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MECHANISMS FOR CAPACITY BUILDING

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MECHANISMS FOR CAPACITY BUILDING

1. INTRODUCTION

1. This paper was prepared as an input for UNCED's background report (A/CONF.151/PC/69) on " Protection of the oceans and all kinds of seas, including enclosed and semi-enclosed seas, and coastal areas and the protection, rational use and development of their living resources ". It has been prepared by the United Nations Environment Programme with very valuable comments and inputs from all members of the Working Party on Oceans, including the Food and Agriculture Organization of the United Nations, the Intergovernmental Oceanographic Commission of the United Nations Educational, Scientific and Cultural Organization, the United Nations Centre for Human Settlements, the Office for Oceans Affairs and the Law of the Sea of the United Nations Secretariat, the International Atomic Energy Agency, the International Council of Scientific Unions, the World Metereological Organization, the International Maritime Organization, the World Health Organization. Non-governmental organizations also contributed including the Oslo and Paris Commissions, the World Resources Institute, the International Union for Conservation of Nature, the International Council of Scientific Unions, the Environmental Defense Fund, Greenpeace International, Friends of the Earth and the International Indigenous Commission. It responds to Decision 1/20 of the First Preparatory Committee of UNCED and addresses specifically the following items (a), (b), (d), (e) and (i) of paragraph 1 of the Decision related to:

- Establishment of mechanisms for endogenous capacity building and human resources development, including measures to support the strengthening of the institutional capacities of developing countries to address ocean and sea-related issues;

- Measures to strengthen technical co-operation both between developed and developing countries and among developing countries, for the development and strengthening of capacities of developing countries for identifying, analyzing, monitoring, managing and preventing environmental problems and for developing their natural resources in the pursuit of sustainable development;

- Measures to expand and strengthen national, regional and international data gathering, evaluation and monitoring systems and information exchange mechanisms;

- Promotion of public awareness and education campaigns, inter alia, through non-governmental organizations, to foster a better appreciation of the problems facing the marine and coastal environment;

- Measures to strengthen regional, subregional and interregional co-operation programmes, including the Regional Seas Programme of the United Nations Environment Programme, which have proved effective and viable mechanisms in dealing, inter alia, with pollution-related problems.

2. Capacity building is a requirement common to all aspects of environment and development. This document addresses the specific requirements and mechanisms for building capacity for marine and coastal environmental management and development at local, national and regional levels, both internally and through international assistance programmes.

2. ISSUES

3. The environmental problems of the world, and particularly of the world's coastal areas, are growing much faster than the capacity of most countries to assess and resolv them. The marine environment presents special difficulties, since the sea is a relatively inaccessible medium for humans and requires special and often costly means to observe and understand it. While the industrialized countries have made great strides in coastal management and in ocean science and technology, this progress has not been widely shared with developing countries. Furthermore, the knowledge of many physical and biological processes in the coastal environment and in the sea is still inadequate for the management of marine and coastal resources, especially in the context of sustainable development. With the accelerating problems of the marine environment, in the context of sustainable development. With the accelerating problems of the marine environment, especially in coastal zones and in heavily exploited fisheries, it is a matter of urgency in all countries to build especially in coastal zones and in heavily exploited fisheries, it is a matter of urgency in all countries to build their capacity to address ocean and coastal issues, particularly in developing countries where the need to achieve sustainable use of available resources is essential for survival. That capability must include a technical, scientific, social and political understanding of the means and methodologies to develop and implement solutions.

4. Several principles must underlie any international approach to capacity building :

- capacity must be developed nationally whenever the size and level of development of the country permit, so that it is rooted in the country, becomes part of its institutions and will eventually become self-perpetuating and self-supporting, free of excessive dependence on outside experts or aid;

- for countries with smaller populations or a lack of infrastructure, and for regional and global problems, the sharing of capabilities on a regional basis can achieve economies of scale and make the best use of scarce expertise and financial resources while reinforcing national efforts;

- capabilities must be developed only as fast as they can be absorbed and used effectively; the world is full of underutilized facilities, unserviced equipment and trained people who have left their countries because they could not use their skills there;

- short-term individual aid projects are rarely successful; building capacity requires sustained action over a long period until a critical mass is established and the process becomes self-sustaining.

The challenge of ocean and coastal development

5. The type of capacity required to harmonize and advance environment and development

in oceans and coastal areas is determined by the issues that are faced. Reference is frequently made to the vast untapped resources of the ocean as a great hope for developing countries. However the development of ocean mineral and energy resources has proven to be a costly and technically complex operation and, apart from petroleum, has not proven economically feasible in present circumstances. Most living marine resources are heavily exploited, even on the high seas. Much recent fisheries development has been based on the rapid but unsustainable exploitation ("mining") of existing stocks until they are over-fished to low levels, rather like the logging of tropical rain forests. Many coastal fisheries have long been under pressure from local subsistence and artisanal uses and provide little scope for commercial development. Commercial fisheries for export to developed countries have increasingly taken resources away from local subsistence uses. Impacts from pollution and intensive coastal development are now reducing the productive capacity of many fisheries and other marine resources. The challenge of sustainable development in the oceans, therefore, lies in finding ways to fit together the many, often damage many other uses and values of the coastal zone. The costs may or may not outweigh the benefits, but while the latter generally go to the developer, the former are usually borne by the society at large. There are also downstream effects of changing land use and environmental problems inland, which eventually reach the coast. The results is the rapid deterioration of many coastal areas being recorded around the world today.

