

The Millennium Ecosystem Assessment – Marine and Coastal Aspects

Introduction

The Millennium Ecosystem Assessment (MA) is an international initiative attempting to assess the state of the world's ecosystems in the context of human well-being. The MA is modeled on the IPCC in that it is a consensus statement on the state of ecosystems that is peer-reviewed by a range of experts.

The goal of the Millennium Ecosystem Assessment (MA) is to establish the scientific basis for actions needed to enhance the contribution of ecosystems to human well-being without undermining their long-term productivity.

Where possible the connection between the goods and services that ecosystems provide to human well-being and the trade-offs that are made to the ecosystems in providing those goods and services are also explored where possible. Four scenarios regarding the future are investigated as part of the MA and the responses that are available to decision makers are also discussed. Complementing the MA is a series Sub-global Assessments conducted at various spatial scales throughout the world.

The conceptual framework for the MA places human well-being as the central focus for assessment while recognizing that biodiversity and ecosystems also have intrinsic value and that people take decisions concerning ecosystems based on considerations of both well-being and intrinsic value.

The MA will produce four major volumes in addition to the Conceptual Framework, which describes the MA process and concepts. The volumes are:

- **Conditions and Trends** – highlights the current state of ecosystems and the links to human well-being. The time frame for this volume is a modern historical perspective and then a short-term projection into the future (10 years or less). The volume also provides some scope for interventions but more detailed descriptions etc. are found in the Responses Volume. [Note the C&T volume does not have a strong climate change component because a decision was made to not repeat IPCC reporting, but to use it where appropriate in the various chapters]
- **Scenarios** – this volume describes the four scenarios that were developed as part of the MA. There are two components: the narratives (qualitative) that give a detailed description of how various ecosystems or parts of ecosystems may behave in the future given the general parameters of the four narratives; and models (quantitative) global models of population changes, land-use, water, fresh-water fish and food-demand were used to compliment the scenarios. Most of these models are not ecosystem based and therefore limited in terms of describing how ecosystem services (e.g. biodiversity) will change in the various scenarios.
- **Responses** – this volume describes a range of response or interventions that can be taken to manage ecosystems. The purpose of this volume is not to recommend one response option over another but to highlight the differences between responses.

- **Sub-global Assessments** – the various assessments will provide more detailed descriptions of the condition and trends for the particular area studies, as well as describe the scenarios in a more localized geographic context and describe the most appropriate response options for the case study.

In addition to these four major volumes there will be various Synthesis Reports including one for decision makers as well as one for each of the conventions that are partners in the MA: Convention on Biodiversity, Desertification, RAMSAR and Migratory Species are partners in the MA

Marine and Coastal in the MA

The addition of marine and coastal ecosystems was a late addition to the MA and therefore it has been a case of “catch-up” and “fitting-in” since then. While there has been considerable support for the inclusion of things marine and coastal the overall dominance of “terrestrial” issues and expertise has been daunting at times.

1. Condition and Trends

There are two chapters with the titles Coastal and Marine, which are the major sources of information. Marine and coastal issues are also found in other chapters such as food, cultivated systems (aquaculture), nutrient cycling (climate change and marine systems), health and biodiversity.

Once the decision was made to include marine and coastal systems the issue was how to divide the two and the decision was made to use the 50m bathymetric contour seaward to separate the two systems for reporting purposes. The decision was based on the notion that with this boundary it would encompass the major coastal habitats (e.g. coral reefs, estuaries, kelp forests, mangroves etc.) and that the focus of that chapter would be primarily on the coastal habitats. The marine chapter would try to examine the area seaward of the 50m line as well as focus on fisheries. The division of the two systems was revisited during a marine-cross-cut meeting and again the consensus was to use this division. This division has caused much angst amongst reviewers of the two chapters – with no consistency how the chapters should have been divided!

