

UNITED NATIONS ENVIRONMENT PROGRAMME

*Co-operative programmes sponsored
by UNEP for the protection of the
marine and coastal environment
in the wider Indian Ocean region*

UNEP Regional Seas Reports and Studies No. 58



PREFACE

The organizers of the Conference on Economic, Scientific and Technical Co-operation in the Indian Ocean in the Field of Marine Affairs in the context of the New Ocean Regime (Colombo, Sri Lanka, 15-20 July 1985) invited the United Nations Environment Programme to participate in the Conference. Subsequently it was agreed that UNEP would present to the Conference a review of co-operative programmes sponsored by UNEP for the protection of the marine and coastal environment in the wider Indian Ocean region. This document represents UNEP's contribution to the meeting.

The document describes the basic approach of UNEP to the environmental problems of oceans and coastal areas, the strategy used in the implementation of UNEP's ocean-related programme and the major co-operative programmes supported by UNEP in the wider Indian Ocean region. The document also contains a set of suggestions which may be considered when discussing the co-operation in the field of environmental protection of the Indian Ocean as a whole. A short summary of the document is contained in the following paragraphs.

While recognizing that the problems of the oceans are global in nature, UNEP is approaching them through a series of highly structured regional "action plans" in the framework of the Regional Seas Programme of UNEP. The action plans are formulated, adopted and implemented by the governments concerned. Each action plan has clearly defined objectives and goals and contains a set of programme elements (activities) related to the assessment of the environmental problems and to their solution through management measures. A detailed description of the five Indian Ocean Action Plans constitutes the main body of the review.

Most of the action plans are supported by legally binding regional conventions, supplemented with protocols dealing with specific problems. The financial support to activities carried out under the action plans are from the participating governments, from UNEP and from third parties, the specialized organizations of the United Nations in particular. UNEP provides for an overall co-ordination of the Regional Seas Programme and acts as the secretariat for a number of adopted action plans and conventions.

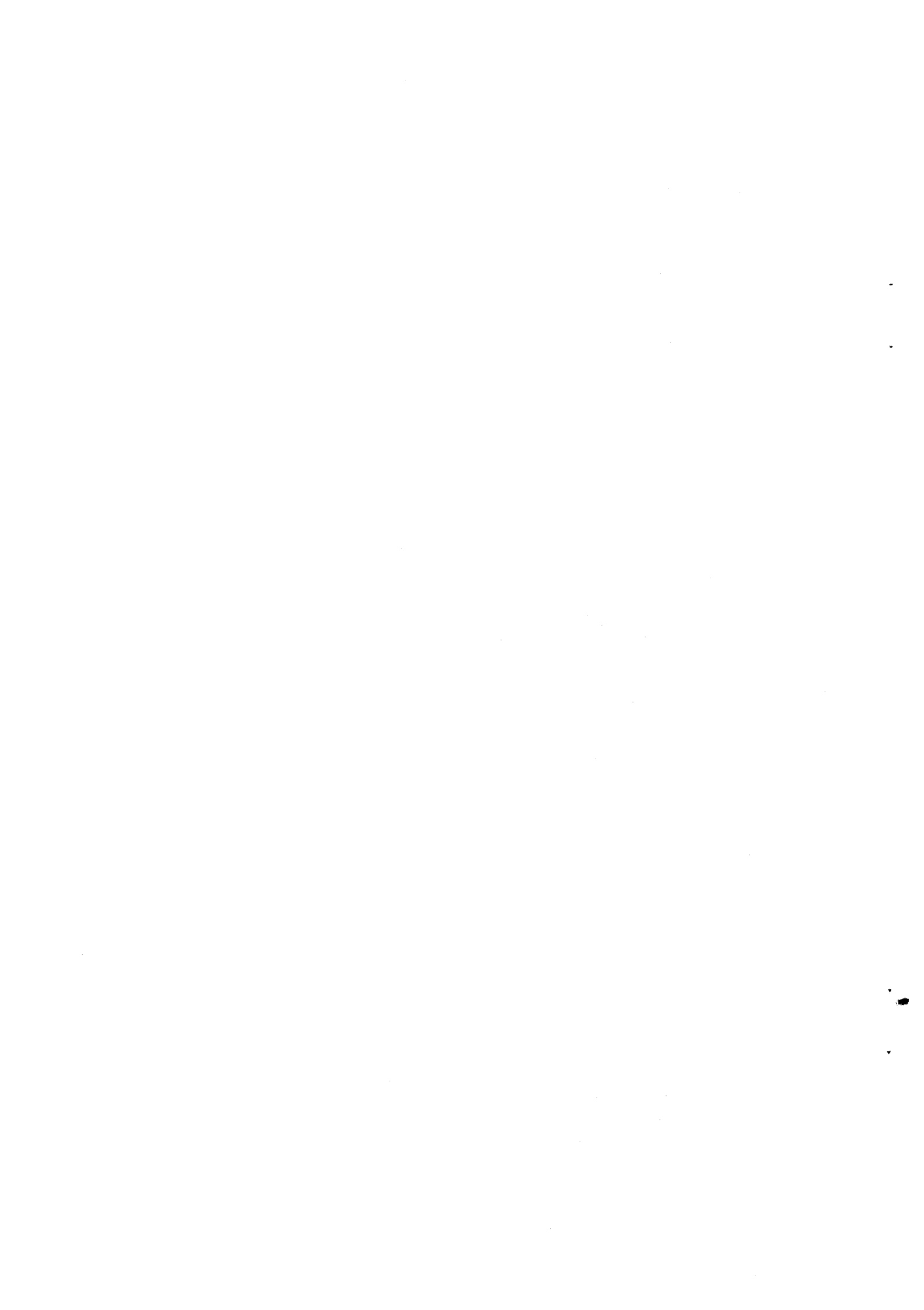
The Regional Seas Programme at present includes eleven regions^{1/} involving more than 120 coastal states. In the framework of the programme five action plans have been adopted or are being developed in the Indian Ocean region. Inter-regional co-operation between these five action plans is proposed as the most rational and cost/effective approach towards the environmental problems of the Indian Ocean region.

