



COASTAL
2000

Recommendations for

A
Resource
Management
Strategy
for
Sri Lanka's
Coastal
Region

Volume II



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Editors

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M.S. Wijeratne**

COAST CONSERVATION DEPARTMENT

1992



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Acronyms and Abbreviations

ADB	Asian Development Bank
AGA	Assistant Government Agent
CCA	Coast Conservation Act
CCAC	Coast Conservation Advisory Council
CCD	Coast Conservation Department
CEA	Central Environmental Authority
CEMP	Coast Erosion Management Plan
CRM	Coastal Resources Management
CRMP	Coastal Resources Management Project
CZM	Coastal Zone Management
DANIDA	Danish International Development Agency
DWLC	Department of Wildlife Conservation
EIA	Environmental Impact Assessment
EEZ	Exclusive Economic Zone
FAO	Food and Agriculture Organization
GCEC	Greater Colombo Economic Commission
GDP	Gross Domestic Product
GSL	Government of Sri Lanka
GTZ	German Technical Cooperation Agency
ha	hectare
ID	Irrigation Department
IPZ	Investment Promotion Zone
LHI	Lanka Hydraulic Institute Limited
kg	kilogram
km	kilometer
m	meter
mt	metric ton
MEIP	Metropolitan Environmental Improvement Program
MFAR	Ministry of Fisheries and Aquatic Resources
MSY	Maximum Sustainable Yield
NARA	National Aquatic Resources Agency
NARESA	Natural Resources, Energy and Science Authority
NGO	Non-governmental Organization
NORAD	Norwegian Agency for International Development
SAM	Special Area Management
UDA	Urban Development Authority
UNCED	United Nations Conference on Environment and Development
UNDP	United Nations Development Program
URI	University of Rhode Island
USAID	United States Agency for International Development

Introduction

This second volume of the *Coastal 2000* document sets out the policies and implementing strategies for a second-generation coastal resources management program.

Volume I gave the environmental and social context within which coastal management is being developed and a brief history of coastal management in Sri Lanka. It also described the primary issues a coastal program should address. Volume II briefly summarizes the coastal resources management issues selected as the focus for this second-generation program. It then presents six policies which together make up the strategy.

Coastal management in Sri Lanka was first mandated by the Coast Conservation Act of 1981, which gave the Coast Conservation Department primary responsibilities for:

- policy formulation, planning and research
- administration of permit procedures regulating coastal development activities
- construction and maintenance of shoreline protection works

These responsibilities are currently carried out within a narrowly defined coastal zone. The second-generation coastal resources management program, as presented in this document, calls for a broader perspective of coastal zone management in terms of objectives, participating agencies and levels of government, and the range of geographic areas and environments affected.

Coastal 2000 has evolved from discussions among key national agency officials and non-government representatives who are concerned that the condition of coastal resources in Sri Lanka is deteriorating. The consensus of these discussions is that new and more effective approaches and strategies are required to address the environmental and resource use issues at hand. While there was acknowledgment that the first-generation coastal management program under the CCD has had notable success and should be continued and strengthened, it was recognized that the program needs to be expanded and made more holistic in its approach.



Palm-fringed sandy beaches sometimes eroded by wave action are a common feature of Sri Lanka's coast.

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Long-Term Goals for Coastal Management

The policies set forth in this document support the long-term goal of sustainable use of natural resources that can enable Sri Lanka to develop its economy, human capabilities and quality of life without sacrificing future options. The major objectives are to ensure maximum benefits to and participation of local communities; to build local and national institutional mechanisms for implementation of resource management schemes; and to improve awareness of people through education in order to equip them to solve the problems of protecting and managing resources in an integrated and sustainable manner.

It is important that the coastal management program be practical and implementable within a given time frame. Research, planning and implementation must be integrated as soon as possible so that action plans are put into effect with a minimum of delay.

Resource Management Issues to Be Addressed

An effective strategy must set priorities among the many significant issues in coastal resources management in Sri Lanka. It should not attempt to address all the issues at once. The issues that have been selected for this strategy have no hierarchy of importance. They have been selected because they are interrelated and cannot be addressed in isolation. These issues are the driving force behind the policies and strategies of *Coastal 2000* and are presented to show the progression from problem to solution. They are arranged below in an order that shows how the policies and strategies set out in *Coastal 2000* can help in forming an effective response to the issues.

