

COASTAL ZONE MANAGEMENT PLAN

SRI LANKA
COAST CONSERVATION DEPARTMENT
Colombo, Sri Lanka
1990



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Preface

The Sri Lanka Coastal Zone Management Plan has been prepared in accordance with section 12 of the Coast Conservation Act No. 57 of 1981. It was submitted to the Coast Conservation Advisory Council and was also made available for public comments before submission to Cabinet. The Plan has now been approved by the Cabinet of Ministers.

The Coastal Zone is the interface between land and sea and includes that part of the land affected by its proximity to the sea and that part of the sea affected by its proximity to the land. This is a dynamic area, intensely used, where impacts of unplanned development activities can have significant deleterious effects. The prime objective of the Plan is to provide for the sustained use of coastal resources for the economic and social benefit of the nation.

The Sri Lanka Coastal Zone Management Plan addresses only certain critical coastal problems. Initial emphasis has been given to problems which have resulted in significant economic and social loss and which are at the same time, most amenable to management. The Plan defines these problems and describes a management strategy to control coastal erosion; reduce the loss and degradation of coastal habitats such as coral reefs, estuaries and lagoons, mangroves, seagrass beds, salt marshes and barrier beaches, spits and dunes; and addresses issues relating to loss and degradation of archaeological, historical and cultural monuments and sites, and areas of recreational and scenic value.

The Plan should be considered a first generation plan and the policies and management strategies contained therein will have to be tested and their success evaluated over time. Coastal zone management planning is a continuing effort and modifications and refinements will be introduced in subsequent plans.

It is my pleasure to acknowledge the valuable contributions made by Dr. J.I. Samarakoon (University of Kelaniya), Professor P.L. Prematileke, (University of Peradeniya), Dr. Kem Lowry (University of Hawaii), Mr. H.J. M. Wickremaratne (Lanka Hydraulic Institute), and Mr. B.W. Perera (CRM In-Country Project Administrator). Considerable assistance was provided by Mr. Stephen Olsen and Ms. Lynne Hale, Coastal Resources Center, The University of Rhode Island, who assisted in the drafting of the Plan.

The Workshop on Management of Coastal Habitats in Sri Lanka held in Colombo in May 1986 provided a forum at which the major issues concerning coastal habitats in Sri Lanka were discussed. Recommendations made by the group of professionals who attended the workshop have been incorporated in the Plan.

Very special thanks are due to members of the Advisory Council, agencies concerned with environmental management and the public who commented on the Plan at the review stage.

The guidance and support provided by the Honorable Minister of Fisheries and the Secretary, Ministry of Fisheries, particularly during critical stages of plan formulation, proved invaluable. The considerable time and effort devoted to the preparation of this plan by the Staff of the Coast Conservation Department is gratefully acknowledged.

Director
Coast Conservation Department
Sri Lanka

Foreword

Recognizing the Coastal Zone as a distinct region with valuable resources that require special attention, the Government of Sri Lanka enacted legislation in 1981 which enables coastal resources to be conserved and development to be managed.

Until recently, much of the Coastal Zone was considered a wasteland having only marginal value unless reclaimed or converted to other uses. It is now well established that the Coastal Zone contains some of the most productive ecosystems, which, if managed for sustainable development, can support progress and help meet food, health, housing, and other critical national needs. The coastal fisheries which provide the bulk of the protein needs of Sri Lanka's population is largely dependent on the environmental quality of coastal habitats such as lagoons, estuaries, mangroves, sea grass beds, and coral reefs. Loss or degradation of these habitats leads to decrease in fisheries productivity.

Clean and stable beaches are a prime natural resource on which important economic activities such as tourism depend. Furthermore, they are the best natural defense against the ravages of coast erosion. However, unplanned development which is taking place today, threatens the stability of the beaches in several coastal areas. With rapid population growth and rapidly diminishing national resources, we need to plan our development strategy in concert with resource conservation and environmental management. If we fail to do so, we shall not be able to reach our objectives of increasing employment, incomes and improving the quality of life of our people.

We therefore need to pay very special attention to resolving coastal issues through institutional arrangements designed to allocate scarce resources among competing users. It is also necessary to maintain the programme's priority and ensure that public support and assistance for management measures, which are sometimes rather irksome, are forthcoming. Without such support the programme will fail.

I would like to thank those persons in the public and private sectors who have devoted time and thought to this document and made significant contributions to its form and content. In particular, I thank the several agencies, groups and individuals who commented on the document during the review period and made suggestions, many of which have been incorporated.

I commend this document. I trust it will be used by developers and management agencies and hope that the people of this country will provide Coastal Zone Management all support and assistance.

R. Karunatileka
Minister of Ports and Shipping

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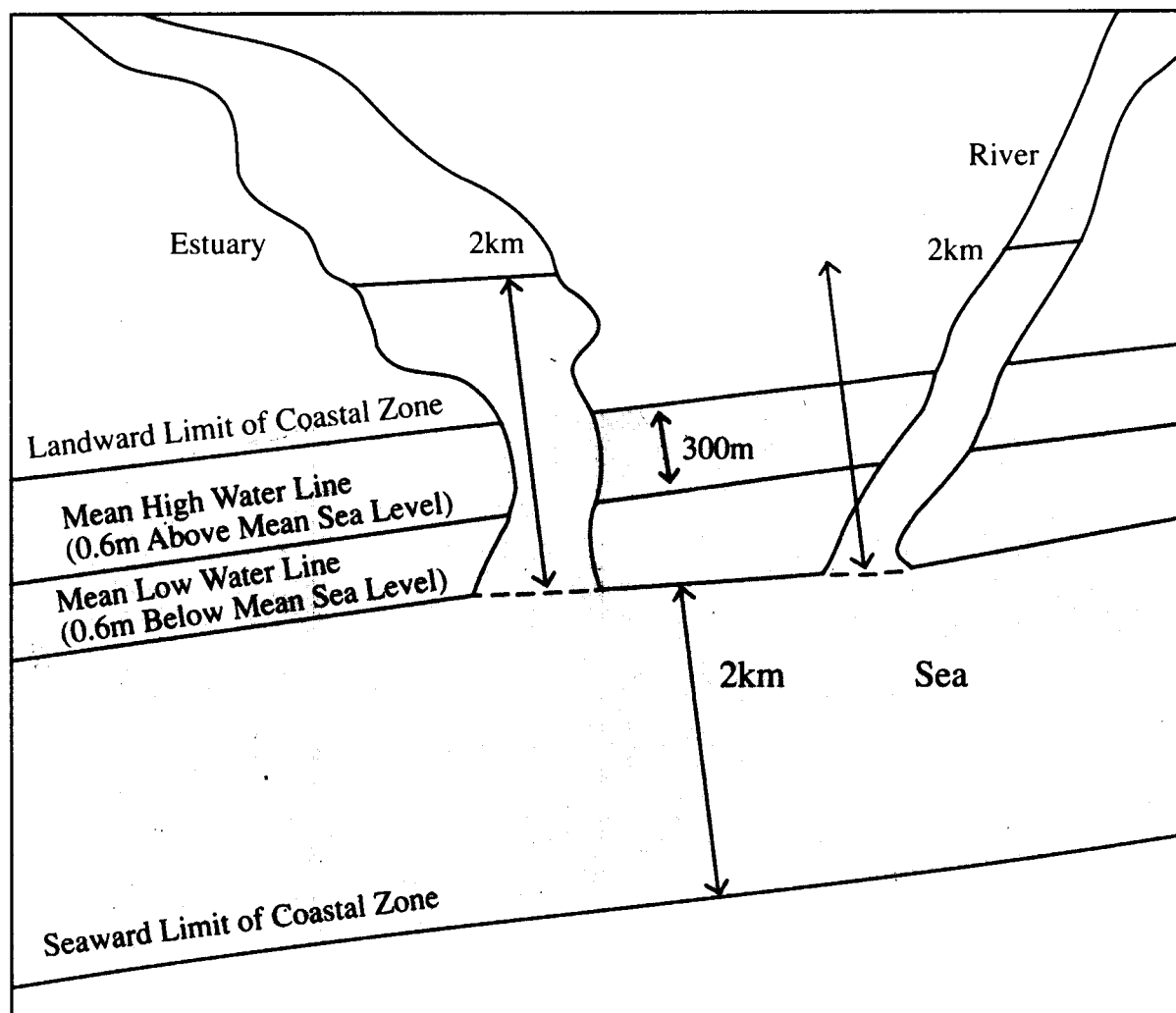
Introduction



1.1. THE NEED FOR A COASTAL ZONE MANAGEMENT PLAN

Sri Lanka is an island situated between 5° 55' and 9° 51' N, and 79° 41' and 81° 54' E, between the Tropic of Cancer and the Equator. It has a land area of 64,000 square kilometers and a 1,585 kilometer long coastline. In the last five centuries, following foreign occupation, the country's development has been closely related to maritime activities. Prior to this period, its civilization was concentrated in the interior. Today, more than half of its population of sixteen million people lives in villages, towns and cities in the coastal districts. The trade and commerce that provided the original impetus for settlement of coastal communities have been supplemented by fishing, tourism and a host of other important economic activities. A substantial proportion of the national economy and social welfare of a large number of its people is inextricably interwoven with the sustainability of resources provided by the natural habitats of the Coastal Zone. During the four decades following independence (1948), the economic importance of coastal areas has increased further with the growth of human settlements and the development of commercial harbours, fishery harbours, landing facilities, river training and outfall schemes, transport, communications, recreational facilities and tourism. Development has been particularly intense in the southern, southwestern and western coastal areas of the country. The benefits of economic development have brought problems in their wake-increasing conflicts over coastal uses, and the depletion and

Figure 1.1
The Sri Lanka Coastal Zone



The “Coastal Zone” is defined in the Coast Conservation Act as. . .

“That area lying within a limit of three hundred meters landwards of the Mean High Water Line and a limit of two kilometers seawards of the Mean Low Water Line and in the case of rivers, streams, lagoons, or any other body of water connected to the sea either permanently or periodically, the landward boundary shall extend to a limit of two kilometers measured perpendicular to the straight base line drawn between the natural entrance points¹ thereof and shall include waters of such rivers, streams and lagoons or any other body of water so connected to the sea.”

¹By definition, the natural entrance points are defined with respect to the mean low water line.

degradation of coastal resources. There are examples of fishery harbours that have silted up and structures designed to keep the outfalls of rivers open that have had the opposite effect. There are instances of shore protection methods that have failed or merely transferred erosion problems to adjacent coastal areas. Although coastal erosion is one of the most visible problems it is by no means the only one. Loss of public access to the shoreline, coastal pollution, depletion of fishery resources, due in part to the depletion of coastal habitats, and poorly sited tourist facilities have contributed to the need for a comprehensive approach to coastal management.

Although interest in coastal problems in Sri Lanka dates as far back as the 1920's, such efforts were mainly focussed on seeking engineering solutions to curb immediate coastal erosion problems by construction of protective structures. During this period, there were many agencies such as the Departments of Public Works, Railways, Highways, and Irrigation that were carrying out coastal protection schemes designed to meet their individual requirements. However, the lack of understanding of the dynamic nature and complex interrelationships among ecosystems and human activities in the Coastal Zone resulted in an escalation of coastal problems and considerable degradation of the coastal environment.

The realization that a comprehensive approach to coastal resource management was required led to the establishment of a Coast Protection Unit in the Colombo Port Commission in 1963. In 1978, a Coast Conservation Division was established in the Ministry of Fisheries. This division was upgraded to a department, the Coast Conservation Department (CCD) in 1984.

In 1981 Parliament enacted the Coast Conservation Act – Act No. 57 of 1981. This Act decreed the appointment of a Director of Coast Conservation with responsibilities –

- (a) for the administration and implementation of the provisions of this Act;
- (b) for the formulation and execution of schemes of work for the coast conservation within the Coastal Zone; and

- (c) for the conduct of research, in collaboration with other departments, agencies and institutions for the purpose of coast conservation.

The definition of the Coastal Zone in this Act is reproduced and illustrated on page 2 of this document. The Act required the Director of Coast Conservation to have a survey made of the Coastal Zone and on the basis of the results of the survey to prepare a comprehensive Coastal Zone Management (CZM) Plan.

This document is Sri Lanka's first Plan for coastal resources management. It is the product of hours of work, several meetings, workshops and considerable research and planning. It represents the best available analysis of Sri Lanka's coastal problems and indicates how best to deal with them. It is, with all that, a first step, albeit an important one. The strategies for managing the coastal problems outlined in this Plan will be tested and revised as necessary over time. New problems may arise and will be dealt with in subsequent Plans.

1.2 SCOPE OF THE PLAN

The legal framework for this Plan is provided by the Coast Conservation Act, No. 57 of 1981, the Coast Conservation Regulation, No. 1 of 1983 and the Coast Conservation Act (Amendment) No. 1 of 1988. The Plan has received the assent of the Cabinet of Ministers on April 11, 1990.

The objectives of this Plan are to:

- Identify coastal problems that need to be addressed;
- Indicate why these problems are important;
- Present the CCD's management programme to address these problems;
- Identify what should be done by governmental and non-governmental organizations and the public to reduce the scope and magnitude of coastal problems;
- Identify research activities of immediate importance to the management of coastal resources.

The Plan deals with the following coastal problems: erosion; loss and degradation of natural coastal habitats; and loss and degradation of archaeological, historical and cultural monuments and sites, and recreational and scenic areas.

The Plan is divided into six Chapters. Chapter 1 introduces the Plan and Chapter 2 describes the CCD's regulatory system. There is a chapter for each of the problems stated above (Chapters 3 to 5). Chapter 6 outlines the measures required for the formulation and implementation of a programme for comprehensive resources management.

This version of the Coastal Resources Management Plan does not cover every coastal problem. It has been designed to address the critical coastal problems first, specifically those problems which have resulted in significant economic and social losses and which are most amenable to management within anticipated budgetary and personnel constraints. These management activities will be tested and refined as necessary. Subsequent Plans will deal with additional problems.

1.3 BASIS OF THE PLAN

During the time this Plan was being developed, it became clear that there exist in Sri Lanka many different ideas about what **coast conservation** means and what a Coastal Zone Management Plan should encompass. To many, **coast conservation** means coastal erosion control. This is perhaps not surprising in a country in which coastal erosion during the monsoon causes serious concern. To others, **coast conservation** means the preservation of natural coastal habitats, such as coral reefs, mangroves, estuaries and lagoons. Moreover, there continues to be confusion about what management means, about how coastal management fits in with all the other laws and agency programmes that affect life in coastal areas, and whether another regulatory programme will stifle those economic development activities that are essential to Sri Lanka's well-being.