7. In many parts of the world, poor populations are crowding into coastal areas because coastal resources are among the few to which they still have free access. Too often, however, their growing numbers overexploit the accessible coastal resources at the same time that pollution from their communities damages and contaminates them. The cholera epidemic along the Pacific coast of South America illustrates the risks inherent in such situations. Few countries presently have the capacity to find development alternatives for these coastal poor whose impact is often greater than that of industrial pollution. There is also a need for simple waste treatment technologies that poor communities can implement for themselves to reduce the risks presented by untreated coastal runoff.

8. Development in and around the oceans requires special approaches and technologies for dealing with a liquid and often corrosive medium subject to enormous forces. Marine technology and ocean engineering are specialized and highly sophisticated fields of which parts, like space technology, may seem far removed from the immediate preoccupations of developing countries. While there is a global need for humanity to advance into and master the marine environment, the development of capacities to use such technologies at the national level needs to be quite selective it terms of national priorities and immediate costs and benefits.

9. Building the capacity for sustainable ocean and coastal development is thus a complex process which will require a considerable and continuing effort by all countries. In some instances the result will be new and valuable forms of development; in many others it will be the maintenance of important resources which would otherwise be degraded and lost . There is a need to develop capacities for a variety of complementary requirements, including:

- research, resource assessments and monitoring to understand the status and trends in resources, the state of pollution and the behavior of natural systems;

- the compilation of appropriate data and their interpretation and use, through tools such as data banks, geographic information systems (GIS) and environmental impact assessments (EIA) which can explain it and make it accessible to decision-makers in planning for sustainable development, i.e. the wise use of all resources; and

- the establishment and application of management measures, especially legislation, regulations and enforcement mechanisms.

10. The seas of our planet are in many ways a single global system with water circulating from one ocean to another. Yet each ocean has its peculiarities and there are enormous differences in the range of marine ecosystems and coastal areas from the poles to the tropics. The study and management of the oceans must therefore cover the full range from the global through the regional to the national and local levels. Building the necessary capacities at each of these levels should be carefully co-ordinated and mutually reinforcing. This paper primarily addresses requirements at the national and regional levels, although international needs are considered when appropriate.

11. Certain regions and countries have special characteristics for which particular capacities must be developed. Enclosed and semi-enclosed seas are especially vulnerable to the effects of pollution and over-development. They must be manged as a single system through appropriate regional arrangements. Marine resources are particularly important for islands, which are handicapped by isolation and small size, and for which the land and adjacent waters comprise a single coastal zone system requiring integrated management. Coastal ecosystem such as coral reefs, mangroves, seagrasses and kelp beds may be sensitive to certain kinds of disturbance and thus need special management measures adopted to their requirements. Many coastal areas are part of large-scale marine ecosystems linking offshore fisheries and water circulation patterns with critical coastal habitats; again the scale of management must correspond to the size of the system. Watersheds and river basins and their associated estuaries or deltas may also be closely linked to coastal systems, and certain of their features may need to be considered together. These specificities must be built into any development programme.

Types of capacity-building

Human resources

12. The most essential capacity is in human resources. Marine and coastal area environmental management requires research and monitoring by specialists in the appropriate sciences as well as managers able to combine scientific, economic, social and political considerations into plans and measures for integrated coastal zone and ocean management. Training to meet environmental requirements should include high level researchers, monitoring technicians, data analysts, all levels of the management structure concerned with marine and coastal problems, local extension agents and even the resource users themselves, such as fishermen and tourism operators, so that they all come to understand how the natural systems and resources they depend on work and what is required to use them sustainably.

13. A major problem in developing countries is the rapid turnover of trained personnel through promotion, the financial attraction of the private sector or overseas employment.

There is thus considerable waste of training effort through this brain drain, and vacant positions which will inevitably interrupt research, monitoring and management programmes. Training must thus be accompanied by sufficiently attractive conditions of service and high enough salaries to retain trained personnel and ensure continuity in management programmes.

14. Apart from the continuing need for specialists with high level training which may require extended periods of overseas study, in-country training programmes are often more effective than overseas training in capacity building since they are closer to the reality of the work opportunities. Short-term training courses are widely used, but in some fields are not as effective as individual attachments or on-the-job training. Training can often be organized most efficiently on a regional basis where it can be adapted to regional requirements.

15. Participation in regional or international expert task teams has been found to be a good way to give local specialists complementary experience and to expand environmental management skills. Similarly, twinning of institutions in developed and developing countries can give local experts access to more facilities and extend their professional contacts.