^{1/} Mediterranean Region, Kuwait Action Plan Region, West and Central African Region, Wider Caribbean Region, East Asian Seas Region, South-East Pacific Region, South Pacific Region, Red Sea and Gulf of Aden Region, Eastern African Region, South-West Atlantic Region and South Asian Seas Region.



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I. INTRODUCTION

Concern for the Oceans

1. The environmental concerns of the 1960's and anxieties about the future of the human environment led to the United Nations Conference on the Human Environment, convened in Stockholm in June 1972 and were crystallized in the Declaration adopted at its conclusion. World-wide concern for the fate of the Oceans was a major element in the environmental thinking of twenty years ago and has not declined since.

2. The Stockholm Declaration ^{1/} expressed the common conviction that man bears the responsibility to protect and improve the environment for present and future generations (Principle 1) and that the natural resources of the earth must be safeguarded through careful planning and management (Principle 2). It also stated that States shall take all possible steps to prevent pollution of the seas (Principle 7).

3. Indeed, the Stockholm Conference outlined a "masterplan" for the world's environment. As inseparable elements of a global strategy it identified three components:

- (a) environmental assessment;
- (b) environmental management; and
- (c) supporting measures.

4. In other words, a strategy for:

- (a) increasing knowledge on existing and changing environmental conditions;
- (b) carefully planning and taking action to improve the environment, to safeguard natural resources through rational use, and to minimize undesirable effects; and
- (c) complementing direct action with indirect activities which would ensure that improvements are well founded and long-lasting.

5. Following the recommendations of Stockholm, the United Nations Environment Programme (UNEP) was created by the United Nations ^{2/} and has since then served as a focal point for global environmental action, and for co-ordination within the UN system. The Governing Council of UNEP defined this environmental action as encompassing a comprehensive, trans-sectoral approach to environmental problems which should deal not only with the consequences but also with the causes of environmental degradation.

^{1/} The full text of the Stockholm Declaration and Action Plan is reproduced in: Compendium of Legislative Authority, produced for UNEP by Pergamon Press, Oxford 1978.

^{2/} General Assembly Resolution 2997 (XXVII) of 15 December 1972.

6. Already at the first meeting of the UNEP Governing Council attention was focused on the protection of oceans and the marine environment, on initiating assessment and monitoring activities, and on the control of pollution, including international and regional agreements with this objective ^{3/}.

7. This attitude was further strengthened by the General Assembly which emphasized the need for protecting and conserving the total living resources of ocean space and stipulated that the Governing Council of UNEP should direct special attention to the question of environmental protection of the seas and oceans ^{4/}.

The Regional Approach

8. Although problems of the seas and oceans are of a global nature, the Governing Council chose to deal with them through a regional approach to be applied, inter alia, to the control of marine pollution and management of marine and coastal resources. Regional agreements on the protection of specific bodies of water from pollution were to be encouraged and the study, conservation and wise management of living resources, including whales and other mammals, were to be promoted ^{5/}.

9. By adopting this approach, it is possible to focus on specific problems of high priority to the States of a given region, thereby responding more readily to the needs of the Governments and helping to mobilize more fully their own national resources. In addition, it was considered that the undertaking of activities on a regional basis would, in due time, provide the basis for dealing effectively with the environmental problems of the oceans as a whole.

10. With this in mind, the Regional Seas Programme of UNEP was initiated following the 1974 Governing Council Decision and a Regional Seas Programme Activity Centre (RS/PAC) instituted in 1977. The Regional Seas Programme has often been referred to as one of the most successful of UNEP's Programmes; at present it comprises eleven regions with more than 120 coastal States participating in it, more than 30 of them around the Indian Ocean alone.

11. The Regional Seas Programme is conceived as an action-oriented programme having concern not only for the consequences but also for the causes of environmental degradation, and encompassing a comprehensive approach to preventing and abating environmental problems through the proper management of marine and coastal areas.

12. In reviewing the activities of the Regional Seas Programme during the last ten years the Regional Action Plan approach will be discussed first.

^{3/} Governing Council Decision 1 (I), Section II, para 12e, of 1973.

^{4/} General Assembly Resolution 3133 (XXVIII) of 13 December 1973

^{5/} Governing Council Decision 8 (II), Section AI, Chapter 4, of 1974.

The Action Plan Formula

13. At this point it is necessary to briefly describe the method used by the Regional Seas Programme of UNEP and participating States in all regions to address their particular environmental problems. Either intuitively (as originally in the Mediterranean) or after careful consideration and identification of environmental problems and priorities (as lately in the Eastern African region), States have agreed on a Plan of Action.

14. Action Plans are not identical. They are formulated according to the wishes of participating Governments and reflect the particular concerns of the region at the period of their adoption. They incorporate issues on which consensus for action is reached; they also take into account the experience gained in the implementation of previous Action Plans. They constitute the basic element of agreement; they need not, however, be static. Indeed, they are constantly amplified at periodic meetings. In the Mediterranean a complete review will probably be attempted after the first ten years.

15. Each regional Action Plan is designed to link assessment of the quality of the marine environment and the causes of its deterioration with activities for the management and development of the marine and coastal environments. The Action Plans promote the parallel development of regional legal agreements and of action-oriented programme activities. As each regional programme is aimed at benefiting the States of that region, Governments are involved from the very beginning in the formulation of an Action Plan.