The Coast Conservation Act provides the legal basis for this Plan and the management activities that are described in the Plan. However, the Act does not provide a rationale for the Plan.

It does not indicate how the Plan is to be prepared or what the emphasis in the Plan should be. Hence, one of the first planning tasks undertaken by CCD staff was to develop a set of planning and management principles which provided purpose and direction to those participating in the planning process. It was also seen as a means of communicating to other agencies with management responsibilities in coastal areas that complement those of CCD, the central purposes of the Plan and to indicate how the planning process would proceed.

This set of principles was initially developed in 1984. They were submitted to the Coast Conservation Advisory Council established by the Coast Conservation Act comprising representatives from Ministries with legal and/or administrative responsibilities for coastal resources or areas. This Council reviewed these principles and formally approved them in 1985.

Because these principles help provide the conceptual framework for the Plan that follows, a brief synthesis is presented below:

- a) The Coastal Zone is a fragile and vulnerable area that requires integrated management of human activities that affect natural resources.
- b) The Coastal Zone is the common heritage of the nation to which every citizen has right of access.
- c) The control, custody and management of the Coastal Zone is vested in the State.
- d) The State accepts responsibility to maintain, and where possible to improve the quality of its Coastal Zone by means of regulation, acquisition, investment or other strategies as may be consistent with the needs and interests of this and future generations.
- e) In accepting responsibility for the management of the Coastal Zone, the State and its agents recognize that there are limits to that management responsibility. The Coastal Zone of Sri Lanka has ecologically vulnerable and inherently unstable areas, subject to natural processes as well as human intervention. Not all impacts of natural processes can be controlled and such attempts may result in social, economic and environmental costs that are prohibitive.

- f) The Coastal Zone Management Plan should be an instrument to promote the socio-economic well-being of coastal communities in particular and the Sri Lankan community in general.
- g) Any individual, private company or government agency, contemplating setting up a development activity within the Coastal Zone must accept the responsibility for carrying out such activity in a manner that will not significantly affect the stability, quality or productivity of the Coastal Zone.
- h) The management of coastal resources and activities affecting these resources is the responsibility of many agencies. The management role of the CCD is to ensure that insofar as possible, all development activities in the Coastal Zone are consistent with the principles of sustainable resource yields. This will be achieved primarily through inter-agency coordination and cooperation, and also by means of investment, research and direct regulation.
- i) Direct regulation by the CCD will occur only in the Coastal Zone as defined by the Coast Conservation Act.
- j) Community understanding and support of the management programme is essential for effective implementation. Hence, the means for effective community participation in the design of management strategies and in implementation activities will continue to be developed and refined. The means of community participation are likely to take different forms depending on the resource management issues and the degree of community interest.

The Coastal Zone Management Plan rests on a solid foundation of information about the nation's coasts. The CCD has carried out a large number of surveys, and technical studies on the coastal resources and issues this Plan addresses. A list of these CCD-sponsored studies and publications is found at the end of the Plan. The results of these inventories and studies are incorporated in the Findings of each chapter.

1.4 DEFINITION OF THE SRI LANKA 'COASTAL ZONE

The Coastal Zone is defined in the Coast Conservation Act as follows:

“That area lying within a limit of three hundred meters landwards of the Mean High Water Line and a limit of two kilometers seawards of the Mean Low Water Line and in the case of rivers, streams, lagoons, or any other body of water connected to the sea either permanently or periodically, the landward boundary shall extend to a limit of two kilometers measured perpendicular to the straight baseline drawn between the natural entrance points thereof and shall include the waters of such rivers, streams and lagoons or any other body of water so connected to the sea.”

A diagram illustrating the Coastal Zone is given in Figure 1.1 on page 2.

1.5 MANAGEMENT FRAMEWORK

Before developing a management framework a problem must be defined. The Findings presented at the beginning of Chapters 3, 4 and 5 describe a coastal problem, then analyse why it is of concern. Findings also discuss causes of the problem and government activities, if any, currently being undertaken to deal with the problem. A management framework is then set forth to address the problem.

The management framework refers to a set of related statements about specific coastal problems that indicate what the objectives are in dealing with the problem, and how the objectives are to be accomplished. The Objectives stated for each coastal problem are specific statements of conditions to be achieved or created; Policies are specific management measures based on the Findings, which show how the objectives are to be achieved. These policies or implementing actions are the primary focus of attention for most readers of the Plan.

Implementing actions in this Plan are of several types: regulations, direct development, research, coordination, education, and plan and

policy development. All these constitute a management plan. For example, the chapter on erosion identifies several management actions for reducing or preventing erosion. The first step is to establish a setback line to ensure that structures are not sited so close to the shoreline that they will contribute to or be affected by erosional processes. Other regulatory measures establish review procedures for constructing coastal protection schemes in some coastal areas, prohibit coral mining and require permits for sand mining. In addition, a public investment programme for developing coastal protection schemes in selected areas has been formulated. Taken together, these actions constitute a Management Plan for erosion control; a set of coordinated activities by which the CCD seeks to halt or reduce problems related to coastal erosion.

Regulation

The regulation of various types of coastal activities constitutes the primary type of implementing action in this Plan. The principal means of regulation is the appraisal of proposed development activities in the designated Coastal Zone by the staff of the CCD prior to issuance of a permit. Such regulation applies to both State and private sector development activities. This regulatory appraisal process involves an assessment of the probable impacts of a proposed development activity, a determination of whether the magnitude and severity of potential impacts outweigh the public good associated with the proposed development activity, and if so, whether the activity can be made consistent with coastal resource management objectives. Based on this appraisal, the Director of the CCD (Director) issues or denies a permit for the proposed development activity. The details of this permit system are described in Chapter 2.

Direct Development

A second major type of implementing action is direct development activities undertaken by government agencies. With regard to coastal erosion management, the major type of direct development is the construction of shoreline protection works. The CCD is responsible for the design,

construction and maintenance of coast protection works including groynes, revetments, and off-shore breakwaters, and the implementation and maintenance of beach nourishment schemes. The Master Plan for Coast Erosion Management completed by the CCD in 1986 is briefly described in Chapter 3.

Research

A third type of implementing action is to identify areas of research and conduct research. Research is necessary because often good management is precluded due to some coastal problems and/or phenomena being inadequately understood. Although some important research has already been done on coastal processes, more research will be required. Because research is expensive and time-consuming, the challenge is to identify and focus on research that is critical to effective planning and management. This Plan includes several research activities that have been identified during the planning process. The CCD will conduct some of this research and sponsor and direct other research projects. Other agencies or individuals will also be invited to undertake necessary research activities.

Coordination

Many agencies have responsibility for the management of coastal resources or activities affecting those resources. In certain cases, responsibilities overlap resulting in actual or potential conflicts among agencies. In other cases, it is not clear which agency or agencies are responsible for the management of some activities that result in adverse impacts on coastal resources.

Because of these jurisdictional gaps and overlaps there is a continuing need for coordination among agencies. To date, most of the coordination in the implementation of the CCD permit system has been informal. The CCD routinely consults with the Urban Development Authority, the Greater Colombo Economic Commission, the Ceylon Tourist Board and other agencies which are directly involved in the approval of development projects. When particularly large or complex development projects are being considered, meetings involving represen-

tatives from relevant agencies such as the Central Environmental Authority (CEA), the National Aquatic Resources Agency (NARA), or the Ministry of Fisheries (MOF) are convened.

Certain strategies in the management framework require more formal inter-agency coordination mechanisms than those currently in use. Memoranda of Understanding among agencies and other formal coordinative devices will be developed as needed in consultation with these agencies.

Education

The management of coastal resources and activities will have its impact on the lives of many people. While management of activities have an immediate impact, the effect of management of resources is not that easily perceived.

In the short-term, management of activities would appear to restrict development and curtail employment of some people. The benefits of such management, however, are widespread and accrue over a longer period. There is, therefore, the need for a continuing education programme to mobilize public support for such management initiatives. An education programme should explain what is being done in Coastal Zone

management and why certain management measures are being undertaken. The successful implementation of the Plan will depend on the understanding and support of the people of Sri Lanka. Those whose activities will be regulated need to understand why regulatory activities are being undertaken. At the same time, not all educational activities can be conducted by planners and managers. They will often require drawing in persons with detailed knowledge and understanding of local conditions.

Education programmes should, therefore, be multi-directional, involving traditional users, politicians, researchers and entrepreneurs as well as planners and managers. Such programmes may be conducted through seminars, workshops, curricula, publications, press reports, films, etc.

Plan and Policy Development

This Plan represents the first stage in developing a management programme for Sri Lanka's coastal areas. Subsequent planning efforts will involve developing objectives and implementing actions for other coastal problems, area-specific management plans, refinement of existing management guidelines and suggested amendments to the Coast Conservation Act.

The CCD Regulatory System

2.1 WHEN IS A PERMIT REQUIRED?

A permit is required for all development activities that are likely to alter the physical nature of the Coastal Zone. The Coastal Zone is defined in Figure 1.1 on page 2. Some activities for which a permit is required are listed in Table 2.1. Other development activities within the Coastal Zone, not listed below, may also require permits.

2.2 WHEN IS A PERMIT NOT REQUIRED?

Activities that may be engaged in without a permit within the Coastal Zone are:

- Fishing;
- Cultivation of crops;
- Planting of trees and other vegetation;
- Construction and maintenance of coastal protection works by the CCD in accordance with the Master Plan for Coast Erosion Management and the Emergency Procedures as outlined in Chapter 3.

2.3 CRITERIA TO BE USED IN ISSUING OR DENYING A PERMIT

The Director shall issue a permit if:

- The activity is consistent with management policies stated in Chapters 3, 4 and 5 of this Plan.
- The activity is not prohibited by this Plan.
- The activity is outside designated setback lines.
- The National Standards set by the Sri Lanka Standards Institute for the relevant environmental parameters are met, and where such standards are not available the interim standards of the CEA are met.

- The activity allows for continuation of existing fishing activities.
- The activity is consistent with the intent of agency zoning schemes and/or guidelines recognized by CCD.

2.4 SUMMARY OF PROHIBITED ACTIVITIES

Activities within the Coastal Zone prohibited by the CCD are:

- Removal of coral other than for research purposes;
- Mining of sand except in areas identified by CCD;

Table 2.1
Activities in the Coastal Zone for which a CCD permit is required.

- Residential and other structures
- Commercial and industrial structures
- Recreational structures
- Harbour structures and navigation channels
- Public roads, bridges and railway lines
- Shoreline protection works
- Sewage treatment facilities
- Aquaculture facilities
- Wastewater discharge facilities
- Disposal of wastes
- Dredging
- Filling
- Grading
- Mining
- Removal of sand or seashells
- Removal of vegetation
- Removal of coral for research purposes
- Breaching of sand bars

- Development within 200 meters (m) of designated archaeological sites;
- Any development activity that will significantly degrade the quality of designated natural areas of exceptional value.

2.5 CRITERIA FOR GRANTING EXEMPTIONS AND VARIANCES

2.5.1 Exemptions

- a) Exemptions may be granted to engage in prohibited activities only if and when the applicant has demonstrated that:
1. The proposed activity serves a compelling public purpose which provides benefits to the public as a whole as opposed to individual or private interests. The activity must be one or more of the following:
 - An activity associated with public infrastructure such as utility, energy, communications and transportation facilities;
 - A water dependent activity that generates substantial economic gain to the community;
 - An activity that provides better public access to the shore.
 2. All reasonable steps would be taken to minimise adverse environmental impacts and/or use conflicts.
 3. There is no reasonable alternative means of a location for serving the compelling public purpose stated.
- b) Such an exemption may be granted by the Director only if the Coast Conservation Advisory Council determines that there are compelling reasons for allowing an exemption and recommends the granting of same.

2.5.2 Variances

- a) Variances from a standard (for example SETBACKS 2.6) may be granted only if the following criteria are met:
1. The proposed alteration will not result in significant adverse environmental impacts or use conflicts.

2. Due to conditions at the site in question, the standard will cause the applicant an undue hardship.
3. The variance requested by the applicant is the minimum necessary to relieve an undue hardship.
4. The undue hardship is not the result of any prior action of the applicant.

- b) Such a variance may be granted by the Director only if the Coast Conservation Advisory Council determines that there are compelling reasons for allowing a variance and recommends the granting of same.

2.6 SETBACKS

A setback is defined as an area left free of any physical modification. It is good planning practice to leave a minimum setback of 60 meters from the mean sea level line. Such a setback is desirable to allow for dynamics of seasonal and long-term fluctuations of the coastline, and to ensure public access to the waterfront and visual access to it. The CCD, however, recognizes that demands of development and land ownership patterns in the Coastal Zone do not always permit the delineation of a setback of 60 meters. The setback standards for construction activities listed in Table 2.2 at the end of Chapter 2 have been designated as minimum standards. Setbacks for water dependent activities such as hatcheries for aquaculture, boatyards, etc. will be determined on a case by case basis.

2.7 ENVIRONMENTAL IMPACT ASSESSMENT

Environmental Impact Assessment (EIA) is defined in the Coast Conservation Act as follows:

“A written analysis of the predicted environmental consequences of a proposed development activity, and includes a description of the avoidable and unavoidable adverse environmental effects of the proposed development activity, a description of alternatives to the activity which might be less harmful to the envi-

ronment of the Coastal Zone, together with reasons why such alternatives were rejected, and a description of any irreversible or irretrievable commitments of resources required by the proposed development activity.”

An EIA will be required in case of development activities that are considered to have significant impacts on the coastal environment. It is the responsibility of the applicant to prepare the EIA. The guidelines for the preparation of an EIA are given in Table 2.3. These guidelines are general. The CCD advises developers to consult with CCD during the design and preparation of the EIA. This will enable the CCD to assist the developer to prepare a concise, cost effective EIA that focusses on the most relevant issues.

On receipt of an EIA from the developer, the Director shall submit a copy of the EIA to the Coast Conservation Advisory Council for its comments. The Director shall also publish a notice in the Gazette indicating the place and time at which the EIA can be inspected by the public and invite the public to comment on the EIA.

The Coast Conservation Advisory Council will submit its comments to the Director within 60 days of submission of an EIA to the Coast Conservation Advisory Council. The public is required to submit comments to the Director within 30 days of the Gazette notification. The Director shall consider all comments received and within 60 days of receipt of comments from the Coast Conservation Advisory Council make a decision whether a permit can be issued and the conditions thereof.