Scientific infrastructure

16. Environmental management frequently requires laboratories and other research facilities which presently do not exist in many poorer countries, or if they exist, are often not efficiently maintained and supported. Until countries are capable of obtaining and evaluating data on their own environment, it will be difficult for them to carry out effective management. Improvements in basic infraestructure will require a considerable capital investment and a commitment to provide adequate operating costs. One particular problem in developing countries is in the acquisition and maintenance of sophisticated intrumentation. Rapid technological change makes such equipment become obsolete very quickly. Maintenance is difficult; spare parts and technicians are generally not available nationally, and must be provide regionally or internationally at great cost if instruments are not to be out of service for long periods. Power supplies are sometimes too unstable or unreliable for electrical equipment.

17. The importance of proper storage, management and quality control of data collected cannot be overemphasized. Much information has been collected over the last decades on the marine and coastal environment which could contribute to determining long-term trends in local conditions, including aerial photographs and remotely sensed images, tide and weather records, and statistics or observations on resource uses. However, it is scattered and frequently lost because it has not been adequately archieved and preserved. Where it still exists, it is often inaccessible and unutilized because it has never been organized and managed to facilitate access. Some types of data such as certain pollution analyses are of little value because of poor or improperly applied methods, insufficient or irregular observation or sampling, inadequately trained personnel, poorly maintained instruments and contamination from careless procedures during sampling or analysis.

18. The provision of boats, ships, diving equipment and other means of access for research and management is a major requirement that is a significant problem for developing countries. Research vessels in particular represent significant capital and operating costs that are beyond the means of many countries. Some access to such facilities is being provided by

co-ordinated international co-operation and assistance, and this could be extended.

19. The development of remote sensing makes it possible to collect data on the marine and coastal environment of kinds and at scales never before possible. Such information can supplement and extend other kinds of data needed for sustainable development. Again facilities are required for the collection, treatment, analysis, storage and utilization of the data geographic information systems may have considerable potential to improve the monitoring and planning of coastal resource uses, but require major inputs of data and trained personnel if they are to be used efficiently as a management tool for sustainable development.

Management infrastructure

20. Many countries, especially developing countries, are unable to assess the problems facing their coastal and marine environment or to plan and implement the rational use and protection of their resources. In particular, they lack the means to integrate coastal and marine use and environmental management in a single policy framework. Management of any major component of the environment requires the capacity to analyse data and statistics, to generate policy options and take management decisions based on the best data available, and to apply management measures and enforce them. Both adequate facilities and trained personnel must be available to do this. Again the problems of access to the marine and coastal environment make it more expensive to carry out surveillance and to take action against offenders of fisheries or pollution regulations. Patrol boats and aircraft may be necessary if a country's authority is to be enforced more than a short distance offshore. Frequently, states have taken action on paper but lack the regulatory enforcement measures and the means (or sometimes the political will) to apply them. Identifying pollution offenses, for instance, requires proof of the level and extent of pollution through reliable sampling and analytical facilities. Sampling in turn frequently requires access to boats which is costly.

21. Pricing, taxing and trading policies at national and global levels are presently serious impediments to equitable and environmentally sound development. Economic measures often encourage or even subsidize environmentally damaging activities or the over-exploitation of resources. On the other hand, financial resources in most national budgets are inadequate to support the infrastructure needed for the protection and sustainable management of coastal and marine areas, particularly for research on and monitoring of environmental problems. Modification of economic and fiscal measures such as taxes and fines may be important means for environmental management but require a legal framework and personnel to enforce the law.

Building for the long term

22. The ultimate objective of any process for building capacity is that such capacity becomes self-sustaining. Once there is a certain critical mass of trained people, administrative structures and facilities, it should be able to maintain itself. This requires an adequate national commitment which is sometimes lacking, particularly for the oceans. Until that critical mass is established in a nation or a region, continued outside assistance in the form of basic support will be necessary. Unfortunately, with the difficult economic situation in many countries, present financial support is insufficient even to maintain the capacity built during times of greater prosperity or inherited from the colonial period. A certain level of

development, stability and economic well-being is an essential prerequisite for the kind of scientific, technical and administrative infrastructure necessary to develop and manage coastal and marine areas. This will require the political will to invest the necessary funds to put statements of principle into action.

23. There needs to be a matching of the political objectives of a nation and the capacity to carry them out. Usually this is met by a convergence between objectives that evolve as leaders come to understand that environment is essential to development, and capacities that are molded to the nations priorities. Too frequently there is no single set of national priorities; each ministry or national constituency has its own goals which may conflict with those of other interest groups, particularly in the coastal and marine environment where fragmented responsibility is common. An improved national capacity for coherent planning is a prerequisite to the efficient strengthening of capacities in other areas.

24. Building a nation's capacity is inherently a lengthy process. It takes time to train people, and even longer for them to acquire mature experience. Establishing institutions and facilities and accumulating data are also processes that require sustained effort over a considerable period. Detailed knowledge of a local environment is not something that can be imported at will. Too many aid and development projects aim for short-term results; they must be fit into longer-term strategies with clear continuity. Preference should be given to arrangements such as the "twinning" of intitutions in developed and developing countries which can provide the continuing and evolving support necessary for effective strengthening of national capacities.

