake the role of lead agencies, under the guidance of the Ad Hoc Steering Group;

96. ***Decides*** that the execution of the 'assessment of assessments', including the activities of the Ad Hoc Steering Group and the group of experts, shall be financed through voluntary contributions and other resources available to participating organizations and bodies, and invites Member States in a position to do so to make contributions.

Annex 4: UN General Assembly draft resolution A/61/L.30 adopted by the General Assembly at the 61st session, December 2006, on Oceans and the Law of the Sea as A/RES/61/222

Section XII, Paragraphs 113-117: Regular process for global reporting and assessment of the state of the marine environment, including socio-economic aspects
Full text available at: www.un.org/Docs/journal/asp/ws.asp?m=A/61/L.30

113. ***Recalls*** that the Ad Hoc Steering Group was established by resolution 60/30;

114. ***Takes note*** of the report of the first meeting of the Ad Hoc Steering Group for the 'assessment of assessments' launched as a preparatory stage towards the establishment of the regular process for global reporting and assessment of the state of the marine environment, including socio-economic aspects, held in New York from 7 to 9 June 2006, and urges Member States from the African and Asian regional groups to propose the remaining representatives to the Chairmen of their regional groups so that the appointment to the Ad Hoc Steering Group of those representatives can be made by the President of the General Assembly without further delay;

115. ***Urges*** the Ad Hoc Steering Group to complete the 'assessment of assessments' within two years as provided for in resolution 60/30;

116. ***Welcomes*** with appreciation the support of the United Nations Environment Programme and the Intergovernmental Oceanographic Commission for the 'assessment of assessments' in providing secretariat services to the Ad Hoc Steering Group and establishing the group of experts, as approved by the Ad Hoc Steering Group;

117. ***Invites*** Member States, the Global Environment Facility and other interested parties to contribute financially to the 'assessment of assessments', taking into account the work plan and budget approved by the Ad Hoc Steering Group in order to complete the 'assessment of assessments' within the specified period.

Annex 5: Conclusions of the second International Workshop on the Regular Process for global reporting and assessment of the state of the marine environment, including socio-economic aspects, Annex of document A/60/91

Full report available at:
http://daccessdds.un.org/doc/UNDOC/GEN/N05/398/99/PDF/N0539899.pdf?OpenElement

1. The second International Workshop on the regular process for global reporting and assessment of the state of the marine environment, including socio-economic aspects, considered the start-up phase, the 'Assessment of Assessments', as a preparatory stage towards the establishment of the regular process provided for in the Plan of Implementation of the World Summit on Sustainable Development (Johannesburg Plan of Implementation) [*Report of the World Summit on Sustainable Development, Johannesburg, South Africa, 26 August to 4 September 2002* (United Nations publication, Sales No. E.03.II.A.1), chap. I, resolution 2, annex.] and General Assembly Resolutions 57/141 and 58/240, including the scope of the process and a task force to initiate the start-up phase.

FEATURES OF THE 'ASSESSMENT OF ASSESSMENTS'

2. The second International Workshop reached the following conclusions about the nature of the 'Assessment of Assessments':

(a) The 'Assessment of Assessments' is not intended to alter the competence of any other organization to undertake marine assessments within its field of competence. It should respect the sovereign rights and jurisdiction of coastal States over maritime zones under their jurisdiction, in accordance with the United Nations Convention on the Law of the Sea. It is not intended that the 'Assessment of Assessments' should make recommendations about the management of human activities that affect the oceans. Other competent authorities should draw their own conclusions about the implications for the management of activities within their fields of competence;

(b) The 'Assessment of Assessments' should be essentially science-based. It should not require any original scientific research or any new marine observations but will involve the integration of existing scientific and technical data and information;

(c) In accordance with paragraph 36 (b) of the Johannesburg Plan of Implementation, the 'Assessment of Assessments' should cover assessments of the state of the marine environment, including socio-economic aspects. The latter might include, for example, existing assessments of underlying trends in the employment in and the economic value of activities affecting the marine environment but should not encompass policy evaluations. Time, resources and professional judgement will determine the range of activities that can be covered;

(d) The 'Assessment of Assessments' will not involve making any new assessments about the state of the oceans or about the state of any particular component. It is intended that it should bring together and review existing assessments;

(e) The 'Assessment of Assessments' will need to acknowledge uncertainties: there may be gaps in scientific knowledge and in data and these should be identified.