2.8 CONTRAVENTIONS

The Coast Conservation Act specifies penalties for contravention of the provisions of the Act. Engaging in any development activity prior to obtaining a permit issued by the Director, and/or non-compliance with conditions stipulated in the permit are contraventions. Penalties may include any or all of the following:

Fines and Imprisonment: Offenders will, on conviction after summary trial before a magistrate, be liable to a fine of up to Rupees twenty-

five thousand or to imprisonment for a term up to one year. In the case of the second or subsequent offence, the offender is liable to a fine of up to Rupees fifty thousand or to imprisonment for a term up to two years. In both cases, the offender can be fined as well as imprisoned.

Confiscation of Equipment and Machinery: Upon conviction for contravening the provisions of the Coast Conservation Act, the magistrate can order the confiscation of any vessel, craft, boat, vehicle, equipment or machinery used in committing the offense.

Demolition of Unauthorized Structures: The Director is empowered to order the demolition of any unauthorized structures.

2.9 MONITORING

The CCD will ensure compliance with permit conditions through a monitoring system that will include one or more of the following:

- a) Monitoring key stages in a project in which the developer shall obtain clearance from the CCD prior to proceeding to the subsequent stages;
- b) Requiring the developer to furnish a certificate of conformity from a nominated authority that the permit conditions have been adhered to;
- c) Direct supervision by CCD personnel or by a nominated authority;
- d) Periodic site visits by CCD personnel;
- e) Requiring the developer to conform to a stipulated time schedule for the development activity or the stipulated quotas;
- f) Requiring the developer to submit reports, carry out surveys, tests, etc.

2.10 ISSUE OF PERMITS

Any person desiring to engage in a Development Activity (see Section 2.1) within the Coastal Zone (see Figure 1.1, on page 2) will be required to obtain a permit issued by the Director prior to commencing the activity.

Table 2.3

CCD Guidelines for Environmental Impact Assessments

1. DESCRIPTION OF PROPOSED ACTIVITY

- a) Description of the nature, aims and scope of proposed activity.
- b) Description of the methodology to be adopted during construction, operation and maintenance.
- c) Description of proposed project's socio-economic and ecological benefits/costs.
- d) Description of the long-term maintenance programme for the proposed activity.

2. SITE DESCRIPTION

- a) Description of the area within which the activity, development or operation is proposed to be sited and its environs. The description should include:
 - Delineation of coastal habitats as defined in Chapter 4 and their ecological state
 - Water bodies;
 - Existing land uses;
 - Existing human activities;
 - Existing archaeological, historic, cultural, recreational or scenic sites as listed in Tables 5.1 and 5.2;
 - Other relevant information.
- b) Location of proposed activity marked on a 1 inch to 1 mile map.
- c) A site map at a scale suitable to show the proposed activity.

3. DESCRIPTION OF POTENTIAL IMPACTS

The description of potential impacts should include the foreseeable direct and indirect, long-term and short-term effects of the activity on the coastal zone. In this context, short-term and long-term do not necessarily refer to any fixed time periods, but should be viewed in terms of the environmentally significant consequences of the proposed action. Any irreversible or irretrievable commitments of resources should be identified. The description should include the potential impacts on the following:

- a) Coastal habitats listed in Table 4.2;
- b) Quality and quantity of coastal waters;
- c) Land and current land use patterns;
- d) The abundance and diversity of plant and animal life;
- e) Erosion and depositional processes along the shore;
- f) Water circulation, flushing, turbidity and sedimentation;
- g) Freshwater runoff patterns and/or saltwater intrusion;
- h) Areas of archaeological, historic, cultural, and scenic significance;
- i) Public access to the shore and coastal waters;

4. PROPOSED MITIGATION MEASURES

A statement setting out proposed measures to minimise impacts identified in 3 above, and a statement on the effectiveness of the proposed measures should be provided. If alternative measures were considered, these should be stated and reasons for selection of the proposed mitigation measures given.

5. ADDITIONAL REQUIREMENTS

The Director may, on a case by case basis, specify other particulars to be included in the EIA.

The procedures for obtaining a CCD permit are summarized in Figure 2.1. Application forms are available free of charge at the CCD, as well as from Assistant Government Agents and Urban Development Authority authorized officers. Specimen application forms are included in the Appendix. Each application must be accompanied by a fee of Rupees fifty.

For permit applications that do not require an EIA, a decision on the application will usually be made within 3 weeks of receiving all the required information. Consultation with CCD early in the project planning stage is advised to facilitate the permit process.

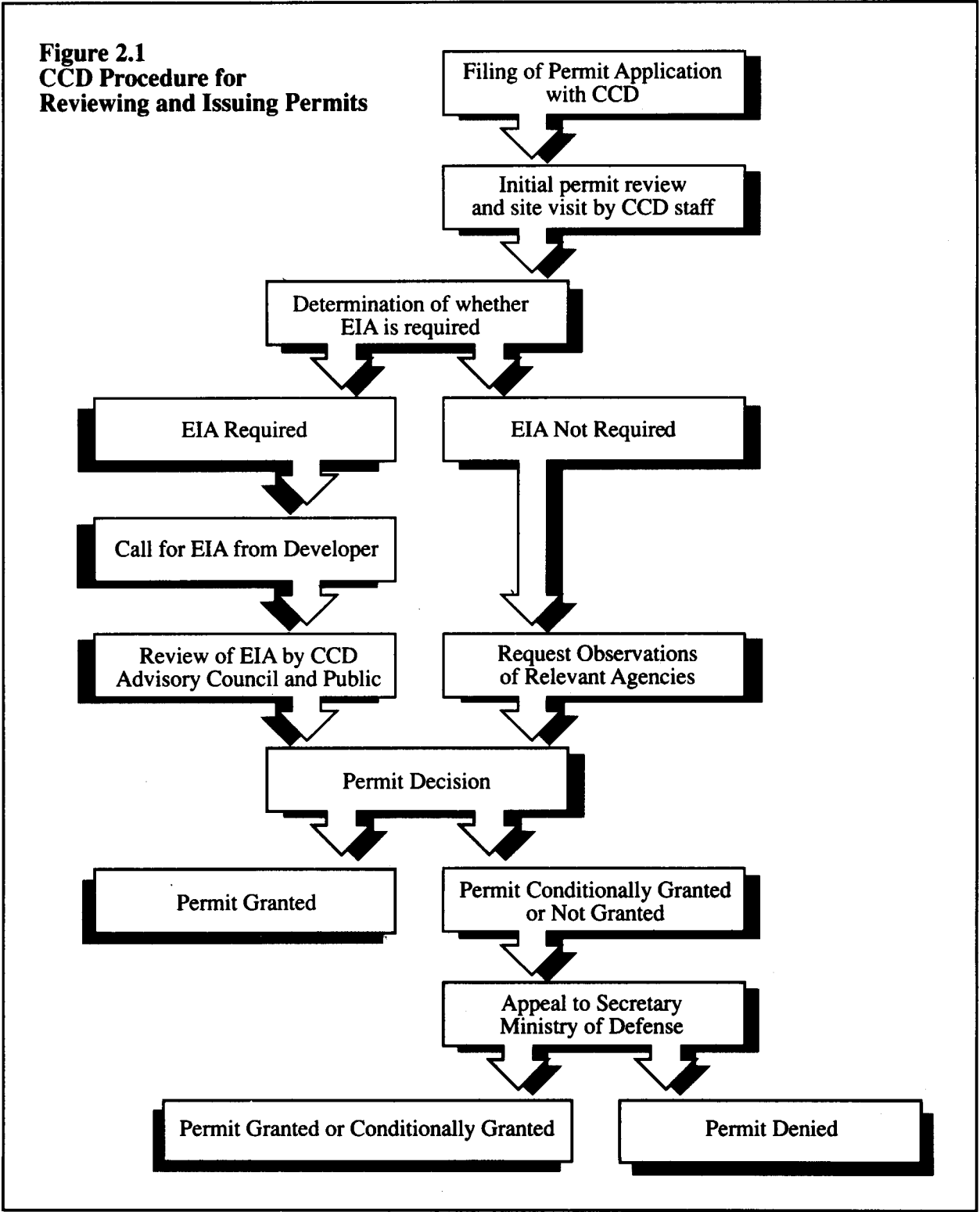


Table 2.2**Setback Standards for Construction in Sri Lanka's Coastal Zone**

Area	Map	Latitude	Longitude	Dwelling Units	Comm./ Indust Buildings	Non Water Dependent Activities	Tourism Dev.	Special Features
Galle face-Mt. Lavinia	Colombo	6° 55' 10"N 6° 50' 06"N	79° 50' 34"E 79° 51' 35"E	E. of rail track	E. of rail track	E. of rail track	E. of rail track	Entire coastal reach is protected by revetment. Saturation of development between Dehiwela & Mt. Lavinia E of railway track. Moratorium on building activity W of rail track.
Mt. Lavinia-Panadura River Mouth	Colombo Panadura-Horana	6° 50' 06"N 6° 42' 48"N	79° 51' 35"E 79° 53' 58"E	10 m	E of rail track	E. of rail track	E. of rail track	Heavily eroding coastline Coast Erosion Management Plan envisages stabilizing entire coastal reach with hard structures.
Panadura River Mouth-Kalutara (Kalido)	Panadura Horana	6° 42' 48"N 6° 35' 14"N	79° 53' 58"E 79° 57' 10"E	10 m	30 m	30 m	60 m	Most of the coastal area is fairly stable though long-term erosion trends have been observed in certain sectors.
Kalido Hotel Meriviere	Panadura Horana	6° 35' 14"N 6° 33' 54"N	79° 57' 10"E 79° 57' 32"E	Not allowed*		Not allowed*		Migrating sand spit, dynamic and unstable area.
Meriviere - Maggona Headland	Panadura-Horana & Aluthgama	6° 33' 54"N 6° 30' 30"N	79° 57' 32"E 79° 58' 40"E	10 m	E of main Highway	E of main Highway	E of main Highway	Eroding coastline. Narrow strip of land between highway & coastline only suitable for construction of dwelling unit.
Maggona Headland - Bentota River Mouth	Aluthgama	6° 30' 30"N 6° 26' 20"N	79° 58' 40"E 79° 59' 16"E	15 m	Not allowed*	Not allowed*		Very high erosion hazard intensity. Heavy tourism dev. has reached saturation.
Bentota River Mouth-Godagala Headland	Aluthgama	6° 26' 20"N 6° 25' 00"N	79° 59' 16"E 79° 59' 38"E	Not allowed*		Not allowed*		National Holiday Resort declared under Tourist Board Act. Coastline subject to seasonal fluctuation.
Godagala Headland-Bandarawatta	Aluthgama	6° 25' 00"N 6° 24' 33"N	79° 59' 38"E 79° 59' 44"E	10 m	E of rail track	E of rail track		Narrow strip of land between rail track and coastline.
Bandarawatta - Kosgoda	Aluthgama	6° 24' 33"N 6° 20' 25"N	79° 59' 44"E 80° 01' 24"E	10 m	E of main highway	E of main highway	E of main highway	Visual access to ocean to be preserved.
Kosgoda - Ahungalle-Middaramulla	Aluthgama Ambalangoda	6° 20' 25"E 6° 17' 28"E	80° 01' 24"E 80° 02' 02"E	10 m	50 m	50 m	50 m	Fairly stable coastline.
Ahungalle-Middaramulla - Balapitiya Wellawatta	Ambalangoda	6° 17' 28"E 6° 16' 08"N	80° 02' 02"E 80° 01' 40"E	10 m	50 m	50 m	50 m	Fairly stable coastline.
Balapitiya Wellawatta - Akurala	Ambalangoda	6° 16' 08"N 6° 11' 36"N	80° 01' 40"E 80° 03' 34"E	15 m	E of main highway	E. of main highway		Coastline subject to erosion.
Akurala - Hikkaduwa Bridge	Ambalangoda	6° 11' 36"N 6° 08' 48"N	80° 03' 34"E 80° 05' 46"E	15 m	E of main highway	E. of main highway		Coastline subject to severe erosion.

1' = 1 mile map (Survey Department) and co-ordinates; * No Build Zone; ** No construction on the Sand Bar

Reference point for measurement of setback is the landward edge of the beach.

Beach is defined as a gently sloping area of unconsolidated material, typically sand, that extends landward from the mean high water mark to the area where there is a marked change in material or natural physiographic form. In cases where there is no marked change in material or natural physiographic form, the beach will be deemed to extend to a distance of 20 meters landward from mean high water level, or to a level of 2.5 meters above mean high water level, whichever is less.

Continued...Table 2.2...Setback Standards for Construction in the Coastal Zone

Area	Map	Latitude	Longitude	Dwelling Units	Comm./ Indust Buildings	Non Water Dependent Activities	Tourism Dev.	Special Features
Hikkaduwa Bridge - Ratgama Outfall	Ambalangoda	6° 08' 48"N 6° 06' 14"N	80° 05' 46"E 80° 07' 25"E	15 m	E of main highway	Not allowed*		Coral reefs & marine sanctuary
Ratgama Outfall - Boosa	Ambalangoda	6° 06' 14"N 6° 04' 15"N	80° 07' 25"E 80° 09' 30"E	15 m	E. of main highway	E. of main highway		Heavy erosion hazard and limited land between highway and coastline.
Boosa-Gintota Outfall	Ambalangoda	6° 04' 15"N 6° 03' 25"N	80° 09' 30"E 80° 10' 32"E	Not allowed*		Not allowed*		Unstable spit.
Gintota Outfall - Galle Fort	Galle	6° 03' 25"N 6° 01' 25"N	80° 10' 32"E 80° 12' 55"E	15 m	E of main highway	E of main highway		Heavy erosion hazard.
Galle Fort - Waggal Modera	Galle	6° 01' 25"N 6° 01' 40"N	80° 12' 55"E 80° 14' 25"E	10 m	E of main highway	E of main highway		Galle Harbuor area.
Waggal Modera - Yakdehimulla	Galle	6° 01' 40"N 6° 00' 20"N	80° 14' 25"E 80° 14' 26"E	No setback required	20 m from top of cliff	20 m from top of cliff		Rocky cliffs.
Yakdehimulla - Welladda-ragoda	Galle	6° 00' 20"N 5° 58' 30"N	80° 14' 26"E 80° 21' 15"E	15 m	100 m or E of main highway	100 m or E of highway		Proposed Marine Sanctuary/ Place of religious worship
Welladda-ragoda - Rassamunai Point	Galle	5° 58' 30"N 5° 57' 15"N	80° 21' 15"E 80° 24' 55"E	10 m	E of main highway	E of main highway		Heavy erosion hazard.
Rassamunai Point - Mirissa Point	Galle	5° 57' 15"N 5° 56' 45"N	80° 24' 55"E 80° 26' 32"E	15 m	E of main highway	E. of main highway		Weligama Bay.
Mirissa Point - Godakanda	Galle	5° 56' 45"N 5° 56' 12"N	80° 26' 32"E 80° 30' 20"E	10 m	50 m	50 m	50 m	
Godakanda - Polhena	Galle & Matara	5° 56' 12"N 5° 56' 18"N	80° 30' 20"E 80° 31' 48"E	10 m	30 m	30 m	30 m	
Polhena - Pallimulla	Matara	5° 56' 18"N 5° 56' 30"N	80° 31' 48"E 80° 33' 26"E	15 m	50 m	50 m	50 m	Coral reef subject to pressures of human activities.
Pallimulla - Dondra Head	Matara	5° 56' 30"N 5° 55' 16"N	80° 33' 26"E 80° 34' 58"E	15 m	50 m	50 m	50 m	
Dondra Head - Tangalle Headland	Matara	5° 55' 16"N 6° 01' 20"N	80° 34' 58"E 80° 47' 50"E	25 m	50 m	50 m	50 m	Stable coastal land formed.
Tangalle Headland - Walawe River Mouth South Bank	Matara & Ambalantota	6° 01' 20"N 6° 06' 15"N	80° 47' 50"E 81° 00' 44"E	50 m	Not allowed*	Not allowed*	Not allowed*	Preserved habitats, Bird sanctuaries Archaeological sites, etc.
Walawe So. Bank - Bundala	Ambalantota Hambantota	6° 06' 15"N 6° 11' 00"N	81° 00' 44"E 81° 14' 45"E	15 m landward from toe of dune		50 m landward from toe of dune		Sand dunes and salterns.