25. Technical and administrative capacities are unfortunately extremely vulnerable to instability and crisis. Well-trained people are always in demand and are thus mobile; if they cannot find satisfaction at home, they will go elsewhere. Facilities deteriorate quickly if not maintained. What has taken years to build may be lost almost instantaneously. Too many countries have suffered serious set-backs in building their capacity for environmental management and development as a result of a period of turbulence.

Regional approaches

26. Effective regional mechanisms are an important part of environmental management capacity both in dealing with regional problems and in reinforcing capacities at the national level. Such mechanisms, whether the UNEP Regional Seas Programmes or others such as the IOC regional subsidiary bodies or the FAO regional fisheries commissions and other regional fisheries bodies, need to be strengthened where they exist and extended to or established in other areas that would benefit from a regional approach.

27. The regional Seas Programme co-ordinated by UNEP and implemented in co-operation with many other agencies and organizations is frequently cited as an example of effective capacity building for environmental management in developing countries. Some of its successes and failures may be instructive in the present context. The Regional Seas action plans, conventions and protocols represent ongoing Governmental commitments which give the programmes an essential continuity of effort. Since the action plans and work programmes are adopted by the Governments based on reviews of national problems and requirements, they generally represent national priorities and respond to real needs. Their

financing at least in part through Government contributions to regional trust funds reinforces this national commitment.

28. The great strength of these programmes and similar IOC in oceanographic research and FAO in fishery research, are in the networks of specialists, institutions and environmental managers that they build across a region both in Governments and in non-governmental organizations. The participation of local experts in a regional activity requested by their Governments increases both their experience and their reputation in the eyes of decision-makers. The more than 100 participants in the regional task teams on the effects of climate change, or in the fisheries Bodies Working Groups on stock assessment, for instance, have become regional experts in this new and increasingly important field. The programmes thus build scientific advisory mechanisms that improve the environmental input into national planning. This reinforcement of the human capacity of a region as a consequence of programme activities is in fact far more important than the results of specific assessment or management projects, useful as these may be.

29. Food and Agricultural Organization in fishery research had developed methodologies, manuals and software at Regular Programme level. With extrabudgetary funds, FAO has set up a worldwide training programme which presently runs a few regional and many regional courses per year (funded by DANIDA). At regional level, FAO is running a network of Working Groups Parties where these methodologies are tested and used in practice to generate advice and scientists are trained on how to write a paper and how to present it to decision-makers. Finally, FAO is also developing fishery research facilities and have had progressive building up programmes during more than 10 years.

30. The identification of appropriate national institutions to participate in the regional activities, and their strengthening as part of ongoing regional programmes gives each country centres of environmental expertise of continuing value. Pollution monitoring laboratories, for instance, receive assistance with equipment, standard methods, intercalibration, equipment maintenance and quality control of data, as well as training when appropriate.

31. The development and implementation of regional action plans by the Governments of a region also influences the national policies and priorities of each participating State as the state of the marine and coastal environment is assessed and specific problems are identified. The process itself results in strengthened national capacities to understand and deal with environmental problems by giving local experts more experience, building national institutions, and strengthening legislation and regulations. At the same time, the compilation of regional needs helps to attract donor support in a mutually-reinforcing process. Regions that have succeeded in establishing effective regional co-ordinating units or organizations have in general been the most successful, as such units improve communications within the region, respond more rapidly to Government requests, and assist in the effective implementation of activities. The existance of a strong regional capacity can compensate in part for weaknesses at the national level, particularly for smaller and poorer countries whose potential capacity is inherently limited.

32. Some regional seas programmes, particularly those composed entirely of developing countries, have not been able to raise sufficient funds to implement their action plans

effectively. While some projects have gone ahead, many others still await funding. It is clear that such regions cannot support complete marine and coastal assessment and management programmes without some continuing outside help. Not all projects have produced the desired outputs or been cost effective; it has been particularly difficult and costly to maintain sophisticated pollution analysis laboratories in many developing countries. However, even in these cases, the people involved have frequently gained in experience and contributed to improved environmental management in their countries.

33. There has been some criticism that Regional Seas projects have been too oriented towards general surveys and the assessment of pollutants such as oil heavy metals which recent evaluations have shown to be less of a problem in some regions than other causes of coastal resources degradation, and that the results have been slow to lead to pollution control measures. As a result the marine pollution projects have been reoriented towards the identification and control of priority local problems. However control measures are costly, and more needs to be done to developed countries capacities to avoid pollution problems through improved planning and environmental impact asessments of development projects, funded where pssible as part of the projects. Building on the earlier surveys, activities in regional Seas are increasingly being focussed on control of land-based sources of pollution and on integrated management of coastal zones and resources. Further efforts are needed to use the Regional seas approach to assist countries in defining and implementing sustainable development in their marine and coastal areas.