1. Institutional arrangements and support for CRM planning and implementation are inadequate.

- National economic planning is only now beginning to give adequate consideration to environmental conservation.
- The information available on the use and condition of ecosystems and natural resources is neither adequate nor sufficiently up-to-date for use in natural resource management planning.
- Issues addressed by the current CZM program comprise only a small subset of the most important coastal issues.
- Provincial, district and local governmental and non-governmental agencies at present have little or no role in designing and implementing CZM plans.
- The national CZM Plan has not yet been translated into local and provincial actions, although activities at these levels will have a significant impact on the status, use and maintenance of coastal resources.
- Boundaries for the coastal zone cannot always be clearly demarcated; management has to address the important issue(s) of a site that may not be confined to a prescribed definition of "the coastal zone."

2. Economic development and increasing demand for resources in the coastal zone are causing environmental degradation.

- The linkages between land use and use of chemicals in agriculture have not been adequately considered in planning for coastal resources management.

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- Fisheries production continues to increase even though most inshore fisheries are now fully exploited and some are overfished.

- Aquarium fish capture is not sustainable at its current level.

Policy 1. The coastal management program will proceed simultaneously at the national, provincial, district and local levels with the collaboration required to achieve effective and participatory resource management by governmental and non-governmental agencies

- No sustainable-use strategy has been prepared for marine fisheries, nor are there adequate means to implement such a strategy.

- The potential for sustainable and environmentally sound aquaculture in coastal areas has not yet been fully realized.

- The siting and construction of tourist facilities have more often than not disregarded coastal environmental concerns of setbacks, waste disposal and protection of vulnerable ecosystems.

- Temporary housing clusters are multiplying in shoreline areas.

3. The potential for economic benefits from improved resource management is not being realized.

- The potential support that the tourism industry can provide for environmental conservation and the potential for nature tourism have not yet been realized.

- Alternative and lucrative economic opportunities in coastal areas are not sufficiently developed and varied to offer options to those dependent on depleted fisheries, coral mining, decreasing mangrove forests and simple beach dwellings for existence.

Activities at the national level, guided by the experience and mandate of the CCD with support of the CEA, NARA, DWLC, MFAR, ID and UDA, will strengthen the capacities of central governmental agencies to implement policies in a collaborative manner. Such activities will efficiently provide the information, research and technical assistance required for effective resource management.

Resource management efforts in the provinces and districts will focus on issues within those jurisdictions. This will require a strengthening of the capacities of provincial and local institutions and the preparation of provincial CZM plans in collaboration with the CCD, UDA, CEA and other agencies.

Work by national and provincial agencies at the local level will focus planning and management efforts upon geographically distinct sites. This will occur through the formulation and implementation of Special Area Management (SAM) plans that address the unique combination of problems and opportunities of a specific place. Such SAM plans will build community-level support through a highly participatory process and create community-based management groups.

This multi-level approach to natural resource management calls for:

- building on successful experiences in the implementation of the present CZM Plan under the direction of CCD

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- testing management actions and refining them while the planning and research process proceeds
- resolving problems caused by gaps and overlaps in agency jurisdiction and lack of effective collaboration
- involving the affected communities and provincial agencies in the process of resource management
- recognizing and responding to the linkages between human activities, the condition of the ecosystem, and the different levels of governmental and non-governmental institutions
- habitat monitoring and management
- implementation of guidelines for resource use
- appropriate siting of development activities
- access and resource-use conflicts
- a change in the practical and legal definition of “the coastal zone”
- guidance, incentives, regulations and procedures for provincial CZM plans
- decentralization of permit procedures
- the formulation of procedures for SAM plans and their implementation

Implementation Strategies of the Program

At the national level. The main responsibility of national-level agencies is to ensure that priority management issues are addressed. The focus will be on:

Detailed strategies to implement the national-level program are outlined in Policies 2, 3, 4 and 5 below. The objective is to



D. Sansoni

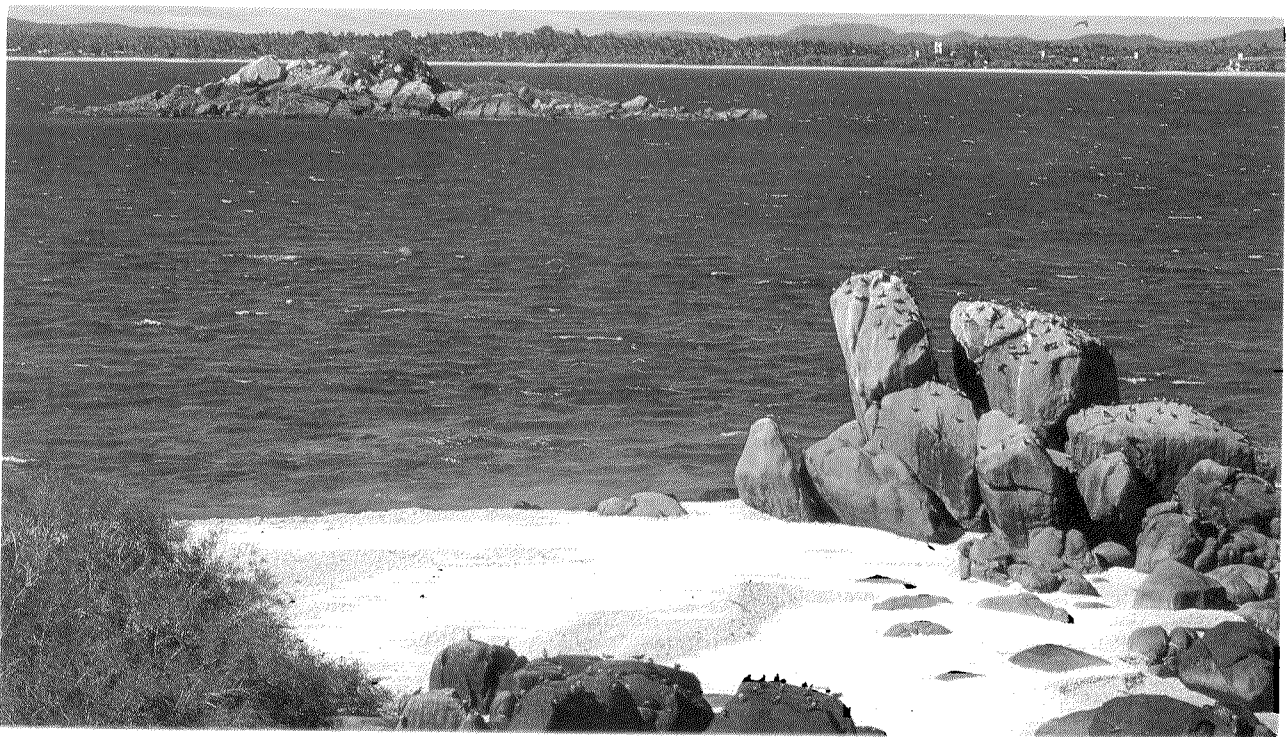
Traditional beach seine fishing on the south west.

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improve the volume and quality of information available to central governmental agencies and to upgrade the capacity of these agencies to implement the CZM program. The national, provincial, district and local programs will be developed collaboratively, with research and monitoring information contributing to planning and implementation in an ongoing cycle.

- an assessment, based upon secondary sources, of trends in the condition and use of coastal resources and in current land-use patterns
- identification of the major resource management issues in the coastal region of the province



The rocky east coast has different features than the south and west coasts.

D. Sansoni

At the provincial and district levels. The CCD will collaborate with the provincial councils in a program where CZM plans will be prepared for the coastal region of each province. The first step will be for the CCD to suggest the substantive topics to be addressed and the process by which the plan will be formulated and approved. The CCD, supported by research findings of NARA and other agencies, will provide technical assistance in CZM plan formulation. Provincial-level planning will address the following topics and activities:

- mapping of areas of particular concern because of special opportunities, use conflicts, vulnerability to erosion or conditions requiring particular attention and multisectoral management. Such sites will be considered priorities for Special Area Management plans and may include estuaries and lagoons, potential aquaculture areas, beaches, important fishing grounds and coral reefs, and habitat areas for vulnerable species such as sea turtles and dugong.

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- delineation (on maps) of areas designated for preservation
- designation of preferred locations for siting of roads, railway lines and harbors which take full consideration of the impacts of such facilities on the future development process and resulting pressures upon coastal features and habitats of concern
- identification of sites considered most suitable for tourist facilities and/or as tourist attractions
- identification of sites with major constraints for development
- designation of green belts along the coast within which construction will be prohibited or restricted

For purposes of the provincial CZM plans, "the coastal region" is defined to encompass the coastal AGA divisions. Once endorsed by the CCD and approved by district environmental agencies, the provincial CZM plans will be used as a guide for development. The process once agreed upon would generally include:

- formal application of the CCD's environmental impact assessment procedures for the area of CCD jurisdiction. In other areas of the coastal region, environmental impact assessment procedures as specified by the National Environmental Act shall apply.
- project proposals within the coastal region, which will be subjected to a consolidated review process that considers the environmental and social impacts of the project according to national criteria set by the CCD and CEA.

Decentralization of the CCD permit process. The decentralization of the existing CCD permit program will involve the provincial councils in the decision process. A decentralized program will require building a provincial cadre of trained technical staff. Whenever practical, all CCD permits, except those requiring an environmental impact assessment, should be decided at the provincial level. A right of appeal process to the director of the CCD may be appropriate.

Special Area Management plans. The CCD or another national agency can organize and promote the formulation of Special Area Management plans for priority sites in collaboration with provincial and local government and those national agencies represented at the site. SAM plans will be developed in the following stages:

- Step 1. Environmental Profile and Level One Plan. The major resource management issues and their causes will be identified through an assessment of information on ecosystems, biophysical features, social and economic conditions, and legal-institutional regimes for particular sites of importance. Implications in terms of the quality of life for the community and the condition of the resource base will be identified. Such environmental profiles require consultation with local leaders, residents, resource users, and others with special knowledge. The document will be subjected to comments from the community and be the basis for initial efforts in public education, which will focus on the consequences of human-use patterns on environmental quality and the resource base. The profile will also be the basis for identifying the needs for technical assessments and research by specialists to improve understanding of issues of critical importance to a resource

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management strategy. An initial set of management initiatives will also be identified and implemented to begin community participation and address priority community needs and resource issues. The environmental profile and the initial management actions will together be termed a Level One Plan.

- **Step 2. Level Two Plan.** Integration of the results of research, recommendations of specialists, experience gained through monitoring initial management initiatives, and results of public education and training will provide the ingredients for a Level Two Plan. This plan will focus on the actions of an integrated resource management strategy and the specific mechanisms and budgetary requirements needed for its implementation. Level Two Plans will describe the management entity responsible for overseeing the implementation of the plan and specify the mechanisms by which such implementation will occur. Level Two Plans will be submitted to the CCD by the local management entity for approval, with recommendations of the provincial councils as required. The immediate and practical actions of these plans will be implemented.

- **Step 3. Incremental Implementation.** Level Two Plans may require financial support for implementation. The CCD or other lead agency will be responsible for seeking such funds from government sources and the donor community. The initial implementation phase will provide for careful monitoring and documentation of the results of implementing the management actions. Wherever possible, such outcomes will be quantified—for example, to document changes in employment of targeted segments of the population, changes in visits by tourists or changes in the abundance and sizes of fish. The local management entity will

continue to implement programs in training and public education, oversee development projects, and assume direct responsibility where relevant for administering elements of the CCD's permit program.

- **Step 4. Plan Refinement and Evaluation.** The plan will be periodically revised and updated in response to the experience gained during implementation and as new problems and opportunities emerge.

Policy 2. Implement a program to monitor the condition and use of coastal environmental systems and the outcomes of selected development and resource management projects through the collaboration of the CCD, NARA, CEA, ID, MFAR and other agencies

A second-generation coastal management program should be grounded upon detailed knowledge of the resources and activities being managed. Worldwide experience, however, has demonstrated that static—one time only—inventories are expensive and often prove to be of marginal usefulness for policy formulation and planning. Rather, it is time series data that is needed for effective resource management.

There are major differences between research and monitoring. Research seeks new knowledge to answer a specific question or to test a hypothesis. Monitoring requires repeated observations of carefully selected indicators to track trends in the condition and use of the areas and resources being managed. A well-conceived monitoring program brings many benefits:

- It provides an objective basis for evaluating the impact of management policies, actions and enforcement and for refining management plans.

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- It can identify emerging problems and opportunities and determine where EIAs are necessary.
- It can foster interdisciplinary thinking and inter-institutional collaboration.
- It can provide material for public education programs.

Long-term monitoring programs are most likely to succeed when they are inexpensive and rely on uncomplicated measuring techniques. The essential step in a monitoring program is to decide what variables can be monitored to serve as useful indicators for the topics of concern to resource managers. Exciting initiatives are being taken in several countries to involve citizen volunteers, schoolteachers, local officials and private sector organizations in the monitoring process. This is proving to be cost-effective and generates information that cannot be produced by central governmental agencies operating from afar. There are also major benefits in public education and in fostering a sense of stewardship among the public that is so crucial to resource management initiatives.

Content of Monitoring Program

A monitoring program should involve several institutions and levels of government, as well as the private sector and citizen groups. Remote-sensing techniques may be appropriate for tracking some variables. Decisions must be carefully made to determine:

- What variables will be monitored?
- By whom?
- Over what intervals?
- At what funding levels?
- What is the best way to set up and utilize the EIA process?

Some of the variables that should be considered for the monitoring program are:

- Quality indexes of critical habitats. The condition and extent of coastal habitats such as estuaries, lagoons, mangroves, coral reefs and beaches need to be monitored so that management can respond appropriately and in a timely manner. Parameters to be monitored may include degree and rate of sedimentation, water clarity, species diversity and density, coral and mangrove cover, rates of productivity and general aesthetic value.
- Erosion and accretion at selected sites. Changes in rates of erosion provide essential information in planning for the prevention of the movement of beach sand or other shoreline features by human activity or physical dislocations.
- Water quality. Information on trends in the changes in oxygen, nutrients and selected toxic chemicals content, or other water quality parameters is required to predict levels of pollution and to evaluate the existing water quality management program at particular sites.
- Fish landings. Trends in fish landings are crucial in the determination of sustainable levels of catch and in formulating overall fisheries management strategies. Necessary annual data include catch per unit effort, total catch by species and total effort for a given fish stock.
- Agricultural production in coastal AGA divisions. Information on basic trends in crop production and prices in coastal areas is useful for improving the efficiency of land use for agriculture, for the diversification of crops and for intensification of certain crops and techniques as alternative sources of income.

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- Industrial production in coastal AGA divisions. Employment in coastal areas depends on the level of production and profitability of the industries operating in the region. Such information also assists in planning for the prevention or mitigation of harmful environmental impacts of industrialization.
- Hotel occupancy and tourist arrivals. The level of tourist activity is usually derived from the rate of hotel room occupancy, which is also an indicator of future trends in the industry.
- Other activities and land use in coastal areas. New settlements and unauthorized structures in shorefront sites need to be surveyed periodically so that trends do not move ahead of preventive planning. An indicator worth noting is the number of construction permit applications received by the CCD annually. Employment trends in coastal areas should also be monitored. Changes in human migration patterns and in land use are also indicative of pending changes affecting environmental management in coastal areas.



A.T. White

Sand mining, although regulated, still contributes to coastal erosion where it occurs.

This information is required for planning on a yearly basis for tourist arrivals, hotel development and general use of beaches. Other indicators useful in monitoring the level of tourism are rates of beach use, visits to cultural sites, visits to parks and recreation sites, and purchases of popular handicraft items.

Audience and Presentation

The program should critically assess the outcomes of selected resource management and development projects. Initial assessments of community needs often prove to be incorrect,

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and the resulting successes and failures are quite different from those originally envisioned. It is important that the outcomes and lessons learned from projects are identified and widely shared. Such monitoring information supports and sustains community-level participation in resource management and is valuable to national agencies. For this reason it is necessary to involve the community in monitoring project results.

Monitoring data is of little use if it is not summarized and presented in a persuasive manner. An annual or biennial “State of the Coast” report would keep the attention of the public and government focused on progress — or lack thereof. Each report could select a few topics for in-depth analysis (water quality, rising sea level, tourism potential, mineral exploitation opportunities, etc.), and then present in summary form the important findings of the monitoring program on other topics.

Policy 3. Implement a research program of direct relevance to CRM through NARA, national universities and other institutions which will provide a better understanding of ecological processes and social and cultural issues as well as provide information of critical importance to the formulation and implementation of coastal resources management plans

Shoreline Resource Use

- Estuarine sand budgets. The CCD permit program can control sand mining, but information is needed to calculate sand budgets in order to estimate annual surpluses of sand, if any, that can be harvested without causing erosion on beaches nourished by the river system. Research can provide data to develop sand budgets for the country’s major rivers.
- Lime sources. Research is required to work out the technical issues and the economics of producing an economically competitive alternative for coral-based lime. Dolomite rock reserves are plentiful, but the lime produced from this source is reported to contain levels of magnesium that cause plaster to bubble. For dolomite to be a substitute for coral, an inexpensive technology must be developed to remove this deficiency. A second alternative is Miocene limestone, which does not have magnesium. In both cases, new industries — preferably at a labor-intensive, cottage scale — a transportation network and marketing strategies must be worked out.
- Mineral sands. Significant reserves of heavy mineral sands exist in both shallow water and shoreline areas. Extraction of such sands on beaches or nearshore brings erosion problems. Research is required to identify suitable technologies and develop strategies so that the associated impacts on beaches — fisheries, tourism, etc. — will be acceptable. Research is needed both to assess the significance of reserves at specific locations and to formulate environmentally sensitive exploitation strategies.
- Structural shoreline protection. To date, erosion mitigation measures have relied almost entirely on structural measures and experimental sand pumping. It is important to identify alternative methods for protecting shorelines. Other techniques include stabilization with vegetation (especially in dune areas and along riverbanks) and with artificial reefs. These techniques require testing, since experience from other nations needs to be adapted to Sri Lankan conditions.
- Sea level rise. Estimates are that sea level rise globally will be in the range of 0.3 to

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1.0 m by 2040. Sri Lanka's densely settled, low-lying coasts would experience massive problems even if the sea level rise is at the low end of current estimates. The impacts of sea level rise should be assessed now, since decisions on siting infrastructure, coastal protection works and other issues will be affected.

- Land use and development planning. It is important that potential and current demand for land be estimated in relation to development plans and this data be used for planning for long-term shoreline stabilization.

Sustaining Habitats

Research on coastal habitats will be a focus in the SAM plans, since they will provide for interdisciplinary issue-driven research on a number of closely linked resources and environmental processes. Within the SAM sites, research will likely be required on:

- assessment of water quality and pollution
- key spawning and nursery grounds for important fish stocks and vulnerable species
- behavior and manipulation strategies for lagoon and estuary inlets
- impacts of various fishing and mariculture practices
- development activities in the watershed which directly affect the area
- traditional-use rights and/or cultural practices relevant for coastal resources management
- opportunities for potential economic products that can be sustainably extracted

- land-use practices
- existing development plans, national policies and institutional arrangements in the area

Coastal wetlands, coral reefs and seagrass beds require special attention and should be the subjects of national surveys and assessments. Much attention has been paid to mangroves, but these are only one feature of Sri Lanka's coastal wetlands. A similar integrated approach to salt and brackish marshes is called for. A second priority is the mapping and characterization of coral reefs and the associated seagrass beds abundant along the northwest and southwest coasts. A management strategy is required for seagrasses, since they are known to be prime habitat for some demersal fish species, sea turtles and dugong and contribute to nearshore sediment stability.

Sustaining Fisheries

Of crucial importance to fisheries management is the generation of reliable data on landings and catch per unit effort. As coastal stocks hover around critical sustainable production levels, good landing data become the primary indicator of overexploitation problems for resource managers. The data collection system managed by NARA needs to be strengthened and expanded beyond its present confines of the western, southwestern and southern regions. Trends in fisheries landings should be highlighted in annual "State of the Coast" reports.

Another priority is the ornamental-fish fishery, which has great economic, social and ecological significance. Surveys of target species and coral reef habitats are urgently required to provide a baseline and to assess

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exploitation rates. Such surveys, together with the monitoring of catches, processing and export practices, should provide the basis for developing management strategies.

Mariculture

Significant potential exists for mariculture and aquaculture. Development has to date been ad hoc and confined mostly to shrimp production for export along the northwest coast. Major problems in mariculture and aquaculture development have emerged concerning water quality, feeds, and conflicts with traditional fisheries and users of wetlands. One estimate is that about 6,000 ha of coastal lands, much of it wetlands, has potential for pond culture. About half of these lands are in the north and east. Before mariculture development proceeds further, a national strategy is urgently needed. It must identify tradeoffs, pinpoint appropriate sites and set a policy on production for export versus production for national markets.