16. An Action Plan is formally adopted by an intergovernmental meeting of the Governments of a particular region before the programme enters an operational phase. In the preparatory phase leading to the adoption of the Action Plan, Governments are consulted through a series of meetings and missions about the scope and substance of an action plan suitable for their region. In addition, with the co-operation of appropriate global and regional organizations, reviews on the specific environmental problems of the region are prepared in order to assist the Governments in identifying the most urgent problems in the region and the corresponding priorities to be assigned to the various activities outlined in the action plan. UNEP co-ordinates directly, or in some regions indirectly through existing regional organizations, the preparations leading to the adoption of the action plan.

17. After adoption of the plan, its implementation is carried out, under the overall authority of the Governments concerned, by national institutions nominated by their Governments. UNEP acts as an overall co-ordinator for the development and implementation of regional Action Plans - although, in some cases, this role is limited to the initial phase of the activities.

18. Financial support is initially provided by UNEP and other international and regional organizations. As a programme develops, however, it is expected that the Governments of each region will assume increasing financial responsibility for its implementation, through specific regional trust funds or other suitable mechanisms. Additional assistance continues to be made available by other bodies within the United Nations system - e.g. for technical assistance and provision of expert advice, training, or technical support. The bodies concerned are encouraged to provide this assistance as part of their normal programmes, and to finance activities through their own funding mechanisms.

19. All Action Plans are structured in a similar way (although the specific activities for any region are dependent upon the needs and priorities of that

region) along the line recommended by the Stockholm Action Plan with its three-pronged approach: environmental assessment - environmental management - supporting measures.

20. This structure has been retained throughout the life of the United Nations Environment Programme and its validity is not questioned. For the purposes of this report, however, it has been found advisable to distinguish some aspects contained within the three areas, for the following reasons:

- (a) whereas financial arrangements can, for all theoretical purposes, be termed "supporting measures", practice has shown that they constitute a chapter in themselves and are in many instances a prerequisite for further co-operative action;
- (b) similarly, institutional arrangements and legal provisions, including national environmental legislation and international agreements, while being unquestionably management tools, again constitute important aspects and should be treated in separate sections; and
- (c) finally, it has been shown that the inclusion of such basic provisions (financial, institutional and legal), under the original Stockholm chapters tends to detract from the importance of other management or supporting measures; indeed, the adoption of a legal framework or even the provision of adequate financial means has often produced exultation and self-satisfaction and left some parties with the impression that "action" was now complete; concrete action is of course what comes afterwards, through implementation of legislation, through wise use of financial resources and through the actual carrying-out of a series of management and supporting activities which should therefore be treated separately.

21. Thus, Action Plans will be viewed in this report as including, with varying degrees, the following components:

- (a) Environmental assessment. This concerns assessing and evaluating the causes of environmental problems as well as their magnitude and impact on the region. Emphasis is given to such activities as: baseline (i.e. present situation) studies; research and monitoring of the sources, levels and effects of marine pollutants; eco-system studies; studies of coastal and marine activities and social and economic factors that may influence, or may be influenced by, environmental degradation. Environmental assessment is undertaken to assist national policy makers to improve the management of their natural resources in a more effective and sustainable manner and to provide information on the effectiveness of legal/administrative measures taken to improve the quality of the environment.
- (b) Environmental management. Each regional programme includes a wide range of activities in the field of environmental management. Examples of such activities are: management of coastal areas; water management policies; control of industrial, agricultural and domestic wastes; contingency plans for dealing with pollution emergencies; establishment of protected areas such as marine parks and wetlands.
- (c) Environmental legislation. An umbrella regional convention, elaborated by specific technical protocols, most often provides the legal framework for co-operative regional and national actions. The legal commitment of Governments clearly expresses their political will to manage individually and

jointly their common environmental problems. By progressively enacting national legislation which reflects the spirit of the Action Plan and lies within the area of application of the Convention, Governments further promote its implementation in harmony with the environmental measures deemed appropriate within the region.

- (d) Institutional arrangements. When adopting an Action Plan, Governments agree upon an organization to act as the secretariat of the Action Plan. Governments decide upon the periodicity of intergovernmental meetings which are to be responsible for reviewing the progress of the agreed workplan and for approving new activities and the necessary budgetary support.
- (e) Financial arrangements. UNEP, together with selected United Nations and other organizations, provides "seed money" or catalytic financing in the early stages of regional programmes. As a programme develops, Governments of the region progressively assume full financial responsibility through annual contributions. Funds are administered by the organization responsible for the secretariat functions of the Action Plan. In addition, Governments contribute by supporting their national institutions participating in the programme or by financing specific project activities.
- (f) Supporting measures. One of the most important and most lasting effects of an Action Plan has been found to be Environmental Awareness. This is created by a series of measures including environmental education at all levels of instruction, training of cadres and technical personnel in environmental management techniques, encouraging direct participation in environmental action and arousing public interest not only through publicizing environmental disasters but also through environmental awareness campaigns, books and other publications, magazine and newspaper articles, newsletters, pamphlets, posters etc, and by publicizing correct environmental data. Supporting measures have not received adequate attention in Action Plans to date.

22. It is essential to bear in mind that all components of a regional programme are interdependent. Assessment activities identify the problems that need priority attention in the region. Legal agreements are negotiated to strengthen co-operation among States in managing the identified problems. They also provide an important tool for national policy-makers to implement national control activities. Management activities, aimed at controlling existing environmental problems and preventing the development of new ones, are one of the means by which States fulfill their treaty obligations. Co-ordinated assessment activities then continue to assist Governments by providing scientific information by which to judge whether the legal agreements and management policies are effective.

