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**PROPOSAL FOR A MANUAL ON THE ECOSYSTEM APPROACH FOR THE
REGIONAL SEAS**

An Outline

For reasons of economy, this document is printed in a limited number. Delegates are kindly requested to bring their copies to meetings and not to request additional copies

A Manual on the application of the ecosystem approach in the Regional Seas has been commissioned by the UNEP Regional Seas Programme and WCMC to Mr. Alan Simcock. The present document is a draft outline of the manual, prepared by Mr. Simcock.

Proposal for a Manual on the Ecosystem Approach for the Regional Seas

This note sets out a proposal for a manual to help the Regional Seas Conventions and Action Plans follow up the commitments of the 2002 Johannesburg World Sustainable Development Summit to “encourage the application by 2010 of the ecosystem approach” to the management of human activities that may affect the oceans. The meeting is asked to consider whether such a manual would be helpful, whether the attached initial sketch covers the right issues, and how the regional seas organisations might help with its development.

1. The 2002 Plan of Implementation of the World Summit on Sustainable Development (the Johannesburg Implementation Plan) gave prominence, in its section on the oceans and seas, to a commitment to “[e]ncourage the application by 2010 of the ecosystem approach, noting the Reykjavik Declaration on Responsible Fisheries in the Marine Ecosystem and decision V/6 of the Conference of Parties to the Convention on Biological Diversity”.
2. The Johannesburg Implementation Plan went on to make a commitment to “[s]trengthen regional cooperation and coordination between the relevant regional organizations and programmes, the regional seas programmes of the United Nations Environment Programme, regional fisheries management organizations and other regional science, health and development organizations”.
3. Urgent consideration is needed of how the combined intentions of these two sets of commitments can be achieved at the regional level.
4. This implementation at regional level also needs to be linked to the implementation of the parallel commitment to “[p]romote integrated, multidisciplinary and multisectoral coastal and ocean management at the national level and encourage and assist coastal States in developing ocean policies and mechanisms on integrated coastal management”.
5. The ecosystem approach does not imply any novel regulatory measures or any new departures in management techniques. Rather, it is concerned with the inter-relationships between the many existing régimes which cover human activities that may affect the sea. It implies a systematic effort to ensure that these inter-relationships are considered in such a way that what is maximised is total ecosystem health and sustainability, not merely the aims of a single sector of human activities or interests.
6. The ecosystem approach will therefore require the regional seas organisations and the other regional bodies to adopt a systematic method to review their regulatory activities to ensure that their separate activities at the regional level, taken all together and considered alongside the regulatory activities of the various States in the region, constitute the ecosystem approach, without any gaps and without any contradictions.
7. It seems that a framework setting out the issues that need to be addressed, and a set of examples of good practice in dealing with those issues could facilitate the adoption of such a systematic method. This framework and examples could usefully be set out in a Manual on the Ecosystem Approach for Regional Seas. Such a manual would help to ensure that there is as much consensus as possible about what needs to be covered. It could also assist in overcoming possible reluctance on the part of some to address issues that need to be covered by showing that there is wide consensus on what needs to be addressed.
8. An initial sketch of such a manual is set out at Annex A. The passages in regular type are suggested material for an eventual manual. The passages in italics are comments on what would need to be done. Any such manual should be developed as a partnership to provide an organic

growth of check-lists and examples that respond to the issues identified by those who will need to make the systems work.

9. If there is agreement that such a manual could be of use, the proposal would be that:
 - a. in the light of the discussion of this initial sketch at this meeting, a first draft would be prepared by the end of 2007. The total size would be about 50 pages. This first draft would be circulated to all Regional Seas Organisations and other regional bodies for comment. It would be for each organisation to decide whether and, if so, how to comment;
 - b. the first draft would incorporate material suggested by the Regional Seas Organisations in the light of this discussion;
 - c. the GRAME Group of Experts on the Assessment of Assessments would be invited, at their meeting in November to consider this initial sketch and an oral report of the comments at this meeting. The purpose of this would be to ensure that developments on assessments of the marine environment and the methods for adopting an ecosystem approach are, as much as possible, in step with each other. Their comments would be taken into account in the first draft;
 - d. a target-date would be fixed for the receipt of comments on the first draft; in the light of those comments, and any further work that this meeting suggests, a second draft would be prepared for checking by the Regional Seas Organisations;
 - e. a final version would be prepared for approval and publication by UNEP and any other organisations involved in supporting the project.
10. This meeting is asked to consider:
 - a. whether a Manual on the Ecosystem Approach for Regional Seas would be helpful;
 - b. whether the attached initial sketch covers the right issues;
 - c. whether the sequence set out in the previous paragraph is a suitable way of proceeding;
 - d. how far the regional seas organisations can help with the development of the manual.