There appears to be great potential for fish culture. Grouper fry are currently being harvested with damaging fine-mesh push nets and exported for cage culture in other countries. Initial trials in oyster and mussel culture in Trincomalee Bay showed excellent growth rates. These fragments of information require further study and the design of a research program that can provide the foundation for strategies to promote mariculture and aquaculture to supplement the protein urgently needed in the national diet. Culture of species, like shrimp, with high export value can also be beneficial if properly managed.

A priority problem for coastal aquaculture at present is the absence of an adequate supply

of high-protein feeds. Current fish landings are insufficient to be used in the industrial production of fish meal. Research is needed to assess the potential of small freshwater cyprinids as a protein source for feeds. Preliminary assessments by NARA suggest that their stocks in newly created reservoirs are large and that these small bony fish are unsuitable for human consumption.

Protected Area Management

Sri Lanka is the final destination for large numbers of migratory birds, many of them waterfowl, that are drawn from a vast region extending from Siberia to Eastern Europe. These birds form high seasonal concentrations at a few very specific sites. Research is needed to better understand the relationships and impacts of the birds on these sites. Tree planting, manipulation of water flow and the like may be in order to prevent sudden, potentially catastrophic impacts during dry years. One aspect of this research should be to specifically assess the impacts of visitors to these sites and the consequences should the numbers of visitors increase. Priority sites for this research are Bundala, Kalametiya, Kumana (in Yala Park) and two sites in the Jaffna peninsula. All these sites are coastal.

Several issues to be addressed are:

- Impacts of visitors and habitat manipulation of coastal wetlands and lagoons. Estimates are that annual tourist visits to Sri Lanka could increase from 90,000 in 1989 to 850,000 when the civil strife ceases. Many of the possible future tourists will visit wildlife preserves. The impacts of these tourists on the ecosystem and the behavior of wildlife could be very significant. In addition, coastal development is causing increasing changes in water movement in coastal wetlands as well as

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changes in surrounding forest cover. The research topics here are similar to those listed for SAM plans and would be applied to a broader area of coastal lagoons and wetlands.

- Migratory bird studies. No information is currently available on annual variations in the numbers of migratory birds visiting the island or their place of origin. Banding studies are needed to produce this baseline information crucial to a management program. Such a program must be closely coordinated with the Point Calimere waterfowl monitoring station in South India.
- Park buffer zones. Research is needed on management techniques for buffer zones. Candidate sites for such studies are Wilpattu and Yala National Parks.
- Management of diversified coastal ecosystems. Protected area management needs to address practical management for the multiple use of coastal sites, which include all major habitats such as beach, coral reef/seagrass, and estuarine/mangrove sites.

Policy 4. Implement a program to strengthen institutional and human capacity to manage coastal ecosystems

The key agencies involved in coastal resources management—the CCD, NARA, UDA, Ceylon Tourist Board, CEA, MFAR, ID and DWLC—all have large gaps in the expertise required to assist with coastal resources management and development. The lack of experience and knowledge is evident when one considers the integrated nature of coastal resources management as envisioned in

this strategy. It is crucial that all possible attempts be made to increase the cadres of trained manpower to assist with resource management at the national, provincial and local levels, in both governmental and non-governmental agencies. A strategy to implement this policy should contain:

1. Opportunities for personnel at national agencies to undergo special training in CRM and to obtain master and doctoral degrees in environmental sciences, ecology, resource management and fisheries management
2. A series of national training courses in coastal resources management to build special practical skills required to carry out field studies, planning, data analysis, community organization and communication liaison work
3. The systematic training and education of provincial governmental and non-governmental officials who will be involved in the implementation of a CZM plan. Such training would include the development of skills in:
 - resource assessment and evaluation
 - resource management planning and implementation
 - community liaison and organization
 - protected area planning and management
 - project evaluation and environmental impact analysis

The training program would also provide the officials with opportunities to visit project sites outside their province and even in other countries.

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4. The involvement of academics and researchers in the training of government personnel and in the process of planning and implementing CRM and SAM projects. The researchers should have knowledge and interest in resource and environmental management.

5. The sharing of knowledge and experience of successes or failures among local, village or provincial groups who have been involved in a coastal resources management program. Coastal conservation and resource management could be introduced as a subject for postgraduate or undergraduate studies at selected national universities.