23. The key to the success of any Regional Seas Action Plan is the political agreement of the Governments concerned and the execution of the programme primarily by national institutions from the region in close co-operation with the relevant components of the United Nations system and other appropriate organizations and in close consultation among each other. The successful implementation of any Regional Seas Action Plan also depends to a considerable degree on the resolve of Governments to implement the measures commonly agreed upon or instituted by themselves within their national competence.

24. The procedures and activities that may be followed in developing an action plan are instrumental in determining the Governments' and experts' long-term commitment to the implementation of the plan's activities and whether or not the Action Plan

corresponds to the real priorities and needs of the region. Without a strong governmental commitment and a realistic programme, efforts to promote regional environmental co-operation will be short lived.

The Role of UNEP

25. UNEP has played a significant part in the adoption and implementation of Action Plans. Besides its catalytic and generally co-ordinating role in the initial stage, UNEP has provided an umbrella under which parties, often not on co-operative terms in non-environmental issues, can meet; it has provided seed money, often quite substantial, thus helping to create the scientific and practical infrastructure for action and co-operation; it is a central point for the collection, interpretation and dissemination of data throughout the world, incorporating them in its world-wide system; and it has passed on experience gained in other areas, ensuring that duplication of effort is avoided.

26. In most but not all Action Plans UNEP has also been requested by participating States, in many cases through the Regional Conventions adopted, to perform secretarial functions and has been entrusted with the management of Regional Funds through which the Action Plans are financed.

27. The Governing Council of UNEP has accorded high priority to the Regional Seas Programme. It has supported the institution of Action Plans and has provided the initial financing necessary for its implementation.

28. It is also appropriate at this point to pay tribute to a number of United Nations specialized agencies and other intergovernmental and non-governmental organizations which have supported the overall Regional Seas effort of UNEP, both in services and kind. To mention but a few: United Nations Industrial Development Organization (UNIDO), Food and Agriculture Organization of the United Nations (FAO), United Nations Educational, Scientific and Cultural Organization (UNESCO), Intergovernmental Oceanographic Commission (IOC of UNESCO), World Health Organization (WHO), World Meteorological Organization (WMO), International Maritime Organization (IMO), International Atomic Energy Agency (IAEA), International Union for Conservation of Nature and Natural Resources (IUCN), World Wildlife Fund (WWF).

29. Furthermore, tribute should be paid to Regional Agencies and Organizations both within and outside the UN System that have initiated, participated in or supported the Action Plans in their Region. To mention but a few: the United Nations Regional Economic Commissions, the Arab League Educational, Cultural and Scientific Organization (ALECSO), Association of South-East Asian Nations (ASEAN), Permanent Commission for the South Pacific (CPPS), South Asian Co-operative Environment Programme (SACEP), South Pacific Commission (SPC), South Pacific Bureau for Economic Co-operation (SPEC).

Stockholm Revisited

30. The present Report is mainly a review of past activities, while future activities will be decided by the parties concerned. However, since future activities will probably have a more general scope and will have to take into account a more global framework of environmental thinking, it is of some interest to examine the validity of the Stockholm Action Plan and to identify possible changes in environmental perceptions since its formation.

31. Going back to the Stockholm Conference, it can be said that the Principles of the Stockholm Declaration are as valid today as they were in 1972 ^{6/} and that they constitute a Code of Environmental Ethics that has not been overtaken by events.

32. However, some environmental conditions have changed since then, some societal values and environmental goals have altered and, most importantly, scientific knowledge of environmental processes has increased.

33. In consequence, some additional principles and approaches have emerged and they are as valid in the Indian Ocean as they are on a global scale. When considering the future and future activities in the Indian Ocean these should be taken into account. They can be summarized as follows:

- (a) Economic growth and the environment: At the time of the Stockholm Conference there was open apprehension, especially on the part of developing countries, that environmental protection might negatively affect development. In some quarters the desirability of economic growth itself was questioned (zero-growth theory, etc.). It is now a well established common perception that long-term economic growth is essential for meeting the aspirations of people in all countries; that enlightened conservation strategies are prerequisites if this growth is to be sustainable in the long run; and that economic growth can be simultaneous with environmental improvement.
- (b) Interconnections between environmental components: It is now common knowledge that everything in the environment is related to everything else. No component can be viewed in isolation. Actions which benefit one area may cause unforeseen damage in others. The possibility of such consequences should be considered in the planning stage. Environmental Impact Analysis is recognized as an indispensable tool in assessing the benefits and dangers from any form of activity.
- (c) Interrelations between people, resources, environment and development: Negative consequences of actions of one sector on any other were once considered only sectorally. Now, increasing emphasis is placed on defining policies and courses of action that would have beneficial, mutually reinforcing positive effects on possibly all four sectors together. Systems analysis is recognized as a useful technique.
- (d) Environmental and Socio-economic interactions: It is now universally recognized that there is no social or economic action or condition without some impact on the environment. Be it affluence or poverty, war, even novel legislation or the change in social values and aspirations, all have environmental implications. Equally, no environmental improvement or degradation is without its positive or negative socio-economic repercussions. Besides, an acceptable level of environmental quality today may become unacceptable in some future decade.

^{6/} See UNEP/GC (SSC)/2, paras 138-173 for a full evaluation and analysis of some of the statements in this chapter.