INITIAL SKETCH of 8 OCTOBER 2007

Manual on the Ecosystem Approach for Regional Seas

TABLE OF CONTENTS

This will, of course, depend on the eventual shape of the text of the manual.

SUMMARY

The document will need to open with a short summary showing how each of its Chapters and Sections gives guidance on how to deliver the important regional component of the global commitment to applying an ecosystem approach to the management of human activities that affect, or may affect, the marine environment.

CHAPTER I – INTRODUCTION: THE COMMITMENT TO AN ECOSYSTEM APPROACH

1. When the world's leaders gather in Johannesburg in September 2002 to consider how best to promote sustainable development, they stressed that "Oceans, seas, islands and coastal areas form an integrated and essential component of the Earth's ecosystem and are critical for global food security and for sustaining economic prosperity and the well-being of many national economies, particularly in developing countries."
2. They further emphasised that "Ensuring the sustainable development of the oceans requires effective coordination and cooperation, including at the global and regional levels, between relevant bodies".
3. One of the actions that they identified to these ends was "Encourage the application by 2010 of the ecosystem approach, noting the Reykjavik Declaration on Responsible Fisheries in the Marine Ecosystem¹ and decision V/6 of the Conference of Parties to the Convention on Biological Diversity,²"
4. As the leaders' parallel commitment to "Promote the implementation of chapter 17 of Agenda 21" showed, this commitment to the ecosystem approach is a natural development of the approach of Agenda 21, emphasising the need for the integration of all policies affecting the oceans and seas. The substance of chapter 17 of AGENDA 21 is a programme of action for achieving the sustainable development of oceans, coastal areas and seas through its programme areas of integrated management and sustainable development of coastal areas, including exclusive economic zones; marine environmental protection; sustainable use and conservation of marine living resources; addressing critical uncertainties for the management of the marine environment and climate change; strengthening international, including regional, cooperation and coordination; and sustainable development of small islands.
5. At the global level, many important steps have already been taken to implement this programme of AGENDA 21:
 - a. the Implementation Agreement on Part XI of the UN Convention on the Law of the Sea was adopted, and in consequence that Convention entered into force in 1995;
 - b. the UN Agreement on Straddling and Highly Migratory Fish Stocks, and the Code of Conduct on Responsible Fisheries was adopted in 1995;

¹See Food and Agriculture Organization of the United Nations document C200/INF/25, appendix I.

²See UNEP/CBD/COP/5/23, annex III.

- c. the Global Programme of Action to Protect the Marine Environment from Land-Based Activities was adopted in 1995, and has been twice reviewed by Governments;
 - d. International Conventions have been developed on anti-fouling treatments of vessels, on ballast-water and sediment management (to control the introduction of alien species), and on bunkers.
6. Many regions and States have also acted to improve their approach to the integration of the management of human activities that may affect the seas.
7. Nevertheless, there is still a massive need for further improvement. As the Johannesburg Implementation Programme makes clear, the regional level has a very important role to play in improving this integration.
8. This Manual is therefore aimed at helping in this work at the regional level. It aims to set out practical ways of developing the ecosystem approach, by showing what issues need to be addressed, by providing check-lists of actions that can help address those issues, and by giving short descriptions of good examples of those actions (with directions to the places where further details of those examples can be found). This will help all those involved by enabling them having to reinvent for themselves techniques and processes which have already been developed elsewhere, by showing the range of issues that need to be addressed and by demonstrating the agreement that exists about workable, practical measures to implement the commitment to the ecosystem approach.

CHAPTER 2 – WHAT IS AN ECOSYSTEM APPROACH?

