UNITED
NATIONS

EP

United Nations
Environment
Programme

UNEP (DEPI)/RS.13 /WP.6.RS
Original: ENGLISH

13th Global Meeting of the Regional Seas
Conventions and Action Plans
Busan, Korea, 3 – 5 October 2011

Development of an Integrated Assessment for the Regular Process

WORKSHOPS IN SUPPORT OF THE REGULAR PROCESS

Development of an Integrated Assessment

1. Title

The UN General Assembly has decided that the main output of the first cycle of the Regular Process for Global Reporting and Assessment of the Marine Environment should be an **integrated** assessment of the world's oceans and seas. The purpose of this session is to help us all to start thinking in greater depth about what an integrated assessment is, and how we can achieve an integrated assessment.

This is a task where no-one yet has the answers. The purpose of this session is to start building the capacities on all our parts to achieve such an integrated assessment. Some of this presentation may seem to some – or, indeed, to many – here as too simplistic, but we need to start from first principles to make sure that we have a workable method of integration.

The thoughts expressed here are not the agreed views of the Group of Experts of the Regular Process - we have not yet had the opportunity to discuss these issues in depth. They are simply some views to get discussion moving.

2. Organisation of the session

We suggest that we spend our time in the following way:

(a) Presentation on the issues of integrated assessment;

(b) Lists of questions for discussion. After each set of questions for discussion are identified, there should be time for questions about the logic of the proposed sets of questions;

(c) Discussion in groups;

(d) Report-back and conclusions.

Let us start by reviewing the three broad fields that we need to bring together.

3. Integrated assessment of ocean processes

There are a number of fundamental processes which are basic to an integrated assessment: the ocean's role in the hydrological cycle, sea/air interactions, primary production, ocean carbonate production and so on.

4. Integrated assessment of human activities

Then there are the human activities that we have to address in carrying out an integrated assessment. This slide is of the port of Valparaiso, Chile, and reminds us of some of the most significant human impacts on the marine environment – fishing, shipping, land-based inputs, coastal development and so on.

5. Integrated assessment of habitats and biological diversity

At the same time, this slide of a coral reef alongside a whale attacking a seal reminds us of the sheer complexity of marine ecosystems and the many trophic levels that we need to bear in mind, from phytoplankton through benthos and fish to the top predators.

6. Putting this together

Originally, the Group of Experts thought that it would be possible to use any one of these three fields as a basis for structuring an integrated assessment. As the Group of Experts of the Regular Process tried to develop the Possible Outline, however, they concluded that it was desirable to use all three, because otherwise some issues were split between too many aspects – for example, – if "habitats" were used as the structural base, land-based inputs affect a wide range of habitats, and it would be difficult to bring together an overview of the total effects of land-based inputs.

The current version of the Possible Outline – on which the General Assembly Ad Hoc Working Group and the Group of Experts of the Regular Process has asked workshops to comment – puts these areas together by dividing the assessment into three main sections:

(a) Part III – Ocean Processes (also called Ecosystem Processes);

The chapters would assess the status of the Ocean Processes listed in the Possible Outline;

(b) Part V – Human Activities

The chapters would assess the impacts from the Human Activities listed in the Possible Outline;

(c) Part VI – Marine Biological Diversity & Habitats

The chapters would assess how far assessments have been made of the state of biodiversity, and then look at the species and habitats that have been identified as needing special attention.

Integrating these three aspects is proposed to be done in two stages:

(d) Part IV will bring together the issues on the cross-cutting theme of Food Security & Safety

(e) Part VII will seek make an overall integration of the various assessments

7. Dimensions of integration

Following the UN General Assembly's remit for the Regular Process, we have to assess the marine environment, including socio-economic aspects. Each of the three main fields – ocean processes, human activities and habitats and biodiversity – therefore needs to be assessed under three dimensions:

(a) environmental;

(b) economic;

(c) social.

8. Basic assessment matrix

We thus have a basic assessment matrix, with three aspects (ocean processes, impacts of human activities, habitats and biodiversity) each with three dimensions (environmental, economic and social). Each of the cells of this matrix can be expanded, and many will probably each form multi-dimensional matrixes in themselves. But this gives a basic structure.

9. First question for discussion

Is this structure, with a description of each of the cells of the basic assessment matrix, with summaries of what can be drawn from each row and each column a workable foundation for the work of the Regular Process?

Now let us look at each of these dimensions in turn.

10. Integrating environmental assessment

Within the environmental dimension of the marine environment, there are multiple interactive elements – geological environment (rocks, sediments,…), the water column (including its composition, structure and movements) and the biota (with all the different trophic levels).

Can we measure whether we have overall a healthy and sustainable marine environment?

11. The *Allium* analogy

Every marine ecosystem is subject to natural variability. The best that we can hope to do is to identify an envelope which we can be reasonably certain contains all the states of all the aspects of the ecosystem that are consistent with it being regarded as healthy and sustainable.

The seed-head of the genus *Allium* (onions) gives us an analogy for defining such an envelope. Each of the radiating seed-stems (pedicels, to give them their correct name) can be seen as a vector that we need to measure to define the envelope.

12. DPSIR

The agreed approach to the Regular Process says that we should use the analytical approach of DPSIR:

(a) Drivers – the underlying forces that drive change in the environment. Here we have a clear link between environmental aspects, on the one hand, and social and economic aspects, on the other;

(b) Pressures – the channels through which these forces affect the environment;

(c) States – the resulting states of the environment;

(d) Impacts – the resulting impacts of these pressures and states on biological diversity and human well-being. Here again there is a clear link between environmental aspects, on the one hand, and social and economic aspects, on the other;

(e) Responses – the ways that society has responded and the results of those responses – though it is clear that we must NOT get into discussions of policy.

13. Measuring the vectors

Within the environmental dimension, measuring the vectors is the normal work of marine science. All five of the elements of DPSIR need to be examined – though there will be scope for discussion about the allocation of aspects between the different DPSIR elements.

We look at:

(a) Physical elements (Oceanography – geology, currents, sedimentation…..)

(b) Chemical elements (Water quality – salinity, nutrients, contaminants…..)

(c) Biological elements (Numbers, health and reproductive success of the various species…..)

And, in all cases, the ways in which they are changing under the impact of human activities

14. Range of vectors

Within each of these broad divisions, there is a wide range of vectors (elements) that can be measured?

For example, for the biological elements, there are at least nine different trophic levels to be considered:

(a) Phytoplankton

(b) Zooplankton

(c) Macrophytes (eg - large seaweeds)

(d) Crustacea and molluscs

(e) Other benthic species

(f) Fish

(g) Marine Reptiles

(h) Sea Birds

(i) Marine Mammals

15. Selecting what information to use

There is interesting science to be done in measuring all these aspects of the marine environment. But if we try to incorporate all the information, we shall drown under the waves of information. We need to select the crucial information.

What can we identify as crucial?

(a) The miner's canary – coal miners used to take small birds (canaries) underground with them, since the birds were more susceptible to methane than men. In other words, can we identify species that are good predictors of problems? For example, the susceptibility of the dog whelk (*Nucella lapillus*) to tributyl tin in anti-fouling paints for ships is a good example. Imposex results from TBT concentrations originally too low to be identified by chemical analysis.

(b) Keystone species – species that have a specific role in maintaining the balance of an ecosystem. For example, sea otters, which prevent sea-urchins undermining kelp forests;

(c) Predominant species – species which form a significant part of the biomass of an ecosystem, so that a change in their status would have a massive effect on the ecosystem;

(d) Economically significant species – species which are particularly important to the human economy, and where a change in status would have significant economic effects;

(e) Water-quality boundary conditions – above (or below) certain thresholds, changes in water quality will have significant effects on ecosystems. For example, elevated levels of nitrates can lead to eutrophication, and other changes (such as in balances of nutrients or in turbidity or insolation) can equally result in unwelcome changes in algal patterns

(f) Changes in sedimentary patterns – that can affect turbidity, the conditions for benthic life and the distribution of nutrients.

16 Linkages (1)

Another set of measures are those which link different elements of the environment. Some of these can bring together a wide range of factors in a single measurement, Many of these will relate to top predators. Some examples relevant to the North Sea:

(a) grey seal (*Halichoerus grypus*) populations: grey seals gather in colonies to give birth. Aerial surveillance allows the populations to be counted fairly easily. Maintenance of the breeding stock is a measure of the health of the population as a whole. Because of annual variations caused by the variety of factors involved, the data need to be evaluated as a running average over a short (5-year) period. The same approach is not, however, valid for other seal species (such as harbour seals);

(b) sea-bird populations: some populations of sea-birds nest in colonies that allow estimates of populations. As for grey seals, these population estimates can bring together reproductive success, food availability, pollution effects and human disturbance.

17. Linkages (2)

Further measures can link the status of natural populations to specific impacts of human activities. For example:

(a) analysis of samples of sea-bird eggs for mercury and/or organochlorine compounds. Over time, this can provide an indicator of trends in the discharges of pollutants;

(b) counts of the proportion of dead sea-birds (such as guillemots (*Uria aalge*)) found with oil contamination on shore-lines. Over time, this can provide an indicator of the levels of chronic oil pollution from shipping and offshore oil and gas installations;

(c) satellite surveillance of chlorophyll *a* concentrations in surface sea water.