Coastal Main Messages

- Coastal ecosystems are important to human well-being but rarely is this value considered in decision-making.
- Coastal ecosystems are not improving; most are continuing to degrade while there are small pockets of success.
- The pressure for coastal ecosystems to provide a range of goods and services is expected to continue to increase for the foreseeable future.
- There are policy options currently available to halt degradation but they are rarely implemented because of the trade-offs to human well being (e.g. jobs and housing) made for difficult choices.

Marine Main Messages

- All the oceans are impacted by humans and fishing is the most widespread

- Other activities such as oil spills, depletions of marine mammals and seabirds, and ocean dumping are also impacting at local and regional scales
- Fleets are going further offshore and deeper so that long-lived stocks are at risk

Food and Cultivated Systems

Discusses the role of aquaculture as a source of protein and its potential impact on small pelagic stocks as well as on impoverished coastal communities that rely on these fish as a source of protein.

The role of small pelagics in as feed for chickens and pigs is briefly discussed as well.

Biodiversity

There is limited coverage of marine and coastal biodiversity in this chapter. Overall, compared to terrestrial systems there is a paucity of information on marine and coastal biodiversity.

2. Scenarios

The MA scenarios address the consequences of different plausible futures to the year 2050. Four futures explore a wide range of contexts under which sustainable development will be pursued, as well as a wide range of approaches to sustainable development.

With respect to context, two basic futures, increasingly globalized and increasingly regionalized are investigated. In terms of approaches futures that emphasize economic growth and promotion of public goods, and futures that emphasize proactive management of ecosystems, including wetlands, and their services are explored.

The four scenarios are Global Orchestration (globalized with emphasis on economic growth and public goods), Order from Strength (regionalized with emphasis on national security and economic growth), Adapting Mosaic (regionalized with emphasis on local adaptation and flexible governance), and TechnoGarden (globalized with emphasis on green technology). The focus on alternative approaches to sustaining ecosystem services distinguishes the MA scenarios from previous global scenario exercises. The approaches were developed based on interviews with leaders in non-governmental organizations, governments and business, the literature, and policy documents addressing linkages between ecosystem change and human well-being.

Marine and coastal was included through narratives on marine fisheries, aquaculture and coastal ecosystems, and through three regional ecosystem models (Gulf of Thailand, North Benguella and North East Pacific) based on Ecopath with Ecosim.

For each scenario a set of narratives covering inshore (developing and developed world), offshore (high seas) and aquaculture (coastal) were described based on a series of drivers. The drivers being globalization, consumption, property rights, technological advances. Similarly for the major coastal ecosystems (coral reefs, estuaries, seagrass, kelp) based on climate change, water schemes, invasive species and land-use change.

The drivers identified in the narratives for the marine (fisheries) systems were modeled using Ecopath with Ecosim and changes in landings, the value of landings and changes in the diversity of the landings were examined.

3. Responses

Most of the material that is of use to decision makers associated with marine and coastal management or fisheries management is contained in just a few chapters, namely Chapter 5 (5.2.7.8 Approaches to Sustainable Fisheries) and Chapter 15 (15.6.3 Integrated Coastal Management). Chapter 9 has a single paragraph on reducing coastal nitrogen pollution through ponds. Overall responses to marine and coastal issues is very limited – responses such as ocean policy at both the national and international level to tackle issues such as marine oil and debris are lacking amongst others that are highlighted in the C&T volume as well as from reviewers in round 2.

4. Sub-Global Assessments

There are two sub-global assessments with a significant coastal component – the Central Coast of British Columbia and the Caribbean. There is a fairly good database of information for this area of British Columbia and it has been the subject of a coastal management plan over the last couple of years.

The Caribbean assessment has been a major exercise in bringing together experts from the various countries in the area. However, it has been successful in bringing together various bits of information so that its value can be optimized. The results are still in preliminary and not available.

5. Synthesis

The MA synthesis for the RAMSAR Convention includes coastal ecosystems – it is still in the initial draft stages but I anticipate it will have a stronger response section for these habitats than what is covered in the responses volume.