1. Many different ‘ecosystem approaches’ exist. There is no single, overriding answer to the question “what is an ecosystem approach?”. In 2006, at the 7th United Nations Open-Ended Informal Consultative Process on Oceans and the Law of the Sea (UNICPOLOS), delegates agreed that “there is no universally agreed definition of an ecosystem approach, which is interpreted differently in different contexts.”³ Likewise, the Conference of the Parties of the Convention on Biological Diversity (CBD) has stressed that there is no single way to implement the ecosystem approach, as it depends on local, provincial, national, regional or global conditions.
2. To start making an ecosystem approach operational, however, we first need to understand that it is an approach to the management of human activities that affect, or may affect, the marine environment. It is not helpful to talk about “managing the ecosystem”. We can only manage the human activities that affect, or may affect, the ecosystem. Nevertheless, it is often a convenient shorthand to speak of “managing the ecosystem” when we mean “managing the human activities that affect, or may affect, the ecosystem”.
3. Secondly, the natural structure and processes of ecosystems are the essential context in which human activities have to be managed. An ecosystem approach therefore has to take into account both:
- a. the natural variation and changes in the ecosystems, and
 - b. the changes that human activities induce in it, both by direct actions on the marine ecosystem (eg fisheries) and by changing the chemical and physical environment of the ecosystem (eg through discharges of chemicals or physical changes to coasts).

³ UNICPOLOS (2006), p.2

4. Thirdly, we need to consider the overall aims of applying the ecosystem approach. CBD has stated:

“The ecosystem approach is a strategy for the integrated management of land, water and living resources that promotes conservation and sustainable use in an equitable way. Thus, the application of the ecosystem approach will help to reach a balance of the three objectives of the Convention: conservation; sustainable use; and the fair and equitable sharing of the benefits arising out of the utilization of genetic resources.”⁴

5. Against this background, there are several important points that help to indicate the particular features of the ecosystem approach:

- a. **ecosystems include humans.** An ecosystem encompasses the biological structure, processes, functions and interactions among organisms (including humans) and their environment. This means that human (social and economic) uses affect – and are affected by – the ecosystems on which humans depend.
- b. **both conservation and the sustainable use of coastal and ocean resources must be included.** UNICPOLOS states that the ecosystem approach should “seek the appropriate balance between, and integration of, conservation and sustainable use of marine biological diversity.”⁵
- c. **the ecosystem approach has no particular scale.** A focus on structure, processes, functions and interactions is consistent with the definition of "ecosystem" provided in Article 2 of the Convention on Biological Diversity: "Ecosystem' means a dynamic complex of plant, animal and micro-organism communities and their non-living environment interacting as a functional unit." This definition does not specify any particular spatial unit or scale. Thus, the term "ecosystem" does not, necessarily, correspond to the terms "biome" or "ecological zone", but can refer to any functioning unit at any scale. Indeed, the scale of analysis and action should be determined by the problem being addressed;
- d. **ecosystems are complex and dynamic.** We do not have complete knowledge or understanding of their functioning. Ecosystem processes are often non-linear, and the outcome of such processes often shows time-lags. The result is discontinuities, leading to surprise and uncertainty. Adaptive management is therefore required, making adjustments to respond to the outcomes of uncertainties, and to take account of increases in knowledge. Measures may need to be taken even when some cause-and-effect relationships are not yet fully established scientifically;
- e. **the ecosystem approach is not exclusive.** Other management and conservation approaches (such as biosphere reserves, protected areas, and single-species conservation programmes) and other national policies and legislation can co-exist with it. The ecosystem approach does not supersede them. Rather, it offers a way to integrate all these approaches and other methodologies to deal with complex situations.

6. On the basis of these fundamental points, CBD has agreed the following 12 principles for the ecosystem approach. They must be taken as a whole, since they are complementary and interlinked:

Principle 1: The objectives of management of land, water and living resources are a matter of societal choice.

Rationale: Different sectors of society view ecosystems in terms of their own economic, cultural and societal needs. Indigenous peoples and other local communities living on the

⁴ Convention on Biological Diversity, Decision V/6 (2000), Sec.A.1.

⁵ UNICPOLOS (2006), p.3

land are important stakeholders and their rights and interests should be recognized. Both cultural and biological diversity are central components of the ecosystem approach, and management should take this into account. Societal choices should be expressed as clearly as possible. Ecosystems should be managed for their intrinsic values and for the tangible or intangible benefits for humans, in a fair and equitable way.

Principle 2: Management should be decentralized to the lowest appropriate level.