1' = 1 mile map (Survey Department) and co-ordinates; * No Build Zone; ** No construction on the Sand Bar

Reference point for measurement of setback is the landward edge of the beach.

Beach is defined as a gently sloping area of unconsolidated material, typically sand, that extends landward from the mean high water mark to the area where there is a marked change in material or natural physiographic form. In cases where there is no marked change in material or natural physiographic form, the beach will be deemed to extend to a distance of 20 meters landward from mean high water level, or to a level of 2.5 meters above mean high water level, whichever is less.

Continued...Table 2.2...Setback Standards for Construction in the Coastal Zone

Area	Map	Latitude	Longitude	Dwelling Units	Comm./ Indust Buildings	Non Water Dependent Activities	Tourism Dev.	Special Features
Bundala - Amaduwa	Hambantota	6° 11' 00"N 6° 16' 40"N	81° 14' 45"E 81° 25' 28"E	Not allowed*		Not allowed*		Yala and Bundala Sanctuaries
Amaduwa- Itikala Kalapuwa	Hambantota & Yala	6° 16' 40"N 6° 33' 12"N	81° 25' 28"E 81° 43' 38"E	Not allowed*		Not allowed*		Areas of importance for wild-life of unique scenic value.
Itikala Kalapuwa- Kandarajah	Yala Panama, Potuvil & Tirukkivil	6° 33' 12"N 7° 04' 20"N	81° 43' 38"E 81° 51' 46"E	50 m	100 m	100 m	100 m	Erosion hazard high. Sparsely populated land available for adequate set back.
Kandarajah- Thanayamadu	Tirukkivil	7° 04' 20"N 7° 17' 54"N	81° 51' 46"E 81° 51' 58"E	50 m	75 m	75 m	75 m	.
Thanayamadu Kalkudah	Tirukkivil Kalmunai Batticaloa Kalkudah	7° 17' 54"N 7° 55' 08"N	81° 51' 58"E 81° 34' 48"E	50 m	75 m	75 m	75 m	Sparsely populated. Land available for adequate set back.
Kalkudah- Pulavi Point	Kalkudah	7° 55' 08"N 7° 59' 36"N	81° 34' 48"E 81° 32' 36"E	60 m	Not allowed*	Not allowed*		Area of unique scenic value and to be preserved.
Pulavi Point- Periya Munai Point	Kalkudah	7° 59' 36"N 7° 59' 46"N	81° 32' 36"E 81° 31' 06"E	50 m	Not allowed*	Not allowed*		— do —
Periya Munai Point- Mudduchchenai	Kalkudah Kathiraveli	7° 59' 46"N 8° 16' 18"N	81° 31' 06"E 81° 24' 00"E	50 m	Not allowed*	Not allowed*		— do —
Mudduchchenai- Kevuliya (Foul Point)	Kathiraveli Trincomalee	8° 16' 18"N 8° 31' 30"N	81° 24' 00"E 81° 19' 00"E	50 m	Not allowed*	Not allowed*		Villuss, barrier beaches
Kevuliya (Foul Point)- Fort Frederick	Trincomalee	8° 31' 30"N 8° 35' 00"N	81° 19' 00"E 81° 14' 36"E	50 m	Determined on a case by case basis			Koddiyar Bay
Fort Frederick- Thavikallu	Trincomalee Nilaveli	8° 35' 00"N 8° 46' 12"N	81° 14' 36"E 81° 08' 40"E	50 m	75m	75m	75m	
Thavikallu- Kokkulai Kemi	Nilaveli Kokkilai	8° 46' 12"N 8° 59' 00"N	81° 08' 40"E 81° 58' 06"E	50 m	75m	75m	75m	
Kokkulai Kemi- Tumpalai	Kokkilai Mullaitivu Iranamadu Point Pedro	8° 59' 00"N 9° 49' 20"N	81° 58' 06"E 80° 15' 10"E	75m	Not allowed*	Not allowed*		Barrier Beaches and villuss.
Tumpalai- Thiruvadinilaya	Point Pedro Jaffna	9° 49' 20"N 9° 46' 42"N	80° 15' 10"E 79° 55' 34"E	10m	30m	30m	30m	
Thiruvadinilaya- Kovilan Point	Jaffna	9° 46' 42"N 9° 45' 40"N	79° 55' 34"E 79° 51' 38"E	50m	Not allowed*	Not allowed*		Fragile area
Delft Islands- Nayinativu Karaitivu & other Islands	Jaffna Puneryn			15 m	Determined on a case by case basis			

1' = 1 mile map (Survey Department) and co-ordinates; * No Build Zone; ** No construction on the Sand Bar

Reference point for measurement of setback is the landward edge of the beach.

Beach is defined as a gently sloping area of unconsolidated material, typically sand, that extends landward from the mean high water mark to the area where there is a marked change in material or natural physiographic form. In cases where there is no marked change in material or natural physiographic form, the beach will be deemed to extend to a distance of 20 meters landward from mean high water level, or to a level of 2.5 meters above mean high water level, whichever is less.

Continued...Table 2.2...Setback Standards for Construction in the Coastal Zone

Area	Map	Latitude	Longitude	Dwelling Units	Comm./ Indust Buildings	Non Water Dependent Activities	Tourism Dev.	Special Features
Kalmunai-Devil Point (Kirimunai)	Puneryn	9° 35' 54"N 9° 23' 40"N	80° 02' 58"E 80° 03' 12"E	50m	Not allowed*	Not allowed*		Low sandy coastline. Sparsely populated. Adequate set backs can be delineated.
Devil Point- (Kirimunai) Weerawandianmunai	Puneryn Tunukkai	9° 23' 40"N 9° 21' 10"N	80° 03' 12"E 80° 03' 30"E	50m	Not allowed*	Not allowed*		
Weerawandianmunai-Sinnativu	Tunukkai	9° 21' 10"N 9° 19' 45"N	80° 03' 30"E 80° 05' 04"E	Not allowed*		Not allowed*		Salt marshes.
Sinnativu-Periya Aru	Tunukkai	9° 19' 45"N 9° 09' 04"N	80° 05' 04"E 80° 05' 20"E	50m	Not allowed*	Not allowed*		Low sandy coastline, open country and jungle land available for adequate set back.
Periya Aru-Padavithurai	Tunukkai Mantai	9° 09' 04"N 9° 05' 30"N	80° 05' 20"E 80° 04' 12"E	20m	75m	75m	75m	
Padavithurai-Nayathumunai	Mantai	9° 05' 30"N 9° 00' 55"N	80° 04' 12"E 80° 01' 40"E	30 m (on mainland)	Not allowed	Not allowed		No construction on barrier beach.
Nayathumunai - Mantai	Mantai	9° 00' 55"N 8° 57' 04"N	80° 01' 40"E 79° 57' 12"E	15 m	50 m	50 m	50 m	
Mannar Island	Talaimannar	—	—	30m	50m	50m	50m	
Mantai - Kudremalai Point	Murunkan/ Kudiramalai	8° 57' 04"N 8° 32' 25"N	79° 57' 12"E 79° 52' 20"E	50 m	Not allowed	Not allowed		Mangrove Swamps/Sand dunes.
Kudiramalai Point - Kandakuliya	Kudiramalai Kalpitiya	8° 32' 25"N 8° 12' 35"N	79° 52' 20"E 79° 41' 54"E	50 m	Not allowed	Not allowed		Mangrove Swamps/Sand dunes.
Kandakuliya - Perichchavillu	Kalpitiya Puttalam Battulu Oya	8° 12' 35"N 7° 49' 40"N	79° 41' 54"E 79° 46' 08"E	50 m	75 m	75 m	75 m	Low sand dunes.
Perichchavillu-Udappu South	Battulu Oya	7° 49' 40"N 7° 44' 30"N	79° 46' 08"E 79° 47' 16"E	30 m	75 m	75 m	75 m	
Udappu South Sinnakaruk-kuponne	Battulu Oya	7° 44' 30"N 7° 37' 30"N	79° 47' 16"E 79° 47' 50"E	30 m	75 m	Not allowed*		Mutupanthiya Lagoon.
Sinnakaruk-kupone -Chilaw	Battulu Oya Chilaw	7° 37' 30"N 7° 34' 40"N	79° 47' 50"E 79° 47' 08"E	15 m	Not allowed*	Not allowed*		Deduru Oya Estuary
Chilaw - Dummaladeniya	Chilaw Negombo	7° 34' 40"N 7° 19' 15"N	79° 47' 08"E 79° 49' 56"E	20 m	75 m	75 m	75 m	Low dunes and sparsely populated
Dummaladeniya - Kammala	Negombo	7° 19' 15"N 7° 17' 40"N	79° 49' 56"E 79° 50' 15"E	15 m	15 m	15 m	15 m	

1' = 1 mile map (Survey Department) and co-ordinates; * No Build Zone; ** No construction on the Sand Bar

Reference point for measurement of setback is the landward edge of the beach.

Beach is defined as a gently sloping area of unconsolidated material, typically sand, that extends landward from the mean high water mark to the area where there is a marked change in material or natural physiographic form. In cases where there is no marked change in material or natural physiographic form, the beach will be deemed to extend to a distance of 20 meters landward from mean high water level, or to a level of 2.5 meters above mean high water level, whichever is less.

Continued...Table 2.2...Setback Standards for Construction in the Coastal Zone

Area	Map	Latitude	Longitude	Dwelling Units	Comm./ Indust Buildings	Non Water Dependent Activities	Tourism Dev.	Special Features
Maha Oya Spit (Kammala - Kammaltera)	Negombo	7° 17' 40"N 7° 15' 36"N	79° 50' 15"E 79° 50' 22"E	Not allowed*		Not allowed*		Spit
Kammaltera - Negombo Rest House	Negombo	7° 15' 36"N 7° 12' 38"N	79° 50' 22"E 79° 49' 42"E	10 m	30 m	30 m	30 m	
Negombo Rest House - Duwa	Negombo	7° 12' 38"N 7° 12' 28"N	79° 49' 42"E 79° 49' 06"E	10 m	50 m	50 m	50 m	
Duwa Lansiyawatta	Negombo Colombo	7° 12' 28"N 6° 58' 52"N	79° 49' 06"E 79° 52' 00"E	10 m from toe of dune	Not allowed*	Not allowed*		Barrier beach protected by sandstone reef which is now showing signs of disintegration.
Lansiyawatta-Kelaniya Estuary	Negombo Colombo	6° 58' 52"N 6° 58' 40"N	79° 52' 00"E 79° 51' 52"E	15 m	30 m	30 m	30 m	
Kelaniya River Mouth - Welladevalaya	Colombo	6° 58' 40"N 6° 57' 54"N	79° 51' 52"E 79° 51' 42"E	100 m**	Not allowed	Not allowed*		Migrating sand bar subject to erosion
Welladevalaya - Galle Face	Colombo	6° 57' 54"N 6° 55' 10"N	79° 51' 42"E 79° 50' 34"E	U.D.A. Regulations		U.D.A. Regulations		

1' = 1 mile map (Survey Department) and co-ordinates; * No Build Zone; ** No construction on the Sand Bar

Reference point for measurement of setback is the landward edge of the beach.

Beach is defined as a gently sloping area of unconsolidated material, typically sand, that extends landward from the mean high water mark to the area where there is a marked change in material or natural physiographic form. In cases where there is no marked change in material or natural physiographic form, the beach will be deemed to extend to a distance of 20 meters landward from mean high water level, or to a level of 2.5 meters above mean high water level, whichever is less.

Coastal Erosion



3.1 FINDINGS

3.1.1 The Nature of the Problem

Coastal erosion is a severe problem in Sri Lanka that results in damage to or loss of houses, hotels and other coastal structures, undermines roads, contributes to the loss or degradation of valuable land and disrupts fishing, navigation, recreation and other activities. In economic terms, the public and private costs of coastal erosion are enormous. Millions of rupees are spent annually to cope with the losses imposed by coastal erosion, and millions more are spent on measures to reduce coastal erosion. These costs, however, do not reflect the personal losses, disruption and inconveniences imposed by coastal erosion.

The impact of coastal erosion is most

severe along Sri Lanka's western and southwestern coasts. It has been estimated that along the coastal segment extending about 685 km from the Kalpitiya to the Yala National Park Bay about 175,000–285,000 square meters (sq m) of coastal land are lost each year. Of this amount, about 95,000–160,000 sq m are lost annually from the 137 km coastal segment that extends from the mouth of the Kelani River (just north of Colombo) to Talawila (Kalpitiya Peninsula).

Coastal erosion in Sri Lanka is not a new phenomenon. Legends and narratives of coastal retreat go back over 2,000 years, including references to this topic in the Mahavamsa. However, the retreating coastline was first viewed as a problem when large numbers of people began to settle and build in the coastal areas during the early part of this century. In the 1920's, there was

concern about protecting Sri Lanka's coastline from erosion and construction of coast protection works began. Since then, the primary means of combating coastal erosion has been to construct revetments and groynes. However, by the 1970's it became clear that erosion control has to be regarded as constituting part of a broader programme of coastal resources management. This is because coastal erosion is the result of powerful natural forces that man can rarely control. Most shoreline protection structures can only buy time, and sometimes make the problem worse. Approaches to managing coastal erosion that are based upon understanding the physical processes that cause erosion and working with rather than against nature are emerging around the world.

The susceptibility of any length of shoreline to erosion is determined by its lithology and geomorphology, its exposure to the natural processes of waves and wind, and the availability of sediment to replenish it. Shoreline erosion is severe along most of Sri Lanka's shoreline but the country is fortunate in having important natural de-

fenses against erosion. Although annual monsoons regularly cause severe erosion in some locations, small waves and weak variable winds prevail most of the time. The more devastating cyclones are infrequent events that occur once every ten to fifteen years. Fortunately, these major storms usually affect only the relatively sparsely populated coastal areas of the eastern and northwestern coastal sectors.

Coral and sandstone reefs that parallel most of Sri Lanka's more developed reaches of shoreline act as natural breakwaters, sheltering the adjacent shore from large waves. Finally, most of the coast consists of gently sloping shores composed of beaches that, when left undisturbed, form an effective first line of defense against the sea, dissipating the energy of breaking waves.

Despite these favourable circumstances, most of Sri Lanka's shoreline is retreating. In several locations, the rate of retreat has increased due to human activities. The proportion of each coastal sector that is retreating and in some cases accreting, is presented in Table 3.1.

Table 3.1
Coastal Erosion and Accretion in Sri Lanka

Sector	District	Coastline in km	Erosion % of coast	Erosion rate m/yr	Accretion % of coast	Accretion rate m/yr	Net Erosion m/yr	Net Loss 1000m ² /yr
West	Puttalam	300	30-40	0.3-0.4	30-60	0.0-0.1	0.2-0.4	60-120
	Gampaha	40	60-70	N.A-1.0	10-20	0.0-0.1	0.9-1.0	35-40
South-West	Colombo	40	40-50	0.0-0.1	N.A.*	N.A.	0.0-0.1	0-5
	Kalutara	40	70-80	0.1-0.5	20-30	0.0-0.1	0.0-0.4	10-20
	Galle	75	70-80	N.A-0.3	0-10	0.0-0.1	0.2-0.3	10-20
South	Matara	55	N.A-90	0.9-1.0	N.A.	N.A.	0.9-1.0	40-50
	Hambantota	135	40-50	N.A-0.2	10-20	0.0-0.1	0.1-0.2	20-30
East	Amparai	110	40-50	N.A-0.2	10-20	0.0-0.1	0.1-0.2	20-25
	Batticaloa	100	N.A-60	0.1-0.2	N.A-20	0.0-0.1	0.0-0.2	10-20
North-East	Trincomalee	210	N.A-40	N.A-0.2	10-20	0.2-0.3	N.A-0	10-0
	Mullaitivu	50	20-30	N.A-0.2	10-20	0.2-0.3	0.0-0.1	0-10
North	Jaffna	275	60-70	N.A-0.3	0-20	0-0.1	0.2-0.3	30-90
	Mannar	155	60-70	N.A-0.5	0-20	0-0.2	0.3-0.5	70-80
ALL COUNTRY		1,585	45-55	0.30-0.35	10-25	0-0.15	0.20-0.35	300-500

(Above erosion/accretion data are based on interviews with long-term residents of respective coastal reaches. Wherever possible the accuracy of these personal experiences have been cross-checked by comparing available maps. These figures should be treated as indicative.)

* N.A. not available

Source: Master Plan for Coast Erosion Management (1986)

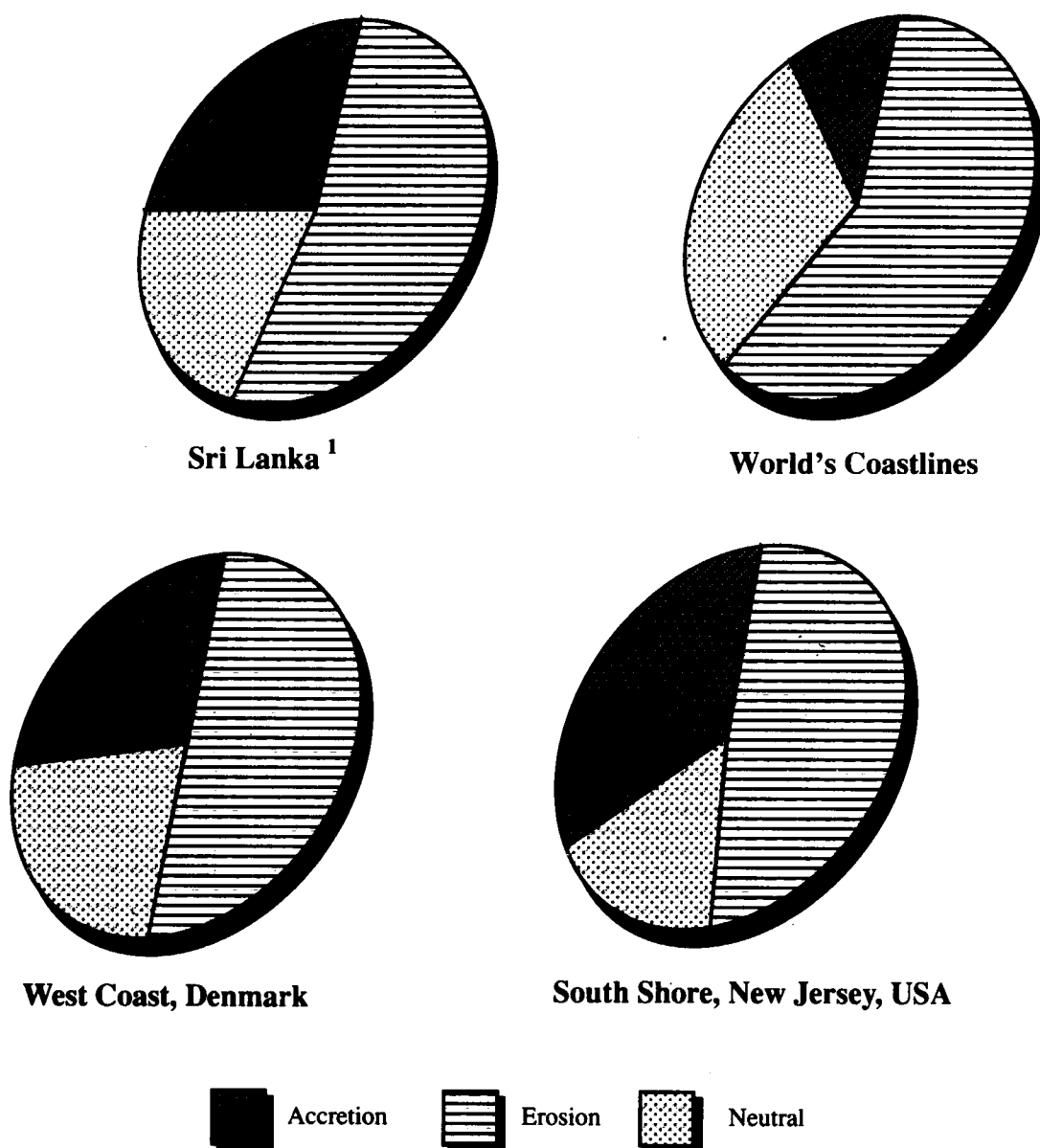
It is important to recognize that erosion is highly localized and within each sector there is wide variation in erosion and accretion rates. Whether erosion of the shoreline is a problem depends primarily on the adjacent land uses. However, the rate of coast erosion in Sri Lanka is not unusual in terms of world trends as indicated in Figure 3.1.

3.1.2 Problem Causes

a) Natural Processes

All shoreline systems are dynamic. Moving water and air carry material from place to place, eroding and depositing, constantly changing the shoreline. In the short-term, these changes are in response to storms, waves, currents and human

Figure 3.1
Erosion and Accretion Along the Coasts of Selected Countries



¹ The percentages show the extremes of the estimated ranges for Sri Lanka Coasts.

Source: Sri Lanka Master Plan for Coast Erosion Management (1986)

Figure 3.2
Short-term Erosion

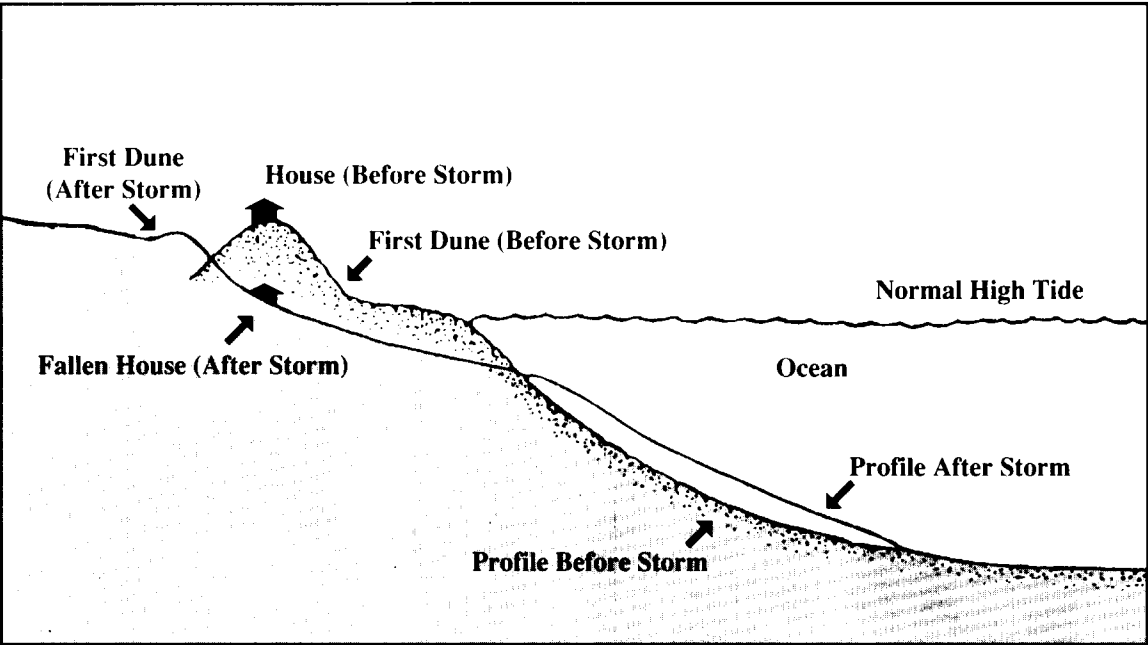
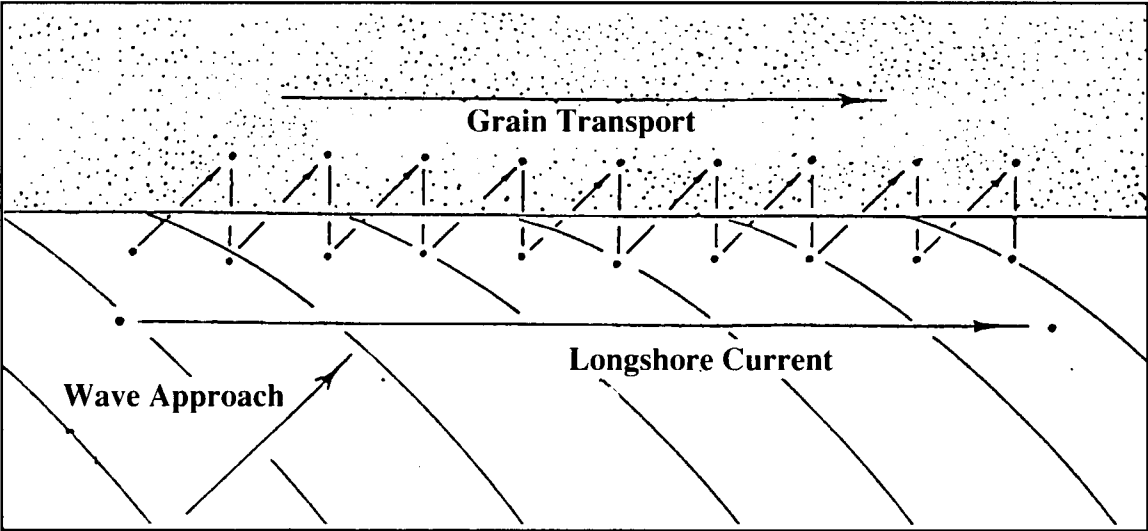


Figure 3.3
Longshore Flow of Beach Sediment Produced by Wave and Current Action When Waves Approach the Shoreline at an Angle.



activities. If in any location erosion is not balanced by accretion, the shoreline retreats. In the long-term, shoreline retreat is a response to changes in sea level.

Waves are the most important agent in building or eroding the shoreline. During calm weather, low energy waves deposit sediment and build up a beach. During storms, large high energy waves dissipate their force on the shore causing erosion of the shoreline. Storms can result in sudden dramatic changes to a beach. Frequently, however, such changes are only seasonal and a beach will recover after a period of calm weather. These processes are illustrated in Figure 3.2.

Most waves arrive at the beach at an angle to the shore, setting up a longshore current. Longshore currents move sediment downstream in a series of zigzags as successive wave fronts advance and retreat. The process of longshore drift is illustrated in Figure 3.3. Longshore drift plays a major role in moving sediment along the shoreline, and is one process that links together geographically separated reaches of shoreline.

Growing beaches and shorelines are fed or nourished by material that has been transported from somewhere else. Sources of beach sand in Sri Lanka include river-borne sediment from inland areas, sediment from eroding coastal features, offshore sand brought onshore by waves

and currents, and broken seashells and corals. Attempts to reduce erosion in one area often result in reduced deposition and possibly increased erosion in adjacent areas. The littoral sand budget is illustrated in Figure 3.4.

Over the long-term, shoreline retreat occurs in response to rising sea level. During the last major worldwide glaciation about 18,000 years ago, the sea level fell by an average of about 100m worldwide. As the glaciers melted, the sea level rose, and despite short-term and local reverses, it is continuing to rise today. While scientists are not in complete agreement as to the current rate of the sea level rise, it is known that the sea level is currently rising faster than in the past. Recent estimates of global mean sea level rise vary from 0.5 meters to 2 meters over a 100 year period. This would no doubt have disastrous effects on low lying coastal areas resulting in shoreline retreat, erosion, flooding, and saltwater intrusion (Figure 3.5). Designers of maritime structures would need to take note of this for the future.

b) Human Activities

While coastal erosion is caused by natural processes, a variety of human activities may add to the problem. Human activities that are contributing

Figure 3.5
Effects of Sea Level Rise

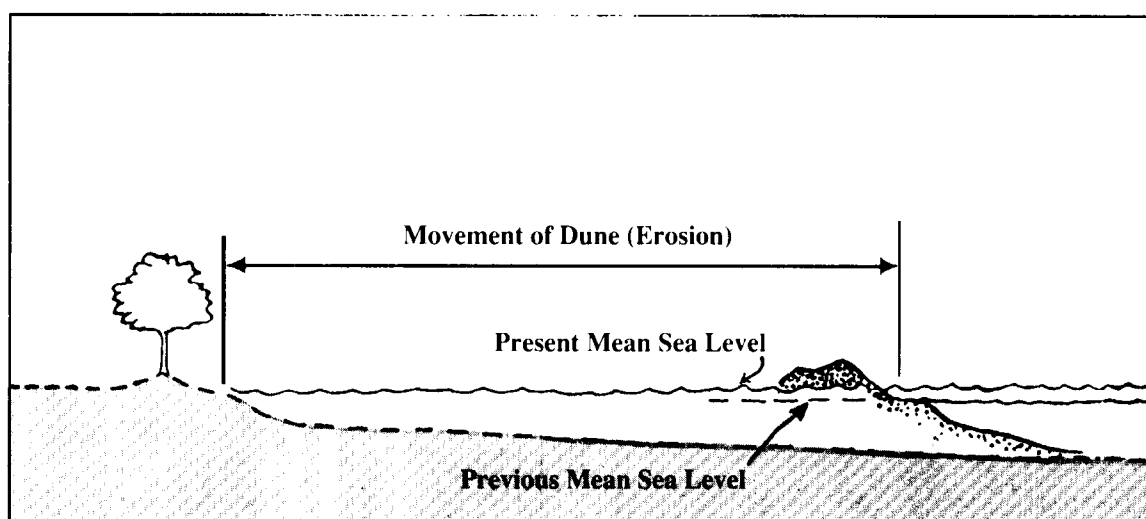
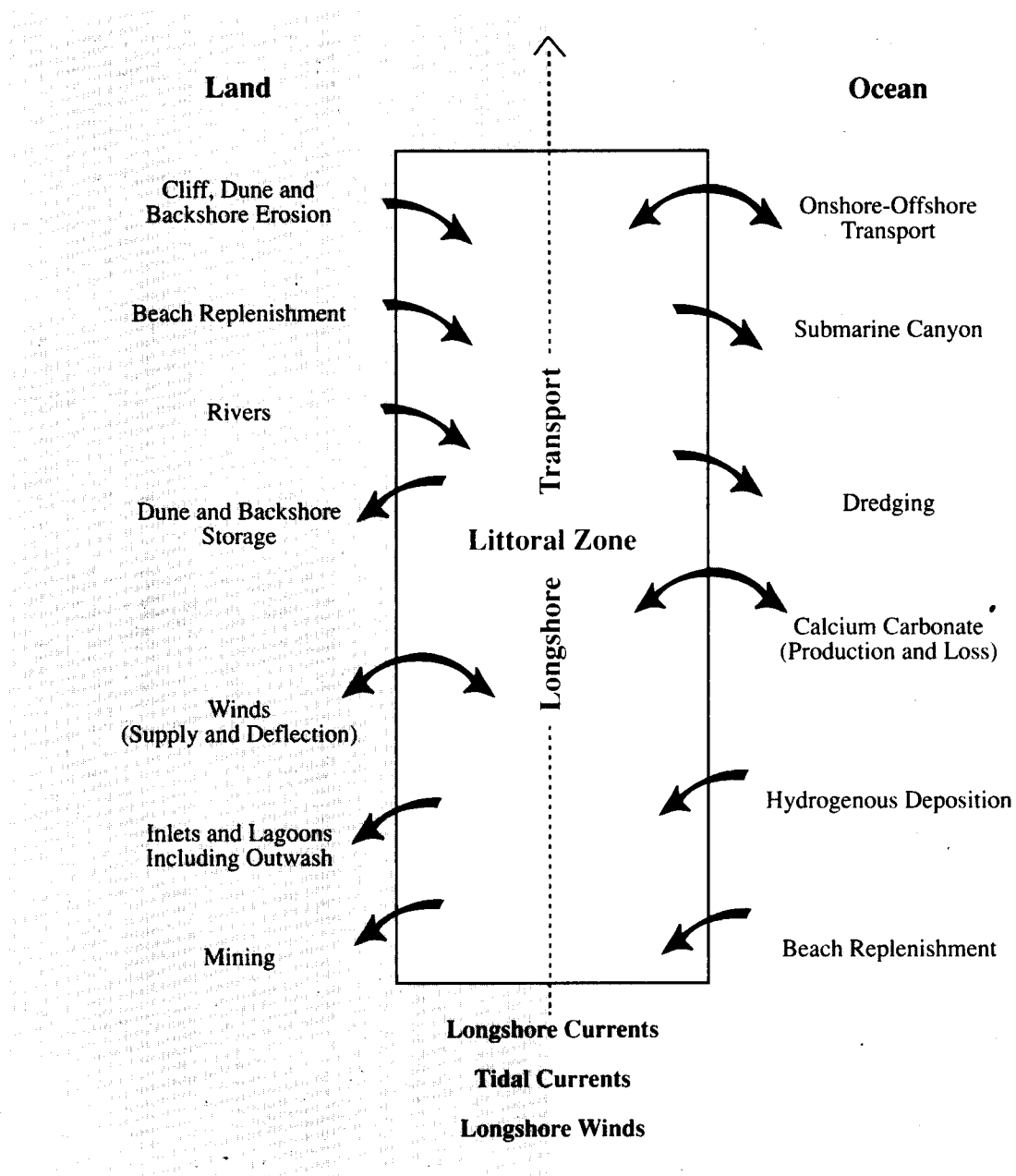


Figure 3.4
Sources of Inputs and Losses to the Littoral Sand Budget
(Arrows Indicate Mean Net Transport of Sand)



Source: Shore Protection Manual (1973) Department of Army, U.S. Corps of Engineers

significantly to erosion of segments of Sri Lanka's coast are discussed in this chapter, and summarised in Table 3.2.

c) Sand Mining

Sand and seashells are mined from Sri Lanka's coastal areas and rivers and are used by the construction industry. Excessive mining and inappropriate siting of sand mining operations can contribute to shoreline erosion and beach retreat by cutting the sand supply to downdrift beaches. Determining the sand budget for any particular reach of shoreline and the role of different sand sources in maintaining beach stability requires site-specific hydrographic and geophysical measurements. Such information is critical for determining the amount of sand that can be harvested from an area without causing erosion problems either at the site or at downdrift locations.

A survey of the location, extent, and socio-economics of coastal sand and seashell mining from Puttalam to Dondra Head has been conducted by the CCD. This area includes most of the major sand mining locations in Sri Lanka. This study revealed that approximately 500,000 cubes (1,415,000 cu m) of sand were mined from this coastal region in 1984. About 1,900 individuals were directly employed as sand miners. These individuals provide sustenance to almost 6,000 individuals. Wages earned by sand miners vary by location and type of mining, but in general, sand miners make good wages. The amount of sand extracted by site in 1984 from rivers and the Coastal Zone is shown in Table 3.3.

River sand is preferred for construction activities and approximately 97 percent of the sand mined in the above project comes from rivers. The Kelani Ganga and Maha Oya are the largest sources of river sand and together ac-

Table 3.2
Activities Contributing to Coastal Erosion in Sri Lanka

<i>Causal Agent</i>	<i>Process</i>	<i>Effect</i>	<i>Examples</i>
Beach Sand Mining	reduction of sand in beach maintenance system posing possible threats to renewal	increased erosion	Panadura, Lunawa, Angulana Palliyawatta
River Sand Mining	reduction of sand in beach maintenance system posing possible threats to renewal	increased erosion of adjacent beaches, erosion of river banks	Kalu Ganga, Kelani Ganga, Maha Oya
Inland Coral Mining	conversion of productive land into waterlogged area	development of inland waste dumps & abandoned pits, reduction of coastal stability by creation of low-lying areas	Akurala, Kahawa, Ahangama, Midigama
Collection of Coral from beaches	reduction of beach nourishment material	increased erosion	Ambalangoda to Hikkaduwa, Midigama, Ahangama and Polhena
Reef breaking	reduction of reef size, creation of gaps in reef	increased wave energy on beaches resulting in erosion	Ambalangoda to Hikkaduwa, Koggala, Midigama, Polhena, Rekawa, Pasikudah, Kuchchaveli, Nilaveli
Reef dynamiting and breaking for fishery activity	reduction of reef size, creation of gaps in reef	increased wave energy on beaches resulting in erosion	Ambalangoda to Hikkaduwa, Koggala, Midigama, Polhena, Rekawa, Pasikudah, Kuchchaveli, Nilaveli
Improperly sited groynes, harbours, revetments, jetties	interference with natural sand transport processes	erosion in some places, accretion in others	Beruwala Fishery Harbor, Kirinde Fishery Harbour
Improperly sited coastal buildings	interference with dynamics of coastal processes	loss of structures, other property due to retreat	Hikkaduwa, Bentota, Beruwela Negombo
Improper removal of coastal vegetation	exposed area subject to more rapid rates of wind erosion	erosion, retreat	Palliyawatte, Koggala, Polhena, Negombo

count for 66 percent of the river sand harvested in 1984 in the study area. The above study further revealed that shoreline mining provided 16,000 cubes of sand in 1984, with most activity concentrated between Thalpitiya and Panadura.

d) Coral Mining

Coral is the principal source of lime for Sri Lanka's construction industry, supplying app-

roximately 90 percent of the total lime used. Coral is also used as an inexpensive source of soil ameliorant which reduces acidity in agricultural lands. In certain parts of the southwestern coastal sector, coral has been mined for almost 400 years. Traditionally, only relic reefs behind beaches were mined. But as the construction industry rapidly expanded in the late 1960's and 1970's, so did the coral mining industry, and this has led to the destruction of living reefs that served as natural barriers against wave attack in these reaches of coastline.

Types of coral extraction in Sri Lanka include reef breaking, collection of coral debris from the beach, and back beach mining. Reefs are also sometimes blasted to provide navigation access to fishing boats. Both coral collection from the beach and reef breaking aggravates erosion. Besides destroying the ecologically valuable reef habitat (see also Section on Coral Reefs), reef breaking reduces the size of the fringing reef and its natural ability to absorb the energy of breaking waves. Without the protecting reef, the full force of waves strikes the shore,

Table 3.3
Location and Estimated Volume of Sand Mining (Puttalam to Dondra Head), 1984

	Number of landing sites	Number of cubes* removed in 1984	% Total
RIVER SAND			
Name of River			
Kelani Ganga	181	222,771	43
Maha Oya	61	111,720	21
Gin Oya	2	79,445	15
Kalu Ganga	67	46,667	9
Deduru Oya	2	22,896	4
Gin Ganga	41	21,563	4
Nilwala Ganga	7	2,005	1
SUBTOTAL	363	507,866	97
SEA SAND			
Name of Landing Center			
Nalluruwa	15	3,756	
Thalpitiya	6	2,988	
Ratmalana-Weliwatte	3	2,592	
Angulana-Moderawatte	8	1,716	
Malanwatuna	3	1,422	
Panadura Estuary	2	1,080	
Ratmalana-Walauwatte	5	768	
Egoda Uyana	3	672	
Lunawa	3	576	
Wellawatte (Hikkaduwa)	2	392	
Lunawa (Beach Road)	1	240	
Madampegama	1	104	
SUBTOTAL	52	16,306	3
GRAND TOTAL	415	524,172	100

*Note: a cube = 100 cubic feet or approximately 3 cubic meters.

Source: CCD Internal Report No. 7: A Census of the exploitation of sand and seashell resources in the Coastal Zone of Sri Lanka (1984).

Table 3.4
Coral Collected from Sri Lanka's Southwestern Coastal Sector in 1984

Location	Amount (in tons)	Percentage of Total Harvest
LAND		
Inland of Coastal Zone ¹	7,532	42
Within Coastal Zone ¹	2,868	16
BEACH	5,377	30
SEA		
From reef	2,282	12
TOTAL	18,059	100

Source: CCD Internal Report No. 3: Socio-economic survey of those engaged in the coral mining industry (from Ambalangoda to Dickwella) 1984.

¹ As defined by the Coast Conservation Act of 1981.

thus increasing the rate of erosion. Coral debris is one source of beach material in Sri Lanka. By collecting large amounts of coral debris from the beach, the amount of material available for beach nourishment is reduced, accelerating erosion either locally or downdrift. Coral debris plays an important role in reef building in that consolidation of debris by binding organisms leads to new coral reef formation.

A study conducted by CCD in 1984 revealed that a quantity in excess of 18,000 tons of coral is extracted in the coastal reach between Ambalangoda and Dickwella. As indicated in Table 3.4, the mining of inland deposits accounts for more than half of such extraction. In the Coastal Zone alone, approximately 1,200 persons are directly employed in this activity and provide sustenance to a total of 4,700 persons.

e) Improper Location or Construction of Maritime Structures

Throughout the world, the effect of shoreline protection works as a means of slowing shoreline retreat has not been satisfactory. Due to the complexity of the forces involved, and an imperfect understanding of the processes that control erosion in any specific area, the vast sums of money spent on shoreline protection often produce only short-term improvements, and more often than not in the long-term, they make the situation worse. Poor results occur most frequently when coastal works are constructed in response to an emergency and when there is insufficient time to acquire an adequate understanding of natural processes prevailing at a specific site.

Other maritime structures such as fishery harbours and river outfall training schemes, unless carefully planned, can also aggravate or cause coastal erosion in adjacent areas. Unless the design of these structures is based on sound understanding of natural processes prevailing at a site, they can, quite apart from causing downdrift erosion, fail to meet the objectives for which they are originally planned. Dramatic examples of such failures can be found in Sri Lanka (e.g., fishery harbours that have silted up in a short period of time and river training works that have caused accelerated erosion of adjacent coastal

areas). Figure 3.6 illustrates the effect of maritime construction on sediment transport and coastal stability.

In the Hikkaduwa and Negombo areas, the construction of vertical or steeply-faced sea walls too close to the waterline has resulted in erosion. Although constructed to provide upland protection they have had just the opposite effect. This is because vertical walls, when constructed in areas where there is significant wave action, actually accelerate beach erosion. Much of the energy of waves breaking on the structure is redirected downward to where the wall meets sand or earth. The shore on the seaward side of the sea wall is thus subjected to much more of the force of the waves than if there was no wall, and erosion is increased. Failure of steeply faced sea walls built on high energy coastlines is illustrated in Figure 3.7.

f) Removal of Coastal Vegetation

Vegetation, particularly in undisturbed environments, provides important protection to coastal land. Roots and stems trap fine sand and soil particles, forming an erosion-resistant layer once the plants are well established. Vegetation also inhibits runoff and reduces siltation that can destroy coral reefs. In marshes and mangrove swamps, vegetation absorbs some of the water's energy, slowing down potentially erosive currents.

Clearing coastal vegetation removes this natural protection and, therefore, frequently contributes to coastal erosion. In urban areas, clearing coastal vegetation is usually done as a part of site preparation prior to construction. In rural areas, vegetation clearing results from a variety of activities, including over harvesting firewood from mangrove swamps, or clearing sites for agriculture or aquaculture. The planting of appropriate vegetation in eroding areas provides protection against erosion but does not, however, assure protection against major storms.

3.1.3 Managing an Eroding Shoreline

Management of human activities and development along an eroding shoreline is difficult. Quite often it is difficult, if not impossible, to protect

Figure 3.6
The Effect of Maritime Construction
on Sediment Transport and Coastal Stability

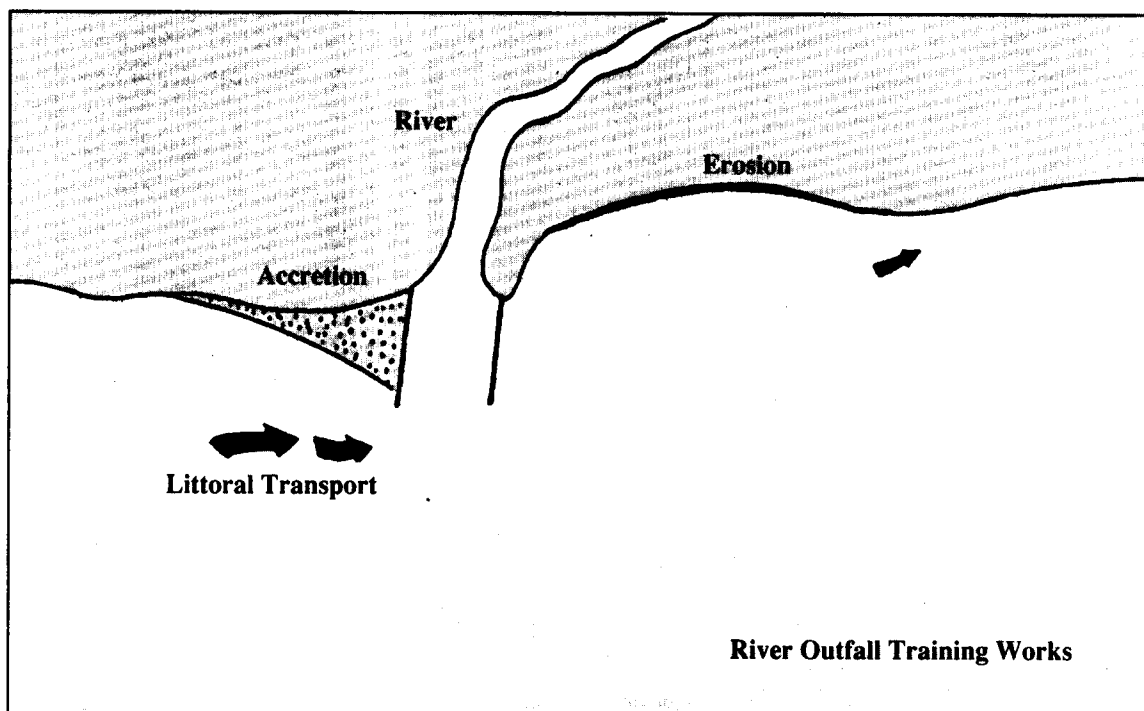
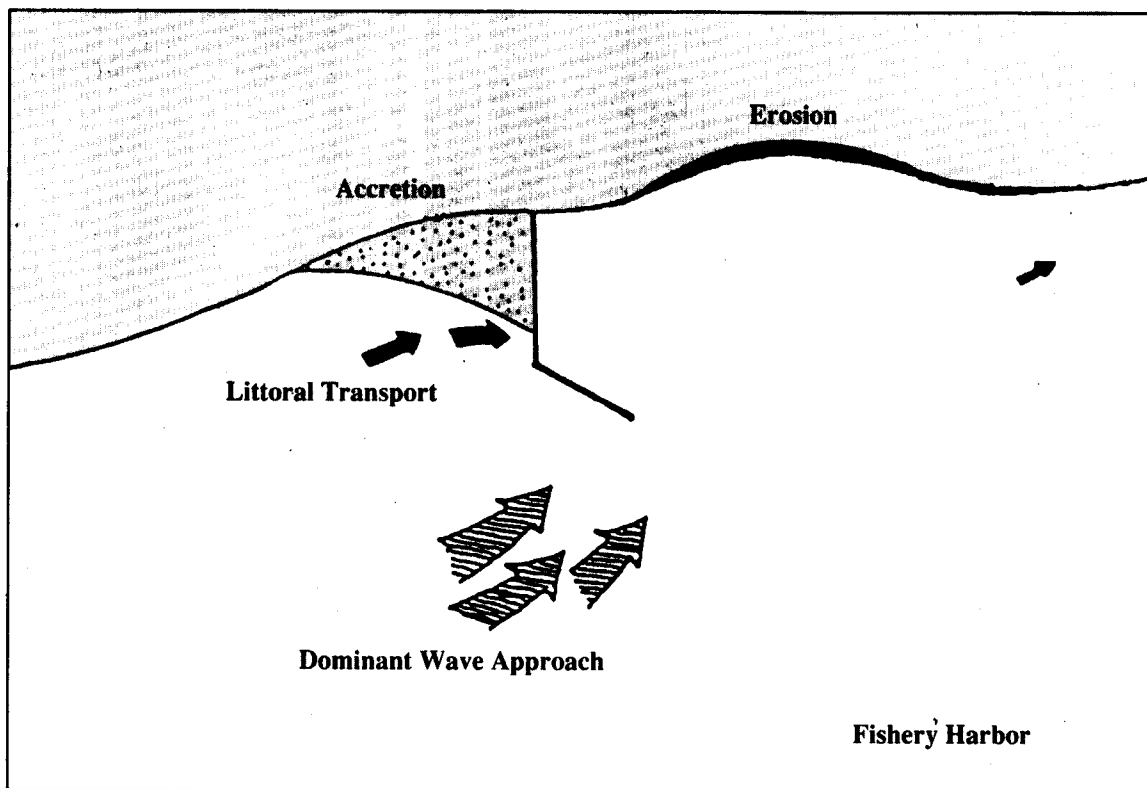
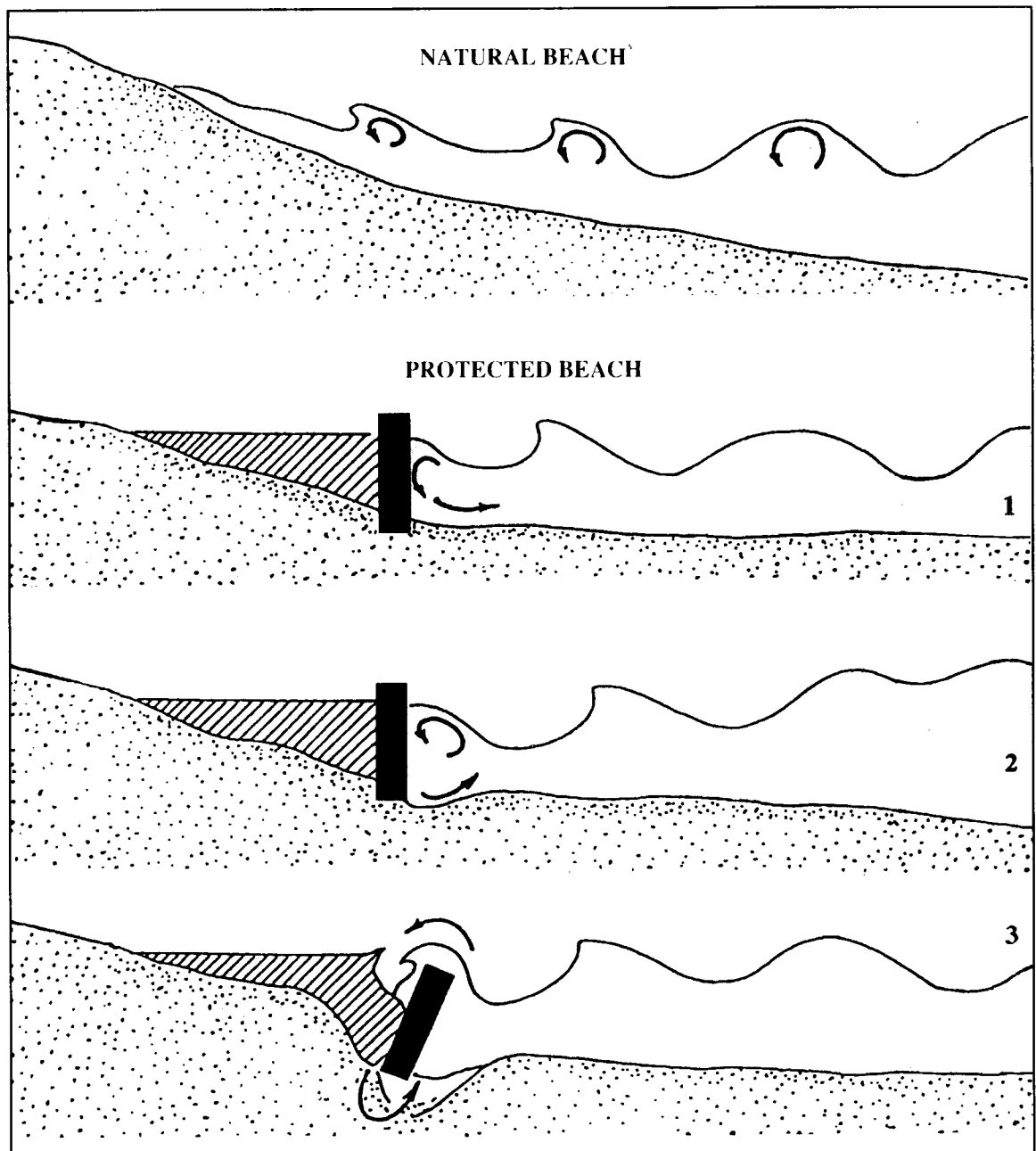


Figure 3.7
Failure of Steeply Faced Sea Walls Built on High Energy Coastline.



A naturally sloping beach dissipates wave energy. Sea walls, bulkheads, revetments, or building foundations, however, reflect the energy almost completely. The reflected energy creates a scouring action near the toe of the structure (1) and may cause the undermining (2) and eventual collapse (3) of the structures.

life and property from erosion-caused destruction. Coastal dwellers, however, demand that their property be safeguarded from the ravages of coast erosion. To meet these difficult demands the best option is to adopt a multifaceted management strategy that goes beyond the traditional approach of building shoreline protection structures to inhibit erosion. Elements of such a strategy should include:

- Use of appropriate erosion control techniques that are cost effective and socially and environmentally acceptable;
- Directing new development away from eroding shorelines;
- Requiring that new construction in erosion prone areas be setback from the shore a sufficient distance so that it will not be threatened by erosion for sometime;
- Regulation of human activities which contribute to accelerated erosion, such as coral and sand mining (Such regulations must, however, recognize the socio-economic dimensions of the activities, as well as their impacts on the shoreline);
- Protection, and where possible, restoration of natural features that inhibit erosion.

a) On-going Management Activities

Current CCD management of erosion consists primarily of shoreline protection structures, use of setback lines and directing development away from eroding areas through the implementation of a regulatory system. A discussion of shoreline protection structures follows. Setbacks and the CCD regulatory system were discussed in Chapter 2.

b) Shoreline Protection Structures

Sri Lanka has made a significant financial investment in protecting its shoreline. Figure 3.8 shows the investment for shoreline protection works during the period 1955 to 1987 for the western, southwestern and southern coastal sectors. Commonly used shoreline protection structures are revetments and groynes. In addition, sand nourishment has been utilized in restricted areas. Existing lengths of shoreline protection works

are summarized by coastal sector in Table 3.5.

It is usually considered that a revetment provides protection only to the length of the coastline it covers, and a groyne, if completely effective, to about three times its length. Hence, all the protective structures so far built in these sectors provide protection only to approximately 70 km of coastline; whereas approximately 270 to 380 km of coastline in these sectors are considered erosion prone areas. Thus the Rupees 311 million investment has protected only between 18 and 25 percent of the shoreline that requires protection. Clearly, protecting the coast with structures is expensive.

In 1986, the CCD prepared a Master Plan for Coast Erosion Management with the assistance of the Danish Government (DANIDA). The Master Plan identifies erosion prone sites along the coast where structural solutions to the erosion problem are appropriate.

In the decade commencing 1986, the Government of Sri Lanka plans to invest, with bilateral assistance, a sum in excess of Rupees 1,200 million to implement the recommendations of the Master Plan for Coast Erosion Management. This expenditure will provide protection to a

Table 3.5
Length of Existing Shoreline
Protection Works

Sector	Total Length (meters)	Value in terms of 1985 prices (RS million)
REVETMENTS		
West Coast	9,100 m	
South West Coast	37,900 m	
South Coast	<u>8,320 m</u>	
	55,320 m	250 m
GROYNES		
West Coast	2,200 m	
South West Coast	3,400 m	
South Coast	<u>1,020 m</u>	
	6,620 m	<u>61 m</u>
		311 m

total of 155 km of Sri Lanka's entire coastline, leaving 160 to 225 km of erosion prone coastline in western, southwestern and southern areas where coast erosion will have to be accepted as a fact of life and development activities and human settlements planned accordingly.

3.2 MANAGEMENT OBJECTIVES AND POLICIES

OBJECTIVE 3.2.1

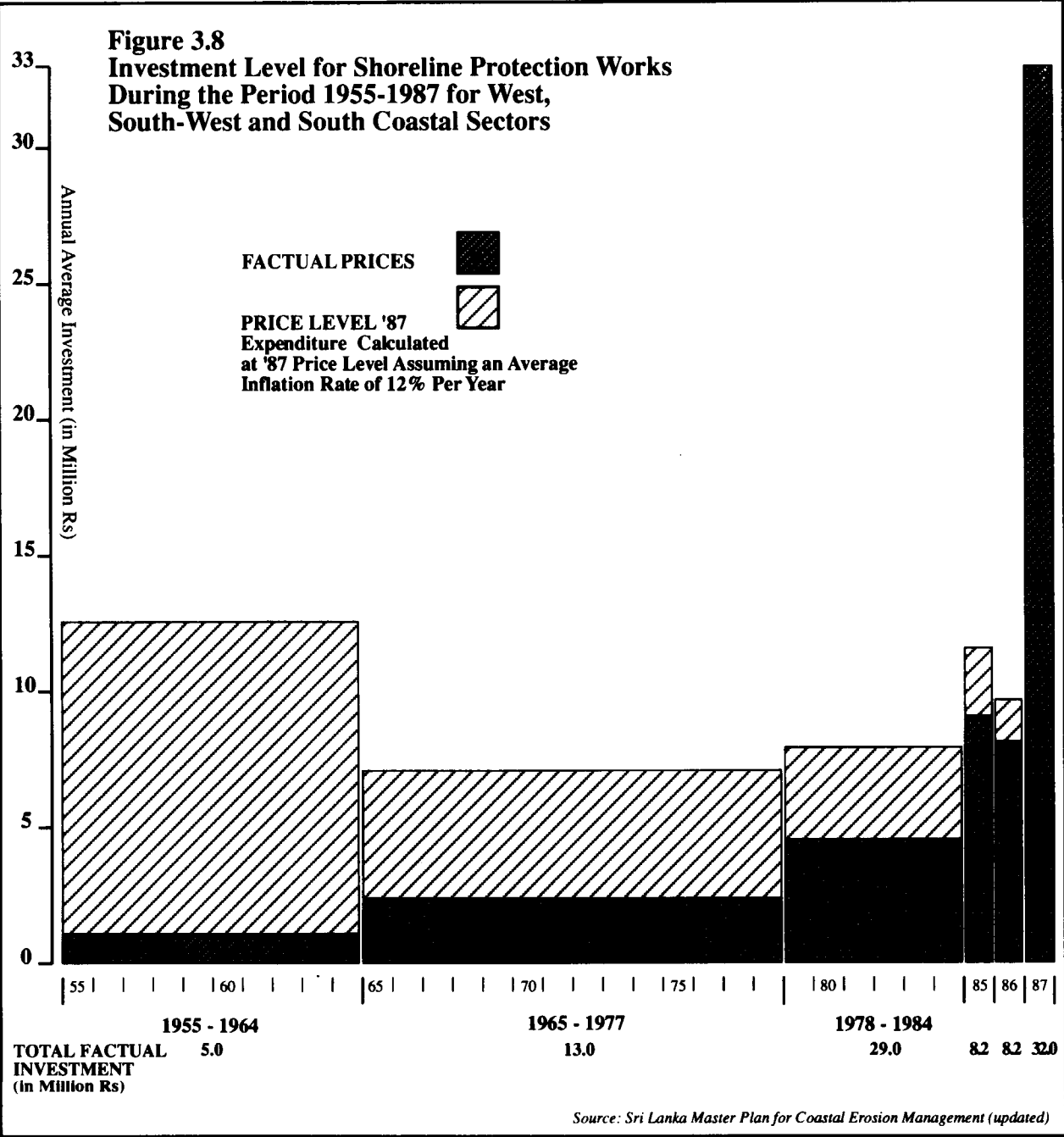
It is the objective of the CCD to ensure that the location of development activities in the Coastal

Zone does not contribute to or aggravate erosion and that development does not occur in hazardous areas.

Policy 3.2.1.1 New construction may be permitted only in accordance with the setback standards set forth in Chapter 2; Table 2.2.

OBJECTIVE 3.2.2

It is the objective of the CCD to ensure that erosion control techniques are cost effective and socially and environmentally acceptable.



Policy 3.2.2.1 Schemes for coast protection implemented by CCD shall be consistent with the Master Plan for Coast Erosion Management.

Policy 3.2.2.2 Shoreline protection schemes implemented by public or private entities other than the CCD may be permitted if consistent with the following guidelines:

- a) The proposed scheme is not in a zone designated “no build” by the CCD. “No build zones” are listed in Table 2.2.
- b) On the basis of sound professional information, applicants shall consider and evaluate non-structural measures and if they are deemed unsuitable, shall state engineering justifications for structural measures.
- c) Applications for structural measures to control erosion shall (i) demonstrate that the proposed structure has a reasonable probability of controlling the erosion problem; (ii) indicate what measures will be taken to minimise erosion in adjacent areas; (iii) demonstrate that the proposed structure is an appropriate solution to the erosion problem considering the long-term rate of erosion in the area, the likely effects of major storms and the stability of the shoreline on either side of the proposed project.
- d) Describe a long-term maintenance programme for the proposed facility including financial arrangements to pay for such maintenance.

Policy 3.2.2.3 Shoreline protection schemes may be implemented in response to a short-term emergency where life or buildings are immediately threatened if such protective schemes are consistent with the following guidelines:

- a) Such schemes will not cause increased erosion in adjacent areas.
- b) Permanent structures (e.g. boulders, revetments, groynes, sea walls) are not incorporated into such schemes.
- c) Materials and elements used for construction are of a nature that would not cause permanent alteration of the shoreline (e.g. gravel, sand, sand bags, gabions) and are easily removable.
- d) The developer monitors the effects of the schemes and implements corrective action, including removal, if CCD determines there are adverse impacts.

e) Such schemes are implemented in the full knowledge that they are temporary emergency measures designed to meet a particular situation and do not constitute long-term solutions.

f) Such schemes are consistent with the aims of ensuring public access and do not disrupt or significantly impede other existing activities (e.g. fishing, tourism, etc.).

Policy 3.2.2.4 CCD will conduct and support research on coastal processes relating to erosion and its control, including investigation into the feasibility of using vegetation to control erosion.

OBJECTIVE 3.2.3

It is the objective of the CCD to preserve and where possible restore coral reefs.

Policy 3.2.3.1 Breaking of reefs, collecting of debris and mining of coral is prohibited in the Coastal Zone.

Policy 3.2.3.2 The socio-economic impacts of the coral mining prohibition will be mitigated through CCD coordination of inter-agency efforts to provide alternative employment to displaced coral miners.

Policy 3.2.3.3 Alternative sources of lime will be sought to meet the requirements of the construction and agriculture industries.

Policy 3.2.3.4 Areas where reef restoration will impede erosion and provide additional habitat will be identified.

OBJECTIVE 3.2.4

It is the objective of the CCD to allow sand mining in the Coastal Zone within sustainable limits.

Policy 3.2.4.1 Sand mining may be permitted if it is consistent with the guidelines given in Table 3.6. The guidelines are designed to prevent increased erosion, destabilization of sand dunes, or increased turbidity in the vicinity of coral reefs.

Policy 3.2.4.2 When sand mining is permitted, it will be regulated through quotas, time schedule

stipulations, setbacks, site rotation, and the imposition of monitoring schemes.

Policy 3.2.4.3 Alternative sources of sand shall be identified to meet the requirements of the

construction industry.

Policy 3.2.4.4 Research shall be conducted to define sustainable yield limits and site specific sand budgets.

Table 3.6

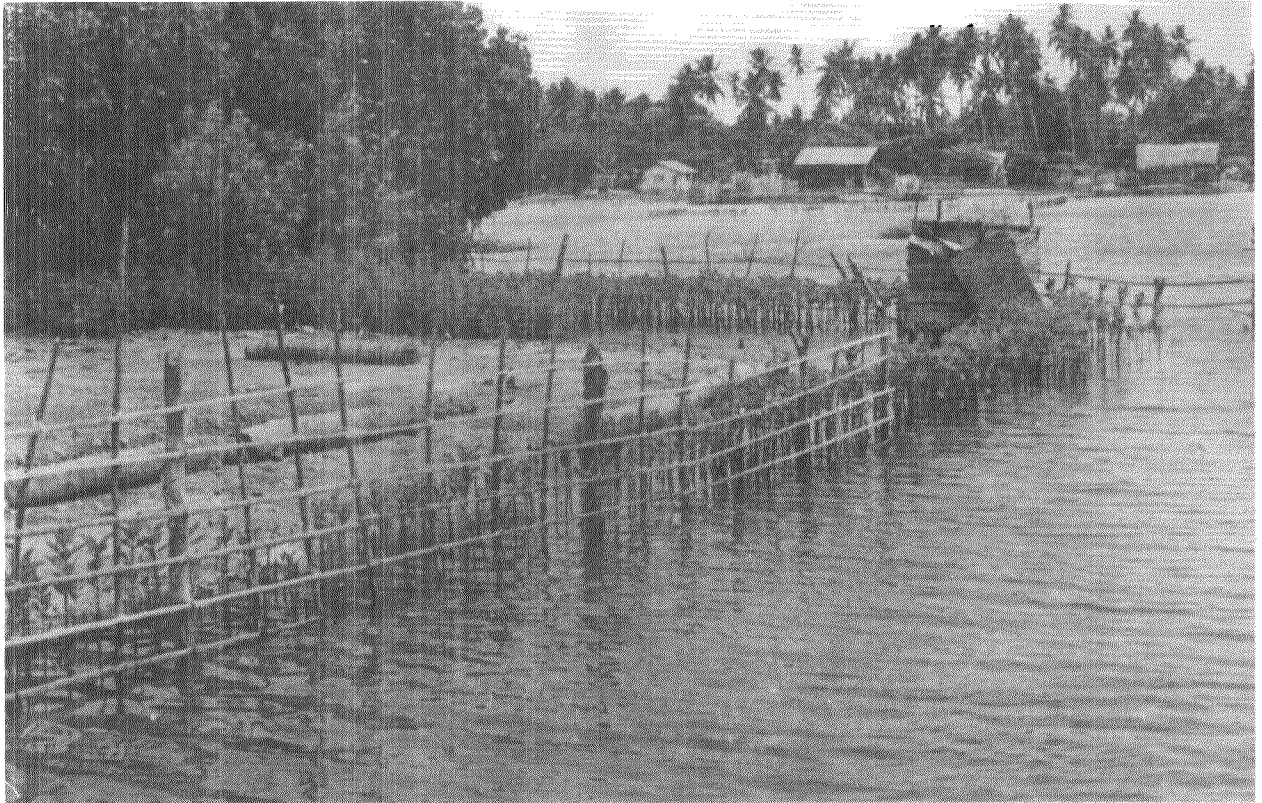
Guidelines for Sand Removal in the Coastal Zone

It is recognized that removal of sand from estuaries, beaches, spits, dunes and sand bars will contribute to coastal instability. However, as these have been traditional sources providing sand essential for building and other activities, the following guidelines will be applied in the issue of permits pending the location of alternate supply sources:

1. **Riverine estuaries.** Removal of sand may be permitted where the downstream beaches do not indicate signs of deficient sand supply. A minimum distance that must be maintained between the mining site and the river mouth will be specified in each permit.
2. **Beaches, barrier beaches and spits.**
 - a) Removal of sand from non-accreting beaches, barrier beaches and spits is not permitted.
 - b) Removal of sand from accreting beaches may be permitted if such removal will not cause adverse environmental impacts in adjacent sites.
3. **Multiple dune systems and stable reservoir areas.** Removal of sand from multiple dune systems or stable reservoir areas known to be the termini of sand circulation cells may be permitted. When sand mining is completed, the developer must re-plant the dune with appropriate vegetation to prevent further sand loss due to wind erosion. Backfilling will be carried out by the developer as specified by CCD.
4. **Sand bars.** Sand removal may be permitted if: a) downdrift areas are not already eroding; b) such removal will not contribute to erosion of the shore or in downdrift areas. Sand bar breaching may be permitted to allow free flow of backwaters during flood periods. If the adjacent areas or the littoral cell concerned indicates a deficient sand budget, sand so removed shall not be removed out of the littoral cell.
5. **Offshore areas.** Offshore sand mining will not be permitted within the 5 fathoms contour or 1000 meters seawards from the low water mark, whichever is furthest. Where there are fringing coral reefs or sandstone reefs, sand mining in the area between the reef and the shore will not be permitted. Offshore sand mining may be permitted in other locations if the following conditions are met:
 - a) The developer carries out, at his cost, investigations deemed necessary by the CCD and submits to CCD all required documentation for evaluation of the permit application.
 - b) The mining site is located as far as possible from any living coral reefs. The CCD will specify the minimum distance between the mining site and the nearest coral reef.
 - c) The mining is restricted to a depth, determined by CCD for a particular site.

Methods of mining, stockpiling of mined sand, method of transfer from the mining site to storage site, and storage site to retain/disposal sites will be specified by CCD.

Management of Coastal Habitats



4.1 FINDINGS

4.1.1 Nature of the Problem

Sri Lanka's Coastal Zone consists of a diversity of shoreline and nearshore habitats. These habitats support many of the nation's coastal fisheries and, in their natural state, provide the nation with a buffer against the sea's erosive force. Many of Sri Lanka's important coastal habitats are being degraded. The problems of increasing pressures of population, the need for expanding settlements, the need for industrial development and increasing exploitation of resources will continue and intensify. The challenge is to manage the development and use of natural habitats in a manner that will provide sustainable yields. The physical and ecological characteristics of many of Sri Lanka's coastal habitats make them espe-

cially susceptible to degradation. These habitats are small, they lack resilience and have a low threshold for irreversible damage. Once degradation exceeds the limit set by the low threshold, rehabilitation becomes prohibitively expensive or impossible.

Management of natural habitats is a new responsibility for the CCD. The 1981 Coast Conservation Act requires an inventory of coastal habitats and an analysis of their significance. It also requires that the CCD prepares a plan for the preservation and management of scenic and other natural resources. Wise management of coastal habitats is a difficult, challenging task which the CCD cannot accomplish by itself. Activities that occur outside the legally defined Coastal Zone can and often do have overriding impacts on coastal habitats. In addition, a number of govern-

mental agencies share responsibility for aspects of coastal habitat management.

The CCD has embarked on a process to develop coordinated management strategies for Sri Lanka's coastal habitats. The process included mapping of the coastal habitats on a scale of 1 to 63,360 using available aerial photography and detailed maps (CCD Internal Report No. 13: Report on the Preparation of Maps Indicating Coastal Habitats, 1986). The CCD also commissioned a summary of available information on Sri Lanka's coastal habitats and a preliminary identification of management issