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Development of an Integrated Assessment for the Regular Process

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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. This can give an indicator of the extent to which excessive levels of nutrients are present.

18. Second set of questions for discussion

(a) What are the most important aspects to be studied in this region? Are we measuring them? Are we reporting and analysing the measurements?

(b) Can measurements in this region be identified that will allow integrated assessment of environmental status?

(c) Can measurements in this region be identified that will allow assessment of linkages between environmental status and the impacts of specific human activities.

19. Integrating economic assessment

There are five main fields that need to be assessed from an economic point of view – the star-fish analogy. Each of the rows in the basic matrix needs to be evaluated in relation to each of these fields. In some cases the evaluation will simply result in a conclusion that it is not relevant. But in others, further, more detailed analysis will be needed.

The five fields are:

(a) Demand and supply;

(b) Inputs and outputs;

(c) Externalities;

(d) Distribution of benefits;

(e) Capital constraints.

20. Demand and supply

Levels of human activities in the marine environment will be affected by demand and supply of goods and services from other sources – particularly provisioning services (food, minerals, transport….). These will be affected by the costs of competing sources of supply and the costs of providing the service.

For example, the level of supply of sea-dredged aggregates will be affected by:

(a) the relative availability of aggregates on land and in the sea;

(b) the relative costs of winning the different sort of aggregates;

(c) regulatory constraints on the different sources of aggregates (in economic terms, another form of cost).

We therefore need to know about the pressures on costs of competing goods and services in order to understand the pressures on the marine environment.

21. Inputs and outputs

The level of many outputs from the oceans will depend on the availability of some of the necessary inputs. For example,

(a) trained manpower;

(b) necessary equipment;

(c) knowledge of how to operate;

(d) knowledge of the state of the oceans.

An understanding of the way in which the state of the marine environment is likely to develop will need to take into account the extent to which the necessary inputs are available.

22. Externalities

The taking of many benefits from the oceans involves both ***internal*** and ***external*** costs.

Internal costs are those carried by the people who receive the benefits.

External costs are those which are suffered by everyone else – damage to the state of the marine environment, loss of amenities….

Since the adoption of AGENDA 21, there has been a commitment to ***internalise*** all costs.

Assessment of all aspects of human activity needs to consider to what extent there are ***external costs.***

23. Distribution of benefits

Where economic benefits are taken from the oceans, those benefits will accrue to different groups of people to different extents.

Within national jurisdictions, do the economic benefits accrue to people or companies in the national private sector, to national public bodies or to foreign persons or companies?

In areas beyond national jurisdiction, do the economic benefits accrue to the private sector or to public bodies? Within the private sector, to nationals of which States do the benefits accrue? And among public bodies, which States obtain economic benefits?

24. Capital constraints.

Extracting economic benefits from the marine environment usually requires capital equipment (ships, navigation installations, offshore installations, aquaculture pens,….).

Are there constraints on obtaining the maximum sustainable benefits from lacks of capital equipment?

25. Third set of questions for discussion

What information is collected and/or available in this region on the economic benefits derived from the marine environment?

Does it allow the five aspects to be analysed?

Are there other economic aspects that are relevant?

26. Integrating social assessment

There are two aspects of society to be considered:

(a) Social groups whose lives are directly connected to the marine environment (seafarers, fishers, offshore oil and gas workers,….). These can be seen as the human component of the marine environment;

(b) Society in general.

There are at least three main social aspects to be considered:

(a) Health;

(b) Income levels and income distribution (which relates back to economic aspects);

(c) Other aspects of well-being (relaxation, aesthetic enjoyment, happiness….)

27. Health

Relevant statistics on health could include

(a) Life expectancy of those in marine work;

(b) Injury rates of those in marine work;

(c) Distribution and impact of marine-related illnesses (especially illnesses related to contaminated food or sea-water).

28. Income of marine workers

Relevant statistics on income of marine workers could include:

(a) Levels in different parts of the world;

(b) Relative levels of pay for marine work compared with pay for other work within the region.

29 Fourth set of questions for discussion

What information is collected and/or available in this region on social aspects of the marine environment?

Does it allow health, incomes and other aspects to be analysed?

Are there other social aspects that are relevant?

30. Groups of questions for discussion

To summarise the main issues to be developed:

1. Is the basic matrix workable?

2. What are the most important environmental aspects to be studied in this region?

3. How can we analyse the economic benefits derived in this region from the marine environment?

4. In this region, how can we analyse the health, income and general well-being of marine workers, and the social impacts of the marine environment on society in general?

31. Envoi

This dish was made in southern Italy around 2,500 years ago. It shows that the ancient Greeks were as interested in a healthy and sustainable marine environment as we are. The First Global Integrated Marine Assessment can help ensure that a healthy and sustainable marine environment will still be around in another 2,500 years. Let us makes sure that it does.