Rationale: Decentralized systems may lead to greater efficiency, effectiveness and equity. Management should involve all stakeholders and balance local interests with the wider public interest. The closer management is to the ecosystem, the greater the responsibility, ownership, accountability, participation, and use of local knowledge.

Principle 3: Ecosystem managers should consider the effects (actual or potential) of their activities on adjacent and other ecosystems.

Rationale: Management interventions in ecosystems often have unknown or unpredictable effects on other ecosystems; therefore, possible impacts need careful consideration and analysis. This may require new arrangements or ways of organization for institutions involved in decision-making to make, if necessary, appropriate compromises.

Principle 4: Recognizing potential gains from management, there is usually a need to understand and manage the ecosystem in an economic context. Any such ecosystem-management programme should:

- (a) **Reduce those market distortions that adversely affect biological diversity;**
- (b) **Align incentives to promote biodiversity conservation and sustainable use;**
- (c) **Internalize costs and benefits in the given ecosystem to the extent feasible.**

Rationale: The greatest threat to biological diversity lies in its replacement by alternative systems of land use. This often arises through market distortions, which undervalue natural systems and populations and provide perverse incentives and subsidies to favour the conversion of land to less diverse systems. Often those who benefit from conservation do not pay the costs associated with conservation and, similarly, those who generate environmental costs (e.g. pollution) escape responsibility. Alignment of incentives allows those who control the resource to benefit and ensures that those who generate environmental costs will pay.

Principle 5: Conservation of ecosystem structure and functioning, in order to maintain ecosystem services, should be a priority target of the ecosystem approach.

Rationale: Ecosystem functioning and resilience depends on a dynamic relationship within species, among species and between species and their abiotic environment, as well as the physical and chemical interactions within the environment. The conservation and, where appropriate, restoration of these interactions and processes is of greater significance for the long-term maintenance of biological diversity than simply protection of species.

Principle 6: Ecosystems must be managed within the limits of their functioning.

Rationale: In considering the likelihood or ease of attaining the management objectives, attention should be given to the environmental conditions that limit natural productivity, ecosystem structure, functioning and diversity. The limits to ecosystem functioning may be affected to different degrees by temporary, unpredictable or artificially maintained conditions and, accordingly, management should be appropriately cautious.

Principle 7: The ecosystem approach should be undertaken at the appropriate spatial and temporal scales.

Rationale: The approach should be bounded by spatial and temporal scales that are appropriate to the objectives. Boundaries for management will be defined operationally by users, managers, scientists and indigenous and local peoples. Connectivity between areas should be promoted where necessary. The ecosystem approach is based upon the hierarchical nature of biological diversity characterized by the interaction and integration of genes, species and ecosystems.

Principle 8: Recognizing the varying temporal scales and lag-effects that characterize ecosystem processes, objectives for ecosystem management should be set for the long term.

Rationale: Ecosystem processes are characterized by varying temporal scales and lag-effects. This inherently conflicts with the tendency of humans to favour short-term gains and immediate benefits over future ones.

Principle 9: Management must recognize that change is inevitable.

Rationale: Ecosystems change, including species composition and population abundance. Hence, management should adapt to the changes. Apart from their inherent dynamics of change, ecosystems are beset by a complex of uncertainties and potential "surprises" in the human, biological and environmental realms. Traditional disturbance regimes may be important for ecosystem structure and functioning, and may need to be maintained or restored. The ecosystem approach must utilize adaptive management in order to anticipate and cater for such changes and events and should be cautious in making any decision that may foreclose options, but, at the same time, consider mitigating actions to cope with long-term changes such as climate change

Principle 10: The ecosystem approach should seek the appropriate balance between, and integration of, conservation and use of biological diversity.

Rationale: Biological diversity is critical both for its intrinsic value and because of the key role it plays in providing the ecosystem and other services upon which we all ultimately depend. There has been a tendency in the past to manage components of biological diversity either as protected or non-protected. There is a need for a shift to more flexible situations, where conservation and use are seen in context and the full range of measures is applied in a continuum from strictly protected to human-made ecosystems.

Principle 11: The ecosystem approach should consider all forms of relevant information, including scientific and indigenous and local knowledge, innovations and practices.