AIMS OF THE 'ASSESSMENT OF ASSESSMENTS'

3. The second International Workshop recommended that the aims of the 'Assessment of Assessments' should be to:

(a) Assemble information about assessments relevant to the regular process, which have already been carried out under the purview of United Nations bodies and global treaty organizations, regional organizations, national Governments, and by any other relevant organization, where appropriate;

(b) Make a constructive appraisal of those assessments, for example, by comparing methodologies, data sources and coverage, in order to identify, collate and synthesize best practices in assessment methodologies and to identify what thematic and other gaps and uncertainties exist in current scientific knowledge and assessment processes;

(c) Establish how those assessments have been communicated to policy makers at the national, regional and global levels.

4. Given the data and assessments that the group of experts, proposed in paragraphs 5 and 11 below, finds to be relevant to the regular process, and based on its evaluations, it would produce a report within 24 months to the ad hoc steering group, described in paragraphs 5 to 8 below, including identification of:

(a) Assessments available on the marine environment and an evaluation of their potential contribution to the regular process;
(b) Data available and how that information might be incorporated into the regular process;
(c) The usefulness and constraints posed by organizing assessment components of the regular process on different scales;
(d) How organizing assessment components on different scales could relate to integrated assessments;
(e) What gaps exist and their implications for the regular process;
(f) The need for capacity-building to support the regular process; and
(g) A framework and options for building the regular process, including potential costs.

ORGANIZATIONAL ARRANGEMENTS

5. The second International Workshop envisages that the 'Assessment of Assessments' might take about two years. The second International Workshop considered the organizational arrangements for that period and recommended that:

(a) An ad hoc steering group be established;
(b) One or more United Nations agencies take a lead role;
(c) A group of experts be established.

It is important that developing countries be adequately represented within the ad hoc steering group and the group of experts.

6. The second International Workshop recommends that the Assembly establish an ad hoc steering group to oversee the execution of the 'Assessment of Assessments'.

7. The composition of the ad hoc steering group should include:

(a) Nominees of Member States, on an equitable geographical basis and ensuring an adequate range of expertise;
(b) The following United Nations bodies: UNEP, Food and Agriculture Organization of the United Nations, International Maritime Organization, Intergovernmental Oceanographic Commission of UNESCO, World Meteorological Organization and International Seabed Authority.

8. The functions of the ad hoc steering group should be to:

(a) Agree on a proposed staged work programme for the 'Assessment of Assessments';
(b) Organize an open-ended midterm review to provide to all Members States of the United Nations, in particular those States not represented on the ad hoc steering group, with the opportunity to comment on and contribute to the development of the ongoing work carried out under the 'Assessment of Assessments'; and
(c) Give guidance to those carrying out the work, if required.

9. One or more United Nations agencies should be appointed to take a lead role in executing the 'Assessment of Assessments', under the guidance of the ad hoc steering group. That agency or agencies, in addition to contributing to the work in accordance with their own mandate, should provide secretariat services to the ad hoc steering group and coordinate the work in collaboration with all United Nations bodies, organizations and programmes.

10. In the view of the second International Workshop, the Assembly should invite UNEP and the Intergovernmental Oceanographic Commission of UNESCO to undertake jointly the role of lead agency or agencies.

11. The lead agency or agencies should establish a group of experts to undertake the actual work of assessing the various assessments. The composition of the group should be approved by the ad hoc steering group.

FINANCE AND RESOURCES

12. The second International Workshop noted that many organizations and United Nations bodies are already engaged in marine monitoring and assessment work and that they would therefore be able to contribute their experience and results to the 'Assessment of Assessments' process.

13. It is recognized, however, that there will be some additional costs, including for the ad hoc steering group, the group of experts, the midterm review, the peer review and publications, for which financial resources will need to be found.

Annex 6: Ad Hoc Steering Group of the Assessment of Assessments of the Regular Process for global reporting and assessment of the state of the marine environment (June 2006)

Full report available at:
www.unep.org/DEWA/assessments/EcoSystems/water/MarineAssessment/reports/Final_report_AHSG1_June_2006.doc

APPENDIX II

III. FEATURES OF THE 'ASSESSMENT OF ASSESSMENTS'

9. ***Also recommends and reiterates*** that the Group of Experts, in implementing the aims and expected outcomes as identified in the conclusions of the second International Workshop, undertakes a critical analysis of the assessments under this scope in order to assess their scientific credibility, and their policy relevance, legitimacy and usefulness, in particular by identifying:

(a) Best practices and approaches;
(b) Thematic and geographic assessment gaps and needs;
(c) Uncertainties in scientific knowledge, data gaps and research needs;
(d) Networking and capacity-building needs in developing countries and countries with economies in transition; and
(e) A framework and options for the Regular Process based upon current relevant assessment process and practices.

10. ***Requests*** the Group of Experts to develop a 'Summary for Decision-Makers' for the consideration of the Ad Hoc Steering Group as part of the 'Assessment of Assessments' report.