34. The regional fishery bodies and their network of fisheries research laboratories provide an important mechanism for collaboration between countries both for development and for environmental protection of fisheries resources. In the developing world, such bodies have dealt with sustainable development for a few decades. They have developed national capacities for data collection (fisheries statistics), training in fisheries analysis and management, and biological and socio-economic research. They have promoted the strengthening of national institutions and organized subregional collaboration on shared resources. Fisheries research laboratories have received assistance and training in research methods and data analysis, and research vessels have been provide on a regional basis. However, many areas still suffer from excessive levels of exploitation, showing that capacity is still insufficient in research, policy-making and the implementation of policies (see Research Paper No. 4 and 5). In general, these regional mechanisms have received insufficient technical and financial support to carry out their effectively. Additional problems with the FAO Fishery Bodies capacity building process is that the needs for basic or strategic research are not properly fulfilled as the work is too short-term oriented. As a result efforts are being made in the CGIAR to develop international capacity in this type of research.

35. Many regional mechanisms have been established over the years to deal with special issues and problems including research, development and the environment. There is a clear need today for closer collaboration between such regional mechanisms to cope with the complex and interrelated issues of development and environment.

3. ACTIONS

a. Strengthening regulatory, administrative and institutional systems

36. Governmental structures need to be modified and integrated to give them the capacity to assess the problems facing the coastal and marine environment and to plan and implement the rational development and protection of marine and coastal resources.

37. Personnel and facilities need to be brought together in effective institutional structures. Many options are available depending on national requirements and traditions. These can range from strong centralized national bodies through decentralized systems to reliance on local government or even traditional leaders and local users to implement environmental protection and management. The form that institutional systems take is less important than the development of the capacity and the assignment of responsibility in one form or another.

38. The integration of coastal management and marine environmental management effectively within a single policy framework requires intersectoral co-ordination, preferably with a minimum of extra bureaucracy or cost, and clearly defined leadership on marine environmental matters within the administrative structure. In support of this decision-making structure, there is a great need to strengthen existing institutions at the national and local level to increase their ability to promote, implement or contribute to the environmentally sound development of coastal and ocean areas and their effective participation in multilateral and international programmes. Regional resource management structure such as fisheries commissions need broadened mandates to consider environmental issues and to co-operate with regional research and environmental programmes.

39. While the United Nations Convention on the Law of the Sea provides a global framework and other international and regional conventions give useful legal support, much needs to be done to strengthen national legislation for the protection and sustainable management of marine and coastal areas which is often weak, fragmented or entirely lacking. States that have not yet ratified or acceded to the relevant conventions should do so and should adopt corresponding legislation to apply them at the national level. Many existing laws also reflect the lack of an integrated environmental approach to coastal and ocean management, and should be supplemented or replaced by new laws. This will require a strengthened capacity to draft environmentally appropriate national legislation.

b. Formulation of appropriate economic and financial policies

40. A major effort is needed to build capabilities for the design and implementation of new approaches to economic factors such as pricing, taxing and trading policies at national and global levels in order to eliminate their environmentally harmful effects and to make them into tools to achieve sustainable use of resources. National economic strategies and policies should include economic incentives and disincentives to control and prevent pollution. The stock of environmental resources needs to be entered into national accounts. Developing such measures will be more successful if decision-makers from the business and financial sectors and local administrations are involved in planning environmental protection measures for coastal areas and oceans resources through consultative or advisory bodies.

41. The "user pays" and "polluter pays" principles can be applied to ensure that the costs of using the environment are borne by those who benefit, for example through taxes on revenues from seaside tourism, commercial fisheries or oil exploitation, and permit fees and fines for pollutant releases. They can at the same time be used to finance the protection and

enhancement of marine and coastal environments.

c. Integrating environment and development in the planning process

42. The development planning process must be strengthened by including the environmental dimension through environmental impact assessment, cost benefit analysis and inclusion of coastal and marine natural resource values in national accounts. Such approaches should be required for all coastal and ocean development projects. Appropriate criteria for this need to be developed. Major projects funded by the World Bank or regional development banks provide opportunities for demonstrating environmental impact assessments, including the training of local personnel.

43. Coastal area management is a complex field requiring the balancing of the strong and often conflicting development pressures along the coast with the requirements of a productive but vulnerable environment. Guidelines need to be developed to assist States to adopt appropriate measures for integrated coastal management. Planning tools such as geographic information systems and coastal vulnerability maps can assist in this process.

44. A wide range of technologies now exists to address marine and coastal problems. A capacity needs to be created in both the public and private sectors to select the technologies and approaches that will be both appropriate and cost-effective in local circumstances.

45. Where growing populations of the poor are degrading coastal areas and suffering from their deteriorating environment, new development alternatives need to be found to remove the pressure on limited coastal resources. Simple waste treatment technologies such as oxidation ponds or reed marshes can be built and maintained locally to treat the wastes of coastal communities and reduce the risk of epidemics.

46. The complete integration of environment and development in the planning process is particularly important on islands with growing populations where both terrestrial and marine resources are limited and thus both the types of development and the total size of the population must respect the carrying capacity of the island system. Traditional knowledge of island resources and their management, where it exists, can be a useful guide to modern approaches. The lessons learned in developing sustainable island life-styles and planning processes will be useful for other societies which may also be reaching environmental limits.

d. Support to sound decision-making

47. To avoid the costly errors that occur that when decisions are made on a trial-and-error basis, improved methods are needed to direct research and analysis to critical environmental management questions and to supply the resulting information to those who need it.

48. Decision-makers need to be given the necessary background to understand the complex issues involved in coastal zone management and sustainable use of resources. Since the political process tends to respond to short-term realities and sectoral interests rather than the longer-term perspectives and integrated approach required for sound environmental management, leaders must be educated and encouraged to extend their vision further into the future. Special efforts are therefore needed to present environmental data in forms that

facilitate their full consideration in the decision-making process. This in turn will build the public support and political commitment without which progress is impossible.

e. Strengthening national institutions

49. National institutions such as universities, research institutes and development bodies can be strengthened through direct bilateral assistance projects or by "twinning" with developed country institutions which can arrange continuing exchanges of personnel and technical support for research projects. It would help to have international co-ordination such as the Unesco UNITWIN project in setting up such arrangements. National institutions can also develop their capacity through participation in regional and international programmes.

50. Contracts with developing countries institutions for participation in research and monitoring programmes should include a capacity-building component.

f. Using local expertise

51. There is often a lack of confidence in the capacity and experience of local experts in developing countries. The involvement of such experts in regional programmes, international meetings and co-operative activities can broaden their experience and strengthen their reputation in the eyes of decision makers. Preference should be given to using local or regional experts whenever possible. International organizations and bilateral aid programmes should search out capable people in developing countries and support their participation in international programmes and scientific activities.

g. Training

52. Quite different training programmes are required for scientists, technicians for monitoring, environmental managers, extension agents, teachers, journalists and resource users. Some effort is required to ensure that a mix of opportunities is available to meet all the manpower needs of a country or region. There is already some co-operation among agencies such as IOC and UNEP to link training to the requirements of specific programmes.

53. While some countries and regions have a pool of trained marine scientists, others have little if any scientific establishment. Training of research scientists is a lengthy process and may have to be completed at overseas academic or research centres. There are already significant international programmes to build up the marine sciences in developing countries, including those co-ordinated by the IOC Committee for Training, Education and Mutual Assistance in Marine Sciences (TEMA), the Unesco Marine Science Training and Education Programme (TREDMAR) and several bilateral initiatives. However, even when there are scientists available, they have usually been trained in traditional disciplines and need to be introduced to the interdisciplinay approaches needed for effective environmental management. There is a need for both interdisciplinary and sectoral scientific expertise at the national level to support both environmental management and development objectives. Scientists also need to learn how to communicative with and convince political leaders and managers. It may be appropriate for different universities or institutions in a region to specialize in training for different fields, with one, for instance, offering physical oceanography, another marine biology and fisheries, and a third coastal environmental planning and management. Special

short courses can be designed to expand the experience of those already trained in a more narrow field. Trained scientists are particularly subject to "brain drain" and special efforts are needed to provide them with suitable positions and support for their research if they are to contribute to the development process in their country of origin.

54. There is a growing need for technicians trained to operate routine environmental monitoring and assessment programmes. IOC is planning comprehensive regional training programmes on operational and applied research and monitoring, including the integrated use of marine data, and covering biological, physical and chemical sampling of near-shore and coastal waters, use of standardized techniques, statistical and mathematical analysis of data, integrated approaches to coastal zone management, use and analysis of remotely-sensed imagery, and Geographical Information Systems.

55. Environmental managers are required in both government service and the private sector. They should receive both some technical education and general management and administrative skills. This need could be met in part by adding some environmental courses to existing training programmes and university courses of study. Specialized programmes such as the World Maritime University set up by IMO are also important and should be supported and expanded. Again special short courses or on-the-job training should be arranged for those presently having to deal with marine and coastal environmental questions.

56. For groups such as schools teachers and journalists who can do much to build public understanding and support, environmental courses should be included in existing training programmes, and special courses should be arranged for in-service training.

57. The training capacity of countries or regions should be developed to maintain a flow of manpower for critical environmental management and development positions in the marine and coastal field. Thus as people advance to more responsible positions or go elsewhere, there will be replacements available. Training specialists in groups can provide for better continuity, as it may be easier for a group to replace a lost member. The extra additional cost of group training may well be made up through better long-term continuity and less need for repeated training to fill vacancies. Training on site in the country concerned ensures that knowledge is adapted to local equipment and conditions and allows the programme to be tailored to the specific needs of the countries concerned.

58. Training is also necessary to promote informed dialogue between those who manage and those who use the environment. Thus decision-makers need to receive some background in ocean issues, and those involved in the marine transportation, fishing and coastal tourism industries should receive some training in the environmental dimensions of their work. Extension programmes should aim to bring basic environmental understanding to marine resource users such as fishermen and those collecting or using coastal resources. Women have an important role in coastal gleaning and other fisheries and should be targeted in any training programme.

59. Where new marine activities are being developed such as aquaculture, special training programmes should be created to provide the necessary manpower. Such training should include the broader environmental impacts of such developments and the management requirements necessary to sustain them.

h. Education and public awareness

60. Participation of the public is important in marine and coastal environmental management, since it is generally the people at the local level, such as fishermen and coastal residents, who are most sensitive to their environment, and who can thus provide feedback on changes in the environment and trends in resources to those responsible for management measures. Such data are critical to determine whether development is sustainable or whether controls or changes are needed. Feedback from the grass-roots is particularly valuable in countries that cannot afford more sophisticated monitoring programmes. Fisheries extension and coastal management programmes should be designed to collect such information.

61. In educational curricula, emphasis is required on the relevance and role of coastal areas and oceans as an essential element of the earth's life support system, on the requirements for sustainable use of coastal and ocean resources, and on the advantages of their proper management. Coastal countries should include some material on the marine environment even at the primary school level, and enough in secondary curricula that even school leavers receive a basic understanding of coastal management issues, since many may go on to become coastal resource users. Some materials for this have already been prepared by Unesco and others, but they need to be more widely used.

62. Public awareness campaigns are needed to reduce the present level of ignorance of the economic, social and environmental significance of coastal and marine resources and of the causes of their deterioration. Where indigenous peoples have traditional knowledge of their coastal environment and marine resources, they should be encouraged to maintain that knowledge and to consider how it can be applied to modern management problems.

63. Participation of the public and citizen's groups (non-governmental organizations-NGO's) at the national level must be stimulated in order to increase society's input to environmental planning and management. In some countries NGO's may have considerable political influence and should have their say in the development of environmental policies and measures. The public should be consulted in the preparation of national developments plans. Citizen's groups should be treated as potential allies in ensuring the effective implementation of policies for control and marine environmental management.

i. Monitoring of environmental parameters

64. Up-to-date information on the state of coastal and marine resources is essential for sustainable development and environmental management. While full environmental research and monitoring systems require considerable scientific infrastructure, much can be done to provide basic data even where the means are limited. All coastal states should develop the capability to monitor the state of their own environment.

65. International agreement is needed on standard techniques for monitoring important marine species and habitats such as coral reefs and mangroves. A combination of simple in situ survey techniques and remote sensing should allow adequate documentation of the state of such critical coastal environments and their change over time. Standard fishing surveys can provide continuing data on the state of fisheries resources. Simple continuous plankton recorders can be used along regular shipping routes to give good information on the status

of plankton populations and such problems as eutrophication and red tides. The capacity to analyze, interpret and store such data will also need to be developed.

66. With the increasing levels of coastal pollution in much of the world, it is necessary to establish and maintain national or regional laboratories capable of analyzing the principal pollutants which may present a risk locally, including urban effluent, agricultural runoff and industrial wastes. Marine pollution sampling programmes can then determine where there are serious problems requiring control measures, and can measures the effectiveness of pollution controls that are applied. Keeping instrumentation in such laboratories working and up-to-data requires careful planning and choice of instruments, continuing follow-up, and assistance with trade-ins or up-grades as methods and instrumentation improve. Users need to be taught to undertake simple trouble-shooting themselves. However regional or international technical support such as that provided by the IAEA International Laboratory of Marine Radioactivity in Monaco will be necessary to keep such laboratories functioning in developing countries and to maintain the quality of their results.

67. Feedback mechanisms are needed to assess the effectiveness of capacity building. For instance programmes for the quality assurance or quality control of analyses of chemical contaminants can identify laboratories having problems and permit rapid remedial measures to maintain the quality of output and thus sustain the initial investment in capacity building.

j. Improved use of data

68. Much data have been collected on most coastal and marine environments. However they are variable in quality, frequently old, and generally buried in reports or overseas depositories where they are unavailable to those who need them. These existing data should be used in a more efficient way, with emphasis on quality control, analysis and interpretation. In particular, they can be combined with recent monitoring data to measure the changes in environmental resources and conditions over time as a basis for determining the sustainable use of resources. Such analyses can give early warning of developing environmental problems or serious overuse or declines in resources that would threaten future development and human welfare if not corrected in time.

69. Existing mechanisms for information exchange such as the Aquatic Sciences and Fisheries Information System (ASFIS) and IODE should be designed to make a more effective use of the large volumes of information available. Whenever possible, these mechanisms should be standardized using widely-available information processing technologies. They should be readly accessible and user oriented.

70. Databases for both existing and new information should be strengthened and consolidated. The collection of irrelevant "data", must be avoided; data should only be collected for specific and well-conceived purposes. This can be best assured by careful design of projects and inter-calibration programmes and by creation of data banks organized to meet the real needs of the users.

71. The development of international monitoring programmes such as those which will contribute to the Global Ocean Observing System (GOOS) will provide an additional source of internationally-calibrated data in support of national environmental planning and policy-

making requirements for coastal and marine areas. For instance, the UNEP/IOC/WMO long-term monitoring programme for parameters related to climate change and sea-level rise in coastal and marine areas should be implemented as rapidly and as widely as possible. Data can be compiled in geographic information systems (GIS) or included in ocean maps or coastal vulnerability maps. The presentation of data in ways that make them accessible to decision makers is critical to their effective use for planning or early warning purposes.

k. Emergency response

72. No part of the coastal and marine environment is free of the risk of accidents involving the spillage of oil or other hazardous chemicals which could seriously damage the environment. Large quantities of such materials are transported by sea and are stored in coastal facilities. Damage can be reduced if such spills are rapidly contained and removed, but this requires careful contingency planning, expensive equipment and trained personnel. Few countries can afford to maintain full preparations for unexpected but possible disastrous accidents. Many countries and regions have been assisted by IMO and UNEP to develop contingency plans and protocols on co-operation in the event of such accidents, but much still needs to be done to increase national and regional capacities to implement such plans and to keep them up to date.

i. International aid and co-operation

73. Bilateral or multilateral co-operative projects related to marine and coastal development or resources exploitation should be an integral part of national development plans. the cost of strengthening national capabilities, including institutional structures, should also be considered as an integral part of project costs. Particular attention should be paid to development of national environmental expertise to support such projects.

74. Transfer of environmentally harmful and obsolete technologies must be avoided. However care must also be taken in selecting highly sophisticated technologies for transfer when they may not manageable due to lack of trained local staff or infrastructure. Long-term co-operation on technology transfer and on building the capacity to evaluate suitable technologies is essential.

74. International assistance programmes, technical multilateral and bilateral cooperation should be based on a proper understanding of local realities. The practices of donor and aid agencies should take into account national aspirations, traditional and cultural values, and the realities of local possibilities and environmental constraints. Support should be provided for long enough to achieve effective capacity building; programmes with some continuity are preferable to single projects. Where only short-term assistance is provided, appropriate follow-up should be planned after the end of the project.

m. Financial support

76. Finance is clearly needed at appropriate scales to catalyze the development of national capacities. However it must not create dependence on outside funding sources which will inevitably be withdrawn sooner or later. There must be a clear understanding from the

beginning that the continuing costs of institutions and capabilities that may be developed should become a national responsibility, even if the transition must be arranged gradually.

77. Budgetary allocations from national and local budgets do not need to be the only source of funds available, however. Industries can be convinced to contribute to monitoring and protection measures related to their activities. The revenues from environmental fiscal measures can be allocated directly to environmental protection and monitoring.

78. Some countries lack the foreign currency necessary for critical inputs to environmental research, monitoring and management projects. Even a small amount of assistance with this foreign currency component can make a big difference in the effectiveness of national activities.

79. New international sources of financial support are becoming available, including infrastructure support from the development banks, and the Global Environmental Facility (GEF). The use of part of these funds for institutional capacity building will help to ensure the sustainability of development projects. Further continuing sources of funding must be sought to assist in developing and maintaining the necessary capacity in the poorest countries and in island areas where some subsidies will be essential to maintain protection, monitoring and management measures in the global interest.

n. International and regional agreements and action plans

80. Widespread participation should be encouraged in international and regional legal agreements that can often provide direct benefits to countries in the reinforcement of their national capacities. Technical assistance is frequently available to help in meeting obligations under such agreements.

81. Regional action plans and co-ordinating mechanisms also provide the means for capacity building through co-operation among countries sharing similar problems and through achieving economies of scale in the development of regional facilities beyond the means of any one country. Regional structures can contribute to technology transfer and training. They build networks through which regional priorities and actions can be identified and implemented. Regional assessment and management is essential for enclosed and semi-enclosed seas. A regional approach is also necessary to study and if necessary manage the large-scale marine ecosystems that are found off most continental margins and that provide the basis for many productive fisheries.

o. Strengthening international capacity for assistance

82. There is presently insufficient institutional capability at the international level to help developing countries with environmental planning and management, training, institutional development and awareness building. The needs have grown much faster than the capacity to respond. Agencies frequently find themselves chasing after the same few overcommitted experts. Funding in relation to the need is totally inadequate. A major effort is therefore required to increase the number of experienced experts, particularly from developing countries, who can implement capacity-building activities, and to reinforce the institutional frameworks through which they can assist. Agencies and other organizations should

exchange rosters of experts, and should use on-the-job training to develop new experts with needed skills.

4. LINKAGES

83. The same capacity required for effective marine and coastal development and management can also contribute to other national and regional priorities. Laboratories established for sophisticated marine pollution monitoring can also analyze similar pollutants in freshwater, soil or foodstuffs, and can assist in controlling the traffic in hazardous wastes. The protection of coastal and marine biological diversity requires many of the same skills and management approaches as terrestrial biodiversity, and is frequently the responsibility of the same departments of conservation or wildlife. There is no real distinction between monitoring climate-related changes or impacts on oceans or coastal areas and measuring similar parameters on land, although the instrumentation must be adapted to each environment. Approaches to integrated coastal planning can be extended inland to cover whole river basins or watersheds. Many tools such as remote sensing, geographic information systems, environmental databases, and environmental impact assessment methods can be used in all environments; developing the capacity for their use can include both general and specifically marine applications.