Rationale: Information from all sources is critical to arriving at effective ecosystem management strategies. A much better knowledge of ecosystem functions and the impact of human use is desirable. All relevant information from any concerned area should be shared with all stakeholders and actors, taking into account, inter alia, any decision to be taken under Article 8(j) of the Convention on Biological Diversity. Assumptions behind proposed management decisions should be made explicit and checked against available knowledge and views of stakeholders.

Principle 12: The ecosystem approach should involve all relevant sectors of society and scientific disciplines.

Rationale: Most problems of biological-diversity management are complex, with many interactions, side-effects and implications, and therefore should involve the necessary expertise and stakeholders at the local, national, regional and international level, as appropriate.

7. The task of this manual is to try to show a practical way to turn these principles into operational practice: to answer the questions “who needs to do what to make this come about?”

CHAPTER 3 – WHO NEEDS TO BE ON BOARD?

1. Since the defining characteristic of an ecosystem approach is to integrate management actions across the board, it is essential to consider at the start who needs to be involved in developing and applying the ecosystem approach, how they can be organised to carry out these tasks, what capacity building is needed to enable them to do so, and how they can be encouraged to “buy in” to the process.

This chapter should therefore begin by analysing the various levels at which an ecosystem approach can be applied to the management, and the various actors who may need to be considered. A check-list of aspects to be considered will include activities such as:

- a. *national and local: all sectors of human activity, including MARPOL special areas; the need to involve specialist ministries, such as those responsible for fisheries, shipping and agriculture will need to be stressed;*
- b. *local international co-operations, such as MARPOL special areas that span several national jurisdictions, GEF projects and port-state inspection régimes;*
- c. *regional: regional seas organisations; regional fisheries management bodies for areas outside national jurisdiction; regional co-operations under the IMO Ballast Water Convention;*
- d. *global: IMO shipping regulation; the International Coral Reef Initiative; the Jakarta Mandate.*

The chapter will need also to make clear that, while an ecosystem approach in any area will need support across the whole of this field, the nature of the support will vary substantially between the different actors, and may in some cases be involve no more than taking note of what is being done. Mechanisms will, however, be necessary to ensure cohesion between actions at these various levels, and the chapter will need to discuss what forms these mechanisms could take.

An effective ecosystem approach requires support not only from all the governmental regulatory bodies, but also from a wide range of other stakeholders. The range of stakeholders that should be considered (industry, artisans, environmental pressure groups, scientific bodies, those with traditional knowledge, and so on) will need to be described, together with methods that have been found efficient in getting them to buy into the processes in the various stages described in the previous chapter.

An ecosystem approach requires a wide range of capabilities – both those that have been involved in traditional sectoral regulation and new ones that enable a wider range of stakeholders to be involved. For example, consideration of the effect of litter on the marine environment may require the mobilisation of a lot of volunteer effort to gather information (and even to carry out clean-ups). This chapter will therefore need to set out a check-list of the capabilities that can be needed, and ways that have been found to be effective in developing them. This is not merely a matter for regions with a substantial proportion of developing States: all regions and all States need to develop new ways of working.

CHAPTER 4 – HOW TO SPECIFY AN ECOSYSTEM APPROACH?

1. Making the ecosystem approach operational means building a bridge from the principles spelt out in chapter 2 to objectives which can be used to guide management decisions. These objectives can take various forms, depending on local circumstances.

2. In an ideal world, it would be possible to specify what sort of sustainable ecosystem we want to see, drawing on what we know about its pristine state and the way that it functions, the economic and social goals that we wish to achieve from its use, and the ecosystem services that we wish to maintain.

3. But our knowledge will never be sufficient to let us go all this way. The best that we can hope to do is to find some way of specifying the several dimensions of an envelope such that, if the ecosystem is within it, we can be reasonably confident that it is healthy and sustainable.

4. To do this, we would need to establish the ecological qualities that we regard as defining that envelope, and the values that we would like to see. This would enable us to set ecological quality objectives (EcoQOs) against which we could test the impacts of the human activities. Efforts are under way to carry out this programme, and they are described in Appendix 1. As an example of what would ideally be needed, a description of a good system of EcoQOs has said that:

- a. a good EcoQO will have a clear scientific basis, linking it to significant aspects of the quality of a marine ecosystem;
- b. it will be possible to collect the relevant data effectively and economically across the whole range to which it applies;
- c. there is a clear reference level or target against which the data on the EcoQO can be evaluated;
- d. there is general acceptance of the validity of the EcoQO by all relevant stakeholders.
- e. EcoQOs will be better the more that they are:
 - i. relatively easy to understand by non-scientists and those who will decide on their use;
 - ii. sensitive to manageable human activity;
 - iii. relatively tightly linked in time to that activity;
 - iv. easily and accurately measured, with a low error rate;
 - v. responsive primarily to a human activity, with low responsiveness to other causes of change;
 - vi. measurable over a large proportion of the area to which the EcoQ is to apply;
 - vii. based on an existing body or time-series of data to allow a realistic setting of objectives.

5. If we cannot go this far, we nevertheless need to specify the directions in which we need to manage the main human activities that impinge on the ecosystem with which we are concerned. We may not be able to describe precisely the aim towards which we intend to go, but we need to be able to say in which directions it lies.

6. *The check-list of actions to specify the approach will therefore need to cover:*

- a. *identify the ecosystem with which we are dealing – it may be a semi-enclosed sea, part of the ocean, or a sea area affected by a specific ocean current. Whatever it is, it is unlikely to be self-contained: there will be influences brought from outside by the ocean, by the movement*

of ships, and by the natural migrations of fish and birds. But we want to find an area that has a natural cohesion;

- b. identify and describe the main human activities that impact on this ecosystem. What are the economic driving forces behind them? What pressures do they impose on the ecosystem? Which are the most significant?*
- c. determine what sort of goals can be set. Can they describe the ecosystem that we want to see? Or can they simply be indications of the directions of management changes that are judged to be needed? How specific can we be – there is little point in going into great detail on one aspect, and treating other, equally important ones with a broad brush?*

This chapter should stress that the ecosystem approach is a form of adaptive management, that requires continuing cycles of:

- a. gathering scientific information about the marine environment;*
- b. assessing that information to reach conclusions on the quality status of the marine environment, and what is advisable by way of intervention in the management of human activities;*
- c. policy decisions on:*
 - i. the objectives to be pursued (and revisions of those objectives);*
 - ii. interventions to be made in the management of human activities;*
- d. the implementation of the policy decisions on interventions in the management of human activities, including enforcing the decisions and checking that they have been implemented;*
- e. evaluation of the work carried out in the cycle.*

CHAPTER 5 – ANALYSING THE ECOSYSTEMS

This chapter will need to describe briefly the approach to analysing the way in which human activities impact on the ecosystem.

Ecosystems change and develop over time. This can be due to:

- a. natural variability;*
- b. response to world-wide changes (global warming, increased ultraviolet radiation as a result of the weakening of the ozone layer, etc); or*
- c. impacts of localised human activities.*

An ecosystem approach has to focus particularly on the last of these sources of change.

In this task, tools are needed to seek to identify:

- a. the conditions in which the ecosystem(s) in question can be regarded as healthy and sustainable;*
- b. the extent to which changes are due to natural variability, world-wide changes and localised human activities.*

Some general descriptions are needed of how this task can be approached, and then support should be given through more detailed descriptions of techniques which have been found helpful, under the headings set out in Appendix 2.

CHAPTER 6 – ANALYSING HOW HUMAN ACTIVITIES IMPACT ON THE SEAS

1. An essential first step in aligning all regulation of human activities with the ecosystem approach is to understand the way in which human activities impact on the seas, and what are the factors that need to be taken into account. For this task, the DPSIR approach is useful. This examines:

- a. the **drivers** that lead to an activity being a problem;
- b. the way in which the activity imposes **pressures** on the marine environment;
- c. the way in which these pressures affect and change the **state** of the marine environment;
- d. the **impacts** of these changes on the lawful uses of the sea; and
- e. the **responses** that are being tried to combat or mitigate these changes and impacts.

Using this framework, the chapter needs to identify check-lists of questions which need to be considered in relation to each of the main human activities that impact on the seas. Short descriptions of examples of ways in which these questions have been answered would then be set out in Annex 3.

CHAPTER 7 – INTEGRATING THE PICTURE

1. An ecosystem approach demands a system for obtaining an integrated picture of the health and sustainability of the ecosystem as a whole. The cycle of policy formulation, implementation and evaluation, feeding back into policy review and formulation is an essential element of the adaptive management that is a central feature of the ecosystem approach. There will never be enough resources to capture information about the whole of the marine environment. In order to establish an integrated picture of what is happening, therefore, a choice must be made of the crucial components to be observed.

A check-list is needed of the issues to be considered in making that choice.

To obtain an integrated picture with the inevitably limited resources, those resources must be deployed efficiently, effectively and economically. Good examples should be given of ways in which this can be done for the crucial components that have been identified.

When the information has been captured it needs to be brought together and assessed. A check-list is needed of the problems that need to be overcome, and good examples of ways in which this can be done.

CHAPTER 8 – ORGANISING AN ECOSYSTEM APPROACH

An ecosystem approach will not just happen. It will need concentrated effort to make it operational.

Different regions will have different priorities in applying an ecosystem approach. It will nevertheless be helpful to give a check-list of issues that need to be considered in establishing what those priorities should be.

Applying an ecosystem approach will require cooperation between a range of independent bodies. A check-list is needed of the issues that will have to be addressed in establishing that cooperation, and, again, good examples of how it can be done.

Everything involved in applying an ecosystem approach will require new ways of thinking and working for everyone. This will require regional organisations and their component States to build the capacities to do so, both in their own organisations and in the various stakeholder

organisations that need to be involved. Examples of how this can be done effectively and economically will be helpful.

APPENDIX 1

SPECIFYING THE GOALS OF AN ECOSYSTEM APPROACH

This appendix will examine some of the processes that are in hand to try to describe the goals of an ecosystem approach. The processes to be described could include:

- a. the OSPAR Ecological Quality Objectives for the North Sea;
- b. the HELCOM Ecological Objectives for the Baltic Sea area;
- c. the Mediterranean Action Plan's road-map
- d. the South Pacific Pacific Plan
- e. Australia's Marine Bioregional Plans;
- f. Canada's Integrated Management Planning.

APPENDIX 2

ANALYSING THE ECOSYSTEM

This appendix would describe briefly the analytical approaches that can be used in assessing the ecosystem and the human impacts on it. The headings should probably be:

1 – Phytoplankton and primary production

The basic influences on the production and life-cycles of phytoplankton can be regarded as insolation, hydrographical conditions including stratification and temperature, and the availability of nutrients. Insolation and hydrography are aspects of climate variability and change, the effects of which need to be identified. The availability of nutrients (and its relation to eutrophication problems) is an area on which guidance on successful approaches can be identified.

2 – Zooplankton

The ecosystem performance of the trophic level formed by the zooplankton may not be capable of easy analysis. The guidance may well be that its health and the influences on it should be considered indirectly, through the performance of the species dependant on zooplankton, and the species whose eggs and larvae are part of the zooplankton.

3 – Macrophytes

The trophic level of macrophytes is likely to be most important to the overall health and sustainability of ecosystems through their role as part of important habitats (such as eel-grass beds). References will be needed to methods that have proved effective in assessing the way in which such habitats are responding to the three levels of change.

4 - Fish

Fish are the most well studied of all trophic levels of the marine environment. It would be superfluous to try to do more than refer to some of the main questions that need to be addressed in considering their overall relationship with marine ecosystems. Nevertheless, it will probably be appropriate to give a check list of some of the most important questions that need to be addressed, under an ecosystem approach, on the relationships between commercial fish stocks, other fish species and other marine and seabird species.

5 – Benthos (including crustaceans and molluscs)

6 – Reptiles

7 – Seabirds

8 – Marine Mammals

ASSESSING THE HUMAN IMPACT

1 – Commercial fisheries (including mariculture)

2 – Land-based impacts

Following the Global Programme of Action to Protect the marine Environment from Land-Based Activities, this chapter would need to cover that programmes nine source categories:

- A. *Sewage*
- B. *Persistent organic pollutants (POPs)*
- C. *Radioactive substances*
- D. *Heavy metals*
- E. *Oils (Hydrocarbons)*
- F. *Nutrients*
- G. *Sediment mobilisation*
- H. *Litter*
- I. *Physical alterations and destruction of habitats (including tourism)*

3 – Maritime Transport

4 – Offshore Oil and Gas Industries (including sequestration of carbon dioxide)

5 – Other Seabed Extractive Industries and Navigation Dredging

6 – Offshore Renewable Energy Generation

7 - Dumping

8 – Marine Litter