11. ***Suggests*** that the Group of Experts, when considering the framework and options for the Regular Process, keep in mind the following questions:

(a) What are the current internationally agreed goals and targets relating to marine environment challenges, and what indicators and data are available to measure progress towards them?
(b) To what extent does the current assessment landscape analyse the status and trends in marine environmental change and the interaction between the marine environment and society, in attempting to meet these internationally agreed goals and targets?
(c) To what extent does the current assessment landscape analyse the drivers of marine environmental change and alterations in environmental services, how they affect human well-being and prosperity, and which groups and what areas are most vulnerable to those changes?
(d) What are the implications of the internationally agreed development goals, including those contained in the Millennium Declaration, in areas such as the marine aspects of human health, food security, poverty alleviation, energy and disaster-preparedness for the Regular Process?
(e) To what extent does the current assessment landscape analyse the effectiveness of existing policies, and how could the Regular Process best be policy relevant without being policy prescriptive?

12. ***Reiterates*** that the methodology of the assessment will:

(a) Be a scientific, credible and independent assessment to be undertaken by a geographic- and gender-balanced Group of Experts, co-chaired by one expert from a developing country and one from a developed country, while it will be subject to an in-depth peer review by experts and governments;
(b) Will be prepared by Chapter Lead Authors (CLA) and a group of Authors, drawing on existing assessments complemented by relevant scientific and technical data and information as appropriate, without requiring new scientific research or marine observations;
(c) Be a policy-relevant, legitimate and useful assessment, as ensured by the Ad-Hoc Steering Group.

13. ***Also reiterates*** that the 'assessment of assessments' as mandated by UNGA in resolution 60/30 is to be completed within two years as a preparatory stage towards the establishment of the Regular Process and approves,

contingent on the availability of sufficient voluntary contributions and other resources to meet the agreed budget in paragraph 19, the two year tentative work plan attached as Annex 1 starting with the first meeting of the group of experts.

14. ***Requests*** UNEP and IOC of UNESCO to present the 'Assessment of Assessments' report to the Ad Hoc Steering Group for its consideration before it is presented to the UNGA.

IV. GROUP OF EXPERTS

15. ***Adopts*** the profile of experts and criteria for the selection of experts as presented in Annex 2;

16. ***Agrees*** that proposed experts to be considered as members of the Group of Experts and/or as peer reviewers for the 'Assessment of Assessments' could be submitted by the members of the Ad Hoc Steering Group no later than 1 July 2006 to the lead agencies. Each proposal should be accompanied by a résumé of the experts' experience;

17. ***Requests*** the lead agencies to submit the proposed composition of the Group of Experts to the members of the Ad Hoc Steering Group for approval on 'no objection' grounds;

18. ***Further decides*** that the composition of the Group of Experts of no more than 20 experts will be approved unless written objections are received by the secretariat within 10 working days after the Ad Hoc Steering Group members have received the proposed composition of the Group from the lead agencies.

Annex 7: A user guide for the Global and Regional Assessments of the Marine Environment Database (GRAMED)

GRAMED (www.unep-wcmc.org/GRAMED) aims to provide information about existing key marine assessments operating at a global or regional scale and covering a variety of disciplines.

The searchable database contains information on the activities' background, process and outputs, with links, where possible, to access additional available information and full text. GRAMED aims to include a cross-section of relevant marine assessments and related activities, but this list is not exhaustive. Only a few examples of national-scale assessments have been included to demonstrate that these can also provide useful lessons to the Group of Experts.

Activities that are included in the database are unavoidably biased towards those that produce readily available information and outputs, particularly over the Internet, and this may have resulted in the omission of those that do not produce such information.

Users should be aware of the limitations of this tool; in particular, the complexity of the assessment processes is in many cases difficult to represent using the thematic categories employed here. Similarly, to aid functionality, information relating to geographic coverage has been simplified. For these reasons, the information contained within this database provides a simplified overview of the main features and components of the assessments, and it is recommended that this tool be used as a reference to locate relevant assessments and sources of further information.

Search

The 'search' option allows the user to search for assessments within the database, using the following criteria:

- ❑ Keyword (within the assessment title)
- ❑ Assessment acronym
- ❑ Classification of assessment
- ❑ Geographic scope of assessment.

The search will display any successful results in a list, allowing the user to access each individual assessment by clicking on the hyperlink on the assessment title to view full details of the assessment.

View all records

The 'view all records' option displays all of the record titles (with geographic scope, start date, end date and status) within the live database. This page allows the user to export this full list of assessments into three formats:

- ❑ Microsoft Word
- ❑ Microsoft Excel
- ❑ PDF document.

The user can view each individual assessment in full detail by clicking on the hyperlink on the assessment title.

View records

The 'view records' option allows the user to view an individual assessment by selecting its title from a box at the top of the page.

Once a title has been selected, the page will display the full details of the assessment.

The user can view all other assessments within the same classification by clicking on the hyperlink on the classification text.

Once opened, the record shows general information, including:

- ❑ Full assessment title.
- ❑ Geographic scale, whether regional or global, and specific geographic coverage.
- ❑ Assessment organization, including lead organization and collaborating organization and relevant acronyms.
- ❑ Thematic focus of the assessment.
- ❑ Links to further information including website, reports and contact details.
- ❑ Additional detailed information, accessible by clickable tabs.

Main sections of information available are:

- ❑ *Mission mandate:* the mandate and objective of the assessment.
- ❑ *Synopsis:* a brief summary of the nature and scope of the assessment.
- ❑ *Justification:* a summary of the rationale behind the assessment, and its political, exploratory or management-oriented origins.
- ❑ *Socio-economic aspects:* an indication of whether socio-economic elements are included in the assessment, and links to available further information and/or data.

- *Assessment schedule:* assessment start and end dates, current status, and an indication of periodicity if repeated.
- *Spatial data:* an indication of whether spatial data is produced, and if so, the type.
- *Output, approach and audience:* a summary of the output types produced, methodological approaches and end-user target groups.
- *Outreach activities:* a summary of the types of activities and outputs produced to communicate assessment objectives or outputs to the wider community.

Filter by category

The 'filter by category' option allows the user to view all assessments within the database assigned to each classification. This page allows the user to export this full list of assessments into three formats:

- Microsoft Word
- Microsoft Excel
- PDF document.

The user can view each individual assessment in full detail by clicking on the hyperlink on the assessment title.

Annex 8: Methodology for this survey

Methodology for this survey involved desk-based research and interviews with scientific experts from various marine backgrounds to generate a searchable online Web-based interface of results. Specifically, three activities were carried out during this survey: data collection (Internet search and key informant interviews), database development, and analysis and reporting.

I. DATA COLLECTION

(a) *Internet search:* a preliminary list of assessments was constructed using the 2003 UNEP report. This was expanded using Web-based research undertaken from January to May 2006. Initially emphasis was placed on activities generating spatial data but was later broadened to include all activities considered pertinent to assessment of the marine environment. Information regarding each activity was gathered during this process according to the fields listed below in section (II). The information was refined throughout the process to ensure important components were captured. Wherever possible, gaps within information were filled; where information could not be found, this is identified in the database. National-level activities were not the focus of this study; however a few have been incorporated where they have particular lessons to be drawn.

(b) *Key informant interviews:* phone and email interviews with experts in marine assessments were carried out in the first quarter of 2006. Individuals were identified using three criteria: having an extensive experience of working on the state of the marine environment; having an understanding of key assessments being undertaken; having an understanding of the limitations of different assessment approaches. Twenty key informants (KI) were identified.

The main purpose of KI interviews was to generate an understanding of commonly perceived problems within the marine environment and assessment approaches as well as to identify recommendations to ameliorate these problems. The interviews were based around four questions:

1. What assessments is your organization currently involved in?
2. What other assessments are you aware are being undertaken or have been completed?
3. What are the critical elements that a regular process should incorporate?
4. Which components of assessments need to be evaluated during an assessment of assessments?

Information collected during interviews was incorporated into the overall analysis of the survey.

II. DATABASE DEVELOPMENT

An online searchable database (Global and Regional Assessments of the Marine Environment Database – GRAMED) was developed to present the information gathered on each of the assessments, and is based on the following fields:

1. Title of activity
2. Acronym of activity
3. Principal organization
4. Organization acronym
5. Organization mission statement
6. Other collaborating organizations
7. Methodological approach
8. Output type
9. Incorporation of socio-economic aspects
10. Links to any socio-economic components
11. Spatial data availability; with URL
12. Outreach activities
13. Target group
14. Start date
15. Finish date
16. Status of activity
17. Is it repeated
18. Periodicity
19. Global or regional scale
20. Thematic focus
21. Justification
22. Synopsis
23. Geographic coverage
24. Engagement of experts
25. URL of full text reports/outputs
26. Assessment URL
27. Contact details
28. Funding information
29. Evaluation/lessons learned (with URL if available)
30. Comments

Categorization of activities

Due to the varying definitions of what constitutes a 'true' assessment amongst the scientific community, database entries have been classified into five categories. It is important to note that this process was subjective and established through consultation with the lead agencies and the peer review group. The selected categories include:

Broad assessment (BA)

Assessments measuring multiple parameters of the ecosystem to give an overall picture of health, such as biological, physical and socio-economic data gathering. This is a 'general' assessment, in that it focuses on more than one aspect of the marine environment and may look at some of the linkages between various components.