- (e) Alternative life-styles and new social values and preferences have made their appearance since the 1960's. These should be taken into account in studies of alternative consumption patterns, technological styles and land-use strategies. As an example, waste is not any more considered only a hazard; it is undesirable as a concept, as much as excessive consumption. Institutional and educational frameworks should be reconsidered. New and imaginative approaches to development are called for. The unchaining of the environmental lobby and the recent political successes of environmentally oriented groups (the "greens") is but an externalization of some new social values.
- (f) Uncertainty of change: Environmental systems are never static. There is a slow process of evolutionary change, but there are also non-linearities, discontinuity and randomness in environmental processes. This is equally true in human environmental systems with continuous but also non-linear change in social and economic processes. Development plans and environmental management systems must not rely unduly on the continuation of current trends. They must also allow for discontinuities, rare events such as environmental disasters, environmental surprises such as sudden explosions of animal populations or the occurrence of smog in a hitherto "clean" city, and socio-economic surprises such as sudden rises in oil-prices, armed combat or an unexpected influx of refugees.
- (g) Interdependence of nations: It is now recognized that one of the factors of sound development lies in a regional or global, not in a localized, restricted approach. The development of nations can take place only in the context of mutual support and co-operation. Since no country can provide the whole range of goods and services, the concept of autarky, a utopian aim of self-sufficiency, results in inefficiency and relative poverty.
- (h) The venue of new technology has completely changed the possibilities of tackling problems, including environmental problems, planning processes and development issues. The exponential use of computers due to the diminishing costs of personal and other small computers constitute a revolution of capabilities in itself. Biotechnology, genetic engineering, new recycling techniques, increased use of cheaper "soft" energy and the development of remote sensing and satellite imagery, to name but a few, have expanded potentials in a way unimagined in the 1960's.
- (i) Increased knowledge of environmental processes, especially of slow environmental degradation and of long-range environmental effects have added new insight, in some cases reinforcing the fears of the early 1970's and in some cases diminishing them. Increased awareness and increased capabilities in countering environmental disasters should also be mentioned.
- (j) Environmentally sound management in coastal and maritime activities is now accepted as the key to safeguarding the marine environment. By this means, unplanned or illplanned land-use practices, the irrational exploitation of natural resources, and the pollution to which they incidentally give rise, can be avoided. Emphasis on the concept of management reflects a critical change from earlier concern that the oceans had to be preserved unchanged. Management implies use -- rational use. For example, when deciding on appropriate waste treatment and disposal practices, the waste-receiving capacity of the sea is clearly recognized as an asset which may be used for certain types of waste.

- (k) Action by Governments: There is no question that the future lies in the actions or non-actions of Governments. It has become increasingly evident from the experience in the implementation of the Regional Action Plans that while close co-ordination and co-operation among participating States is still the common goal, independent action by governments is the first step to success. Since any environmental action is primarily beneficial to conditions within the boundaries of each state, any such unilateral action is to be welcomed: it will have beneficial results to the Ocean as a whole. However, unilateral action should not be held against countries which, for reasons of their own, cannot follow suit immediately.

The Indian Ocean

34. The Indian Ocean, a huge sea area ranging from Eastern Africa to Western Australia and bordered to the North by the South Asian subcontinent, is one of the Worlds most important seas. It covers an area of approximately 73,600,000 square kilometers (see Annex I).

35. There are as many as 38 countries including island states which are on the Indian Ocean basin. There are also a number of countries in the hinterland in Asia and Africa which are so closely inter-linked with littoral states as to constitute a part of the Indian Ocean region which may be regarded as a whole for purposes of co-operation and national management.

36. The Indian Ocean watershed extends from the heartland of Southern Africa and the Great Rift range of mountains in the West to the Himalayas in the North, the Indonesian Archipelago and the Great Australian Desert in the East. It can be a narrow strip of land as in the Arabian Peninsula to huge areas including major parts of continents. Some of the worlds important rivers flow from it, including the Zambesi and Limpopo, the Euphrates and the Tigris, the Indus and the Ganges.

37. From earliest days it has been crossed by important trade routes, not least the tanker lanes of today. Its natural resources are enormous, including primary production from fisheries and mineral deposits. The potential of their exploitation is quite remarkable. Over exploitation, or unwise exploitation, as in any other part of the world, could of course lead to undesirable degradation or even injury to those resources that are not renewable.

38. In spite of its large extent and in spite of its apparent diversity (from open ocean to semi-enclosed seas, from huge to minor islands and archipelagos, from narrow to broad watersheds, from the most arid to the most humid coasts), the Indian Ocean should be viewed as one ecosystem.

39. The approach of course may vary from one region to another; it may reflect the different problematique of each region, and different natural, social, economic and political situations; it may be divided for practical reasons or for reasons of effective management into sub-areas or sub-ecosystems. In general terms, however, and from an environmentalist's standpoint it should be considered as one united whole for purposes of conservation, co-operation, and a rational environmental overall approach.

The Health of the Indian Ocean^{7/}

40. The Indian Ocean has a tidal range which varies from 1 to 8 m and there is a twice-yearly reversal of monsoon winds and surface currents. These help considerably to reduce the impact of pollution by dilution and dispersion and even affect bottom currents and settlement of suspended material.

41. Agriculture, industry, and in some cases mining, form the economic base of countries surrounding the Indian Ocean. Effects of pollution in the marine environment from these activities have begun to appear. These effects are so far confined to coastal areas, but owing to the prevailing wind system, the water circulation pattern, and the bottom topography, they may have far-reaching consequences on several countries.

42. Owing to increasing urbanization and industrialization all over the region, the volumes of sewage and effluents along the coasts are increasing. Many countries have large rivers flowing through them and many are badly polluted. Substantial sewage effluents are discharged untreated or after only primary treatment. However, no depletion of fish stocks or large-scale mortality have been recorded so far, although periodic fish mortality has been reported from some of the countries.

43. Aesthetics represent another problem. Hardly 50 per cent of the total population in the area has sanitation arrangements. Large coastal areas are exposed, owing to tidal fluctuations twice a day, and during low tide these places become very unpleasant. In many countries, high coliform counts are often reported from coastal waters.