Policy 5. Update and extend the scope of the master plan for coastal erosion management

The Coast Erosion Management Plan (CEMP) prepared by the CCD in 1984 is an important document of the first-generation Coastal Zone Management Plan. The CEMP was based on data available at that time and was not definitive in regard to work on certain coastal sectors. Much of the information contained in the CEMP has to be reviewed in the light of the large volume of data that has since been collected. Further, for many of the coastal sectors, especially in the northwest, north and east, the CEMP does not provide any detailed recommendations.

Coastal erosion management will continue to be a major preoccupation for the CCD for many years to come. The considerable commitment of financial resources that will be required for mitigating coastal erosion—at least for shorelines, where only the option of structural intervention is available—requires that such investments be supported by well-designed stabilization schemes. It is also essential that coastal development in erosion-prone areas be

properly planned by the delineation of adequate buffer zones and green belts. Development planning in such coastal sections may have to be supported by the large-scale acquisition of privately owned lands.

Updating and expanding the scope of the CEMP calls for:

- establishment of a planning team within the CCD with adequate numbers of engineers and technical staff
- initiation of research projects directed towards identifying the causes of specific erosion problems
- formulation of management schemes for stabilizing coastal beaches that are threatened
- identification and testing of alternatives for structural shoreline protection, such as stabilization of beaches with vegetation or offshore artificial reefs
- inclusion of contingencies for sea level rise as this may affect CEMP management schemes
- implementation of coastal monitoring procedures to gather information on changing coastal conditions and to measure the effectiveness of actions taken to control erosion

Policy 6. Implement a program to create awareness, both by national and provincial government personnel and NGOs, of the strategies for coastal resources management and the issues they address

An underlying theme of the Coastal 2000 Strategy is that the general public, government officials and legislators must understand the

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issues addressed by the coastal resources management program. It is crucial that people in the coastal areas where habitats, fisheries, beaches and water quality are under threat understand the forces causing their degradation and the implications of such degradation. People must begin to appreciate the value of maintaining these resources and ecosystems in a healthy and productive state.

Strategies to implement this policy will include:

1. Public information campaigns of varied forms to highlight the value of coastal resources. Such campaigns will feature:

- media productions through television, radio and newspapers which discuss the issues in coastal resources management and some of

the actions that people can take to alleviate resource degradation

- posters, leaflets and small booklets designed in a simple attractive format, with photographs and drawings to target specific audiences. Each production would describe one issue and/or resource in detail so that ordinary people can understand the problem.
- intensive media coverage of site-specific Special Area Management projects to highlight the problems to be solved, the benefits to be derived from a successful project and the means by which local people can actively participate in the project

2. Opportunities for coastal residents to play an active role in the planning and



Coastal wetlands, lagoons and mangrove forests are productive ecological features along much of Sri Lanka's coast.

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implementation of Special Area Management projects.* Such opportunities would include:

- participation in public meetings to discuss resource management issues in the area and solutions for specific problems of concern to the community
- election of representatives from a community to assist with a resource management project
- organization of community groups to manage and conserve coastal resources

3. Detailed coverage of priority issues through national media and local project meetings and publications that analyze and describe the following issues and their solutions:

- coastal erosion processes and the practical difficulties of physically protecting the coastline because of the complicated dynamics of coastal sediment movements and the high cost involved
- the factors intensifying coastal erosion, such as coral mining, sand mining, inappropriate siting of construction projects, deforestation and flooding
- water pollution caused by increasing and indiscriminate release of waste water into streams, lagoons, beaches and the open ocean,

and how such water pollution affects marine life and ecosystem productivity, human health and the aesthetics of our surroundings

- exploitation of fishery resources, which should be limited in regard to intensity and area, and how catches are determined by the reproductive potential of the fish community, the habitat it resides in, and the availability of food for that species or group of fish
- the implications of human population growth on the ecosystem
- the maintenance, for the benefit of Sri Lankan society, of the essential needs of life and the aesthetic values of the environment

Agency Involvement

The implementation of a public awareness program will necessarily involve many governmental and non-governmental agencies at all levels. The CEA, CCD, NARA, UDA, DWLC, ID and MFAR should all have public awareness and education programs. NGO members can be encouraged to contribute their knowledge and enthusiasm. Community groups can increase their own awareness by appointing trained members to educate others in small meetings. Such community participation should be built into the development and implementation process of the SAM Plan.