Narrow assessments (NA)

Assessments narrow in scope that focus on a particular aspect of the marine environment, such as fisheries or climate change. This does not relate to geographic coverage and may cover national, regional and global scales, as in the Reefs at Risk assessment listed in Annex 12. However, it is focusing on only one aspect of the marine environment.

Research programmes (RP)

Research designed to answer a specific question, such as whether populations of marine organisms have declined or increased.

Data holdings/collections (DH)

Focuses on monitoring/measurements and the collation of this data into central holdings.

Indeterminate activity (InD)

Designated to an activity when insufficient information is available for classification.

III. ANALYSIS AND REPORTING

A preliminary analysis on information included in the database was carried out. A list of questions was established for this analysis. The results can be found on the Data Results page (www.unep-wcmc.org/GRAMED). The resources for this survey do not permit an in-depth analysis of all scientific activities, and recommendations for further work through improvement of the database containing these activities can be found in Annex 9.

Annex 9: A proposal for validating GRAMED

The data held in GRAMED has been derived primarily through published information and through Internet research. Through network development and simple online add-ons to the database, it would be possible to not only achieve a mechanism for validating the information contained, but also to change the existing database into a dynamic tool that would consistently deliver up-to-date information to the user. This would result in a long-term sustainable support tool for the Assessment of Assessments and beyond, i.e. for use outside of the Regular Process by decision makers and practitioners at the national, regional and sub-regional levels.

To validate the online database, the following activities are proposed:

1. The creation of an online reporting tool. This could be password protected, with password available on request.
2. Invite the activities currently included in the database to confirm or make comment on the entry for their activity.
3. Development of a quality-control mechanism.
4. Provision for ongoing support for maintenance.

This mechanism would then be available for ongoing updates. The above-mentioned tasks could be taken over by the Regular Process Secretariat or coordinator, or appropriate body, when the decisions for this mechanism are taken.

Annex 10: Parameters within assessments and activities for analysis of scope (thematic focus)

STATUS (and trends)

Aquaculture
Atmosphere/ocean interaction
Bathymetry
Benthos
Biodiversity assessment: total
Biodiversity distribution
Biogeography
Biogeophysics
Deep seas
Ecology
Ecosystem assessment
Ecosystem process
Environmental assessment
Fisheries
Fluxes between water and sediment
Freshwater input: riverine input/aquifer/groundwater
Genetic range
Geology
Geomorphology
Habitat assessments
High seas
Human health
Hydrology
Land-ocean interaction
Marine biogeochemical processes
Microbial biodiversity
Ocean flux
Oceanographic processes
Polar
Seamounts
Sediment mobilization
Small Island Developing States: SIDS
Species
Species range assessments
Temperate
Tropical
Urban studies and coastal town aggregations
Water quality

THREATS (drivers of ecosystem/ environmental change)

Acidification/increase in CO_2
Coastal development
Erosion
Invasive alien species
Land-based sources of pollution
Marine industries/shipping
Marine litter
Marine tourism
Over-exploitation
Pollution by atmospheric deposition
Pollution by heavy metals
Pollution by organic and inorganic chemicals
Pollution by petrochemicals
Pollution by radioactive materials
Red tides

IMPACTS

Biodiversity change
Climate change issues: its consequences and effects on ecosystems
Currents and changes over time
Economics
Ecosystem services
Ecosystem vulnerability
Employment in the marine environment
Environmental change
Food security of coastal communities
Human well-being
Livelihoods
Navigation
Pathology
Resilience
Species adaptation
Value of ecosystem
Vulnerability of coastal communities

RESPONSE MEASURES (as a result of change)

Anthropology
Capacity-building/training
Conservation and management
Cultural studies
Development and use of suitable indicators for the marine environment
Development of Self-Organizing Maps
Enforcement
Historical ecological assessment
Impact mitigation
Integrated Coastal Zone Management
Interchange and feedback between global, regional and local scales
Legal measures/advances with respect to the marine environment
Marine protected areas
Marine resource management tools and approaches: e.g. quotas, spatial closures and so on, on biomass and ecosystem integrity
Methods that recognize shifting baseline challenges
Modelling methodologie
Policy and governance
Poverty assessment
Sociology
Strategic planning and coordination
Streamlining of all marine assessments under an umbrella coordinating mechanism
Sustainable use
Trade of marine organisms

Annex 11: Carving up the oceans – biogeographical classification schemes for the marine biome

Presently, none of the ways devised to classify the marine environment and create assessment units have been universally accepted. This has proven to be a challenge for many assessment processes. Each of the approaches (Table A11.1) has its limitations and inherent biases. In general, most ecosystem or habitat classification schemes have focused on benthic systems, and the definition and differentiation of pelagic habitats remain unclear. By contrast, the differentiation of global biogeographic patterns has focused much more closely on pelagic patterns.

Challenges and limitations to many of the commonly used approaches include the following:

- Some marine organisms will remain outside the lines of these classification schemes for their entire life histories, while others will move across divisions at different stages of life or seasons and may seem to disappear from the scope of a given assessment.
- Ocean processes do not recognize the boundaries set out by these assessments.
- The vast area and great depth of the oceans means it is difficult to obtain comprehensive or representative datasets.
- Data is based on sampling only a fraction of a highly dynamic multidimensional system.
- Structural habitats, such as kelp forests, coral reefs, seagrasses and mangroves, represent only a fraction of the marine environment. Approaches that classify by dominant vegetation type, popular in the terrestrial environment, are thus limited.
- Coastal and shelf habitats form complex arrangements of extremely different systems in a patchy, interlocking framework, while open oceanic systems are often assumed to be vast and homogenous.
- The sea is a three-dimensional living space with stratification of zones by depth, adding to the complexity of defining biogeographic units.
- 'Fuzzy boundaries' or no fixed line in the oceans, as the fluid medium allows rapid and continual movement of both biota and abiotic conditions.
- Mapping limitations: mapping of habitats is still scant in the marine environment. At fine resolutions benthic habitat maps are only available for a few small areas of shallow waters.
- Synergies in disparate fields of study: for the above reasons, it is useful to combine studies of geography, ecosystems (processes) and their biological components. Traditionally this integration has not happened as often as it may need to.

Consideration of some of the approaches to classifying ocean regions employed by global assessments also helps to identify thematic and geographic gaps in existing assessments. It is clear that the Exclusive Economic Zone forms an arbitrary and human-imposed cut-off point for many assessments. This poses two questions:

1. Will such a cut-off based on political boundaries, rather than the parameters of natural oceanographic processes, provide us with the best possible information to offer to decision makers?
2. What is the status of biodiversity (beyond fisheries) in the high seas – both in the water column and on the deep-sea floor?

Research into Self-Organizing Maps (SOMs) provides a methodology that may be able to contribute to the definition of assessment units of the marine environment, described by process boundaries rather than political boundaries.

SELF-ORGANIZING MAPS

Self-Organizing Maps (www.ucl.ac.uk/oncology/MicroCore/HTML_resource/SOM_Intro.htm) are a product of recent developments in Artificial Neural Networks (ANNs, www.ucl.ac.uk/oncology/MicroCore/HTML_resource/N_Net_Intro.htm) (Eberhart and Dobbins 1990). They use adaptive algorithms to categorize input data into output classes, and can be applied to tasks such as pattern recognition and process monitoring.

Conventional analytical methods, such as simple statistical methods, are useful in summarizing low-dimensional datasets, but are less effective in visualizing multidimensional or multivariate data and often fail to establish linkages between observed environmental effects and their precise cause, limiting abilities to accurately predict natural system behaviour (Thrush et al. 1995; US EPA/NASA 2002; Sanchez-Martos et al. 2002; Aquilera et al. 2001). ANNs classify data more accurately than traditional statistical classifiers (Dalmotova et al. 1997; Kocjanic and Zupan 1997), addressing these

shortcomings and meeting the call for improved multidisciplinary techniques and tools to assess and model ecosystem interactions at different scales and levels using a systems approach (Osenberg and Schmidt 1996; Stewart-Oaten 1996; Vant 1999; Interim Millennium Assessment Secretariat 2001; National Center for Environmental Research Office of Research and Development 2001; Harris 2002; Soule and Kleppel 1988; Buckeridge 1994; Hammond et al. 1995; Ravetz 2000; Gustavsson 2001; Harris 2002).

The potential advantages of applying SOMs to assessments of the marine environment include their capability to:

- ❑ Visualize multidimensional data using low dimensional displays.
- ❑ Conserve all input information with no loss of relevant data.
- ❑ Study cross-scale interactions by performing integrated analyses of dissimilar datasets with inconsistent labelling.
- ❑ Organize data on the basis of similarity by putting entities geometrically close to each other.
- ❑ Identify the links between causal processes and their environmental effects in the form of patterns and structures.
- ❑ Predict unknown data points based on model outputs.

The SOM approach is of particular interest in systems that have a complex interplay of processes, both natural and anthropogenic, contributing to the observed ecosystem status, and therefore lends itself to analyses of complex marine and coastal systems. It is recommended as an early system for environmental managers requiring rapid methods for evaluating ecological status in order to speed up the decision-making process.

The range of advantages of SOMs over conventional analysis techniques make them an exciting emerging tool for assessment and management of the marine environment, particularly for the identification and division of the oceans into functional units for management purposes. SOMs provide the capability for rapid identification of regions of similarity, using algorithms to identify repeating patterns, and for addressing some of the current shortfalls of current subjective classifications of functional units along often ecologically arbitrary boundaries.

FURTHER INFORMATION ON SPECIFIC TOPICS

www.ucl.ac.uk/oncology/MicroCore/HTML_resource/SOM_Intro.htm

www.ucl.ac.uk/oncology/MicroCore/HTML_resource/N_Net_Intro.htm

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Table A11.1: Select examples of current approaches to classification of the oceans

APPROACH	AREA COVERED	COMMENTS	FURTHER INFORMATION
Global International Water Assessment (GIWA)	Consists of 66 international marine, coastal, fresh and surface waters as well as groundwater in nine major regions. Many of these regions fall within 200 nautical miles of the coastline.	❑ Forty-six of these international waters are in fact LMEs. ❑ Ecological status of these water areas and the causes of environmental problems of the regions are analysed.	www.giwa.net
Large Marine Ecosystems (LMEs)	Large Marine Ecosystems are regions of ocean space encompassing coastal areas from river basins and estuaries to the seaward boundaries of continental shelves and the outer margins of the major current systems. LMEs are approximately 200 000 km^2 in area. There are large areas of open ocean which are not incorporated in the LMEs.	❑ Focus on management of marine resources. ❑ Characteristics: relatively large, distinct bathymetry, hydrography, productivity, trophically dependent populations. ❑ Attempt to incorporate areas that are at least partly self-sustaining and ecologically integral. ❑ Not all coastal zones are covered by LMEs: the southern edge of Australia and most of the world's oceanic island regions (South Pacific) are examples of this.	www.edc.uri.edu/lme
Millennium Ecosystem Assessment (MA)	The ocean was classified according to 'biomes' of polar, westerlies, trade winds and coastal boundary, and these biomes were subdivided into biogeographical provinces. This included high seas.	❑ The ocean or 'marine and coastal realm' was divided up into two major sets of systems: 'marine fisheries systems' and 'inshore coastal systems and coastal communities'. ❑ Only fisheries were assessed in the marine (incorporating high seas) component of the MA.	www.maweb.org

Global Marine Assessments

APPROACH	AREA COVERED	COMMENTS	FURTHER INFORMATION
FAO	Nested within larger regions such as the Indian, Pacific, and Atlantic Oceans but also in Global and Trans-Ocean and Inland Regions. This approach encompasses the high seas.	❑ Regional Fishery Bodies (RFBs) directly establish management measures, and provide members with scientific information and management advice. ❑ High variability in functioning of RFBs; focus on fisheries.	www.fao.org/fi/body/rfb/index.htm
UNEP Regional Seas Programme	Covers 18 regions of the world, yet stops at 200 nautical miles, and thus does not encompass the majority of the high seas. (The Southeast Pacific, Pacific, Mediterranean, and Northeast Atlantic do cover high seas to a certain extent.)	❑ Mandate is clearly action-oriented, focusing on both mitigating environmental destruction and analyses of its causes.	www.unep.org/regionalseas
Marine Ecoregions	Forty-three marine ecoregions, some of which are nested within Large Marine Ecosystems.	❑ Stresses habitat representation embedded within regional conservation strategies while emphasizing the maintenance of marine biodiversity. ❑ Probably more closely allied to LMEs, but their aim is more focused towards conservation and priority-setting. ❑ Present system is not global in coverage.	www.worldwildlife.org/science/ecoregions/biomes.cfm

Annex 12: Summary list of broad and narrow assessments

BROAD ASSESSMENTS (BA) n=13

African Environment Outlook
African Process for the Development and Protection of the Marine and Coastal Environment
Development and Protection of the Coastal and Marine Environment in Sub-Saharan Africa (Nigeria)
European Lifestyles Marine Ecosystems
Europe's Environment
Global Environment Outlook Report Series
Global International Waters Assessment
Millennium Ecosystem Assessment: Conditions and Trends, Scenarios and Responses
National Coastal Conditions Report (USA)
North Sea Quality Status Report
State of the Environment (AUS)
Trilateral Monitoring and Assessment Programme (Wadden Sea)
Wadden Sea Quality Status Report

NARROW ASSESSMENTS (NA) n=36

Asian Freshwater and Coastal Cetacean Program
Assessment of Coastal Fish in the Baltic Sea
Assessment of Oil and Gas Activities in the Arctic
BALTEX Assessment of Climate Change for the Baltic Sea Basin – Phase 2
CenSeam
Climate and Crysosphere Project
GloBallast
Global Marine Species Assessment
High Sea Ecosystem Protection Project
History of Marine Animal Populations
ICCAT monitoring reports
Indian Ocean Tuna Commission Monitoring Program
International Bottom Trawl Survey
International Pacific Halibut Commission monitoring programme
Ireland Quality Status Report (IRE)
Mapping of Fish and Shellfish Diseases
Marine Environmental Monitoring Network
Mediterranean Mussel Watch Program
NAFO statistical catch data
NASCO database and assessment activities
NEAFC assessment activities
Oceanic Fisheries Programme
Pew Global Shark Assessment
Reefs at Risk
Regional Marine Turtle Programme
Resource stock assessments
River Basins Impact on Coastal System Functionings
Scientific assessment of ozone depletion
Sea turtle population/mortality monitoring
Southern Ocean Whale and Ecosystem Research Programme
State of the World Fisheries and Aquaculture
Status of Coral Reefs of the World
Stock Assessment Process
World Atlas of Coral Reefs
World Atlas of Mangroves
World Atlas of Seagrasses

Annex 13: PEARL – Prototype Environmental Assessment and Reporting Landscape

It is the objective of PEARL to provide governments and the international community with a comprehensive overview, from a thematic and geographic perspective, of the various environmental assessments completed or being undertaken globally. It serves as a tool to provide timely, relevant, reliable and targeted information on what is being done by various institutions to keep the global environment under continuous review.

Since 1972, UNEP has been mandated by UN General Assembly Resolution 2997 (XXVII) to review the world environmental situation. Due to the increasing complexity of environmental degradation which now requires an enhanced capacity for scientific assessment, monitoring and early warning, UNEP's Governing Council/Global Ministerial Environment Forum (GC/GMEF) initiated a consultative process to identify gaps and needs in the current assessment structure, and the means to address them. This led to the establishment of the Science Initiative (see http://science.unep.org), a multi-stakeholder consultative process that led into the development of PEARL (http://hq.unep.org/pearl/About/About_05.aspx), as it requested UNEP to 'map the assessment landscape'.

'Mapping of the assessment landscape' entails a thorough examination of framework assessment processes, sub-processes, individual assessments and their published outputs. The Global International Waters Assessment (GIWA) provides us with an illustration as to how PEARL works. It is a framework assessment process that was designed in a top-down manner with 66 sub-processes covering all water-related regions of the world. The conceptual framework used in PEARL is shown in Table A13.1 and can be described as follows: a lead institution(s) is responsible for managing an overall assessment process, which may comprise one or more sub-processes under which individual assessments are carried out, ultimately producing outputs such as assessment reports, data compendia or technical reports. Four different metadata forms are used to capture essential data with respect to the assessment process, sub-process, individual assessment and published outputs. These forms are compliant with the Dublin Core metadata standard.

Table A13.1: Conceptual framework used in PEARL

Lead institution	Assessment process	Sub-process	Individual assessment	Published outputs
UNEP	GIWA Process	Arctic Sub-process	Arctic Assessment	Arctic Climate Change Arctic Pollution Issues

Global Marine Assessments:

A survey of global and regional assessments and related activities of the marine environment

In 2003, UNEP and the Intergovernmental Oceanographic Commission (IOC) of UNESCO published *A survey of global and regional marine environmental assessments and related scientific activities* in response to the call of the UN General Assembly (Resolution 57/141) and the Heads of States and Governments at the World Summit on Sustainable Development to establish a regular process for the global reporting and assessment of the state of the marine environment. Today, the urgency to understand the state and functioning of our oceans is greater than ever. In December 2006, the 61st session of the United Nations General Assembly adopted a new resolution (A/RES/61/222) on Oceans and the Law of the Sea, renewing the commitment of Member States to support the implementation of the start-up phase: the Assessment of Assessments of the Regular Process.

This sequel builds on the 2003 survey to provide a starting point for the Assessment of Assessments. It lays out the components of an effective assessment, key considerations for establishing an assessment process, the findings of this latest survey and an analysis of gaps and emerging issues. It also draws lessons from completed assessment processes.

The report is supported by an interactive online database tool, which enables the user to search through assessments and activities relating to the marine environment, providing information on the activities and their implementation.

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UNEP-WCMC Biodiversity Series No 27

ISBN: 978-92-807-2800-2

February 2007 DEW/0925/NA