44. Concentrations of toxic metals, like mercury, copper and lead in plankton and fish are still much lower than levels recorded in many industrialized countries.

45. Fertilizers, pesticides and insecticides are abundantly used in countries round the Indian Ocean, in agriculture, pest control and disease-vector control. In many countries, however, organochlorine pesticides are either totally banned or are gradually being replaced by organophosphorous and carbonate pesticides. Although no detailed study of their accumulation and harmful effects has been carried out, efforts are slowly being increased and a survey has indicated that plankton off the Indian Coast has DDT concentrations ranging from 0.05 - 3.21 ppm wet weight.

46. In countries of the region, power generation is mostly thermal, but some nuclear power is generated. So far, no harm has been reported from these sources. Radioactive wastes are disposed of in conformity with international convention. Whenever coal is used in the thermal power plants, the fly ash creates problems in the environment but experience with cooling water discharges suggests that if properly sited these do not cause a problem.

47. Tourism is being promoted in all the countries of the region. Large modern hotels have been constructed on the sea shores. In some countries refuse from such hotels has spoilt some of the beaches. Waste waters also cause problems, at times generating hydrogen sulphide in water.

^{7/} From GESAMP, The Health of the Oceans, Reports and Studies No. 16, UNEP, 1982.

48. Oil pollution is a chronic and sometimes acute problem in and around the harbours of all the countries in this region. In 1979 the global marine transport of oil was 1,750 million tonnes, 58 per cent of which was shipped from the Middle East countries, much of it across the Indian Ocean, both to the East and West. This, coupled with the increasing emphasis on offshore oil exploration in many countries of the region, makes the northern Indian Ocean very liable to oil pollution. Fortunately, few tanker disasters have so far occurred along these routes. The effect of oil spills is seen on the beaches of every country in the form of deposits of tar-like residues. The frequency and intensity depend on the current patterns along the coasts.

49. Coral reefs and mangroves occur widely in almost all the Indian Ocean regions and are important to the economy of many regions. Damage can occur to them due to over-exploitation and effects of pollutants.

50. The growth rate of Indian Ocean corals may be assumed to be of the order of about 0.15 - 0.5 cm per year. Several reefs have almost disappeared, owing to their exploitation to supply raw material to the cement industry. Some reefs have died owing to the impact of pollutants, particularly oil from spills. Examples of this are the Kavaratti reef in the Laccadives; the southern part of Great Nicobar Island in the Andaman group, and the south-western part of Madagascar. Dredging for harbour construction has destroyed some coral reefs of the Mahé island in the Seychelles.

51. Mangroves constitute a diverse resource in the region, they contribute to nutrient supplies, and are important spawning grounds, nurseries and feeding grounds for economically significant aquatic species. They provide protection to sensitive communities like coral reefs, and control the characteristics of bottom sediments, local mean water level and water courses. Mangroves constitute a substantial part of many countries and a significant part of the population is dependent on them.

52. The Indian Ocean receives about 34×10^8 tonnes of suspended sediment annually, of which about 16×10^8 tonnes come from the rivers flowing through the Indian sub-continent. This quantity is increasing owing to human activities, such as sea-bed and terrestrial mining, land clearance for agriculture, lumbering, urbanization and dredging to deepen harbours and estuaries. Most of this silt settles near the river mouths and in the coastal areas.

53. From 1959-1965 the area was the subject of an intensive co-operative investigation, which was known as the International Indian Ocean Expedition (IIOE). The IIOE programme was initiated and organized by SCOR but several United Nations bodies became involved, e.g. UNDP, UNESCO and WMO, and the then newly-formed IOC performed co-ordinating functions for several projects. Twenty-three States participated in the programme and up to 39 vessels were engaged in studies in the area which stretched as far south as the Cape of Good Hope and Tasmania and included the Red Sea and Gulf of Aden, as well as the Kuwait Action Plan regions. Much new and valuable scientific information was obtained and a far better understanding of the monsoons and the potential for fisheries development in the area was gained. The programme also generated a fundamental understanding of plate tectonics in the area.

54. There are five UNEP Regional Seas Programmes in the wider Indian Ocean region. Within the context of these programmes, four Action Plans have been adopted so far and three Regional Conventions signed. In the next two paragraphs these are underlined to distinguish them from other Regional Seas Programmes worldwide.

Regional Seas Progress Worldwide

55. Action Plans are operative or being developed in five Regional Sea Areas in the Indian Ocean (underlined) and eleven Regional Sea Areas worldwide (see also Annexes II and III):

- the Mediterranean region (Action Plan adopted in 1975);
- the Kuwait Action Plan region (adopted in 1978);
- the West and Central African region (adopted in 1981);
- the Wider Caribbean region (adopted in 1981);
- the East Asian Seas region (adopted in 1981);
- the South East Pacific region (adopted in 1981);
- the Red Sea and Gulf of Aden region (adopted in 1982);
- the South Pacific region (adopted in 1982);
- the Eastern African region (adopted in 1985);
- the South Asian Seas region (preparation initiated), and
- the South-West Atlantic region (to be developed).

56. Regional Conventions for the protection and management of the marine and coastal environment have been adopted in seven regions as part of the Action Plans mentioned above:

- Mediterranean region, Convention signed in 1976, in force since 1978;
- Kuwait Action Plan region, Convention signed in 1978, in force since 1980;
- West and Central African region, Convention signed in 1981, in force since 1984;
- South-East Pacific region, Convention signed in 1981;
- Red Sea and Gulf of Aden region, Convention signed in 1982;
- Wider Caribbean region, Convention signed in 1983;
- Eastern African region, Convention signed in 1985.

In all regions, the conventions that have been adopted may be described as "umbrella agreements". Each convention is designed to be elaborated by specific technical protocols.

57. A more detailed description of the five Action Plans of the Indian Ocean region follows in the next section of this report. The regions will be treated successively in a clockwise fashion, using the following acronyms (for a full list of acronyms and abbreviations see Annex VI):

- | | |
|-----------------------------------|-----|
| - Eastern African region | EAF |
| - Red Sea and Gulf of Aden region | RED |
| - Kuwait Action Plan region | KAP |
| - South Asian Seas region | SAS |
| - East Asian Seas region | EAS |

58. In some Action Plans there is an added initial chapter on Issues Addressed. These are problems which have been identified primarily in the region under which they appear, but are often characteristic of the Indian Ocean as a whole. They have not been included in all Action Plans in an effort to avoid duplication. This of course is not possible in the description of the Action Plans themselves.

II. THE FIVE INDIAN OCEAN ACTION PLANS

I. The Eastern African Region^{8/}

A. Issues addressed

59. Environmental problems in the Eastern African Region have been identified and reported by a joint UNEP/UN/UNIDO/FAO/UNESCO/WHO/IMCO/IUCN exploratory mission, and reviewed at a workshop which took place in Mahé, Seychelles, 27-30 September 1982.

Planning and Management of Coastal and Marine-Related Land Use

60. The main issues of concern have to do with the protection and management of marine and coastal resources.

61. The chief geographical characteristics of concern in considering the effect of land use practices on the marine environment along the coastline are the nature of the immediate shoreline areas (beaches, lagoons, reefs and dunes; or estuarine areas including mangrove forests); the patterns of human occupancy and activity in the relatively narrow coastal strip which generally consists of a gently sloping plain; and the utilization of upland areas in ways that may affect the coastal or marine environment, especially through changed rates or volumes of freshwater release or sedimentation. The effect of the latter is especially felt on the Mozambique coast along which some twenty-five main rivers enter the Indian Ocean.

62. Coastal characteristics of the smaller islands of the Western Indian Ocean are quite different from those of the continent and Madagascar. On these islands the entire land mass can be considered as included in the coastal zone in the sense that activities nearly anywhere would have an effect on the marine environment. Similarly, due to the limited land resources, the location of development or the siting or conduct of various operations or activities is an important aspect of planning in which marine-related factors must be taken into account. The primary problems on the islands from the coastal zone management point of view are the protection and management of the immediate shorelines, the planning of urban and other economic growth and the prevention of localized effects resulting from shorefront or inland activities.

63. The chief coastal land use issues from a marine perspective are livestock raising and agriculture in the coastal zone; the planning, control, and servicing of urban development in this area; the planning and assessment of major coastal facilities such as industrial projects, tourism facilities, and ports; the development of marine fisheries; and the conservation of coastal and nearshore natural resources.

Erosion/Sedimentation

64. Perhaps the most obvious effect of human activities on the marine environment of the Western Indian Ocean is the tremendous increase in siltation from major rivers as a result of soil erosion, caused chiefly by upland activities.

^{8/} Extracted from documents RSRS 6-12 and 53, UNEP/IG.60/4-5, UNEP/WG.77/4, and UNEP/WG.117/5.

65. Sedimentation along the continental-type coastlines has begun to change the very nature of the shoreline and the related natural systems in many areas. The huge volume of sediment that is being carried down the major rivers of the region is slowly increasing the formation of river deltas and other estuarine areas and encouraging the spread of mangrove forests. Sedimentary accumulations in the coastal zone are affecting the natural courses of rivers, extending flood plains and modifying the composition of beaches and sea bottoms.

66. While some soil erosion occurs within the coastal zone, the most significant problems of soil loss are in inland areas - especially the elevated plains or uplands where most of the population of East Africa and Madagascar is concentrated. The erosion/sedimentation problem is unique among the environmental problems of the region as its effects, although originating primarily in areas well inland, are also felt in important ways on the coast.

67. While depleting cultivable land resources upland, soil erosion affects the coast negatively in numerous ways: accretion of beaches and loss of tourism potential; loss of coral reefs through smothering, loss of light due to turbidity, and nutrification; this, deplorable in itself, may cause further erosion of the shoreline; flooding of river valleys, coastal plains, and deltas; effects on the characteristics and productivity of estuarine areas; deposition of sedimentary material in the continental shelf; siltation of the coast, dams and irrigation works.

68. Another source of disruption of balanced coastal ecosystems are hydrodevelopment projects. These often have effects on the flow and sedimentation rates with similar if sometimes opposite effects as enumerated in the previous paragraph. Environmental Impact Studies should be conducted before embarking on such projects.

Other activities with an impact on the coast

69. Development in the coastal zone also affects the coast in a number of ways: loss of unaffected coast to urbanization with additional problems of waste disposal etc; the practice of shifting cultivation, bushfires and livestock raising can be destructive to fragile coastal and dune vegetation; major agricultural projects, as well as intensified decentralized agriculture, are particularly disruptive; house construction requires extensive mining of limestone from ancient or existing coral reefs; industry puts a strain on the coast: agro-industry to a lesser and large industrial plants to a greater extent (cement plants use limestone, chemical and textile plants create toxic effluents including dyes and heavy metals, refineries pose dangers of oil-spills).

Coastal and marine habitats

70. The coastal regions of East Africa, Madagascar, and the smaller islands fall within several biogeographic provinces which determine the characteristic fauna and flora of the various ecotypes that exist along the coast and in the nearshore environment. Several ecotypes that provide important habitats for the characteristic marine life of the region should be singled out for special attention: coastal dry forests; coastal dunes; coastal floodplains; fresh and brackish water marshes; mangrove forests; coral reefs; reef-back lagoons; sandy beaches; and sea-bird rookeries (sea cliffs and nearshore islands). Protection of these areas is warranted for several reasons, such as their functions as habitat for local species of fauna including fishes and migratory birds; in shoreline stabilization and in

prevention of inland or coastal erosion in conserving marine fisheries productivity; and for touristic and recreational purposes. Valuable marine habitats along the coast and in nearshore waters are threatened directly or indirectly by a variety of human activities.

71. One especially valuable marine habitat of the region is the extensive mangrove forests characteristic of western Madagascar and the continent southward from Somalia, and which exist elsewhere in the region in pockets. The mangroves provide critical habitat as nursery grounds for the shrimp which form such an important economic resource in the countries with extensive mangroves. Here and in other areas in the region, the mangroves also provide habitat for the fry of marine fish and year-round habitat for various crustaceans, especially crabs. They also trap sediments released from rivers, binding some and freeing some sedimentary nutrients at a relatively uniform rate into nearshore waters. The mangroves can also serve as a sink for pollutants from coastal and upland sources.

72. The mangroves in Eastern Africa are threatened by various activities. In some areas they are extensively cut for poles and for firewood and charcoal, some exported, under licence or illegally, to the Middle East. In other areas mangroves have been lost by the clearing of salt-pans, often they are subject to a certain volume of usage as construction materials or a source of tannins for leathermaking. The vitality of mangrove swamps is also threatened by fluctuations in the amount of fresh water and sediment reaching them due to upstream hydraulic works. Mangrove areas are sometimes reclaimed and converted for salt ponds and occasionally to make way for other economic activities such as port expansion. Mangroves can also be threatened if siltation from rivers degrades protective reefs and exposes the shore to increased erosion. Loss of the extent and vitality of mangrove forests can reduce marine biological productivity of dependent species, especially shrimp.

73. Coral reefs are threatened by siltation of nearshore marine areas due to terrestrial erosion. They are also exposed to chronic but low-level oil pollution in some areas, especially in the vicinity of harbours. Coral reefs are sometimes dredged or subjected to turbidity by dredging in connection with port improvement and maintenance, or land reclamation. Corals and associated marine life are collected as souvenirs, especially near tourist areas. Reefs are also subject to unenlightened and destructive fishing practices, such as dynamiting and poisoning. The balance of life in the reef ecosystem can also be affected by overfishing of certain species. Changes in reef ecosystems could lead to depletion of fisheries potential and to loss of aesthetic and recreational values.

74. Other coastal and marine habitat areas such as coastal dry forests, coastal dunes, coastal floodplains, fresh and brackish water marshes, reef-back lagoons, sandy beaches, and sea-bird rookeries are also threatened by human encroachment, especially for gathering of natural products and conversion to economic uses. Severe loss of such habitats would seriously affect associated populations of coastal and marine animal species and related aesthetic values.

Protection of rare and endangered marine species

75. The coasts and seas of the region provide habitat for several rare or endangered species - such as marine turtles, the dugong, the Nile crocodile, sea-birds and migratory birds, and indigenous coastal birds and mammals - that cannot be effectively protected until : more is known about their location and behaviour; critical habitats are identified and preserved; and human activities adversely affecting them are controlled to the extent possible. Actions on the national, regional, and global level can be helpful in this context.

Fisheries development

76. In general the periphery of the Indian Ocean, and especially the Eastern African area, are characterized by primary biological productivity lower than that of the other oceans, except for certain favoured locations, owing to the narrow continental shelves.

77. Coastal fishery potential in the region is therefore limited and the major fisheries occur in shallow shelf areas for shrimp; in nearshore waters and in estuaries for small, including small pelagic, species; and on and near reefs for reef fishes and demersal species. The Western Indian Ocean is, however, also characterized by the presence of schools of highly migratory, or large pelagic species, especially small tunas (bonito and skipjack); these could form the basis of an offshore fishing industry.

78. Artisanal fisheries should be enhanced and commercial fishing encouraged, provided that overfishing can be controlled and fishing gear with no detrimental effects on coral reefs and fish (fry) populations is chosen.

79. The regional pelagic fishery resources, mainly of highly migratory tunas, are perhaps the most significant economically but also present the greatest technical, economic and political difficulties. Further significant unrealized opportunities exist. Regional co-operation will be necessary on development and allocation of regional fishery resources.

Oil pollution

80. The Western Indian Ocean is a major transit route for tankers carrying crude oil from the Arabian Peninsula and which use the Cape route. In addition, practically all the countries are actively searching for oil and gas along the coastal plain and continental shelf and banks, with external assistance. Some of these countries, e.g. Tanzania and Mozambique have already discovered gas deposits.

81. A number of problems emerge. The transit tankers as well as those delivering crude or refined oil to the countries of the region often ballast in the open sea. The oil so released has found its way to the coastline where, like on Comoros, Somalia, Kenya and Mauritius this forms into balls or is deposited on beaches and coral heads, thus severely affecting the tourist activities of the region. At the same time deposition on coral and other habitats such as mangroves directly affects life on these habitats; free swimmers and sea birds are also affected.

82. Besides, there have been oil spills especially at receiving/loading facilities. Dar-es-Salam harbour witnessed this in 1981 and a wide range of marine life was severely affected. The discovery of a new oil field also presents certain oil spill dangers. It is evident therefore that rigorous preventative measures are undertaken at the harbours, depots, and in order to prevent tanker owners deballasting tankers at sea. It is worth noting that currents flow towards the coast and not away from it.

Pollution from land-based sources

83. The industrial sector in the region is not large and is primarily oriented toward the processing of agricultural products. The necessity, nevertheless, exists for the rational management of all forms of industrial wastes, including their ultimate disposal into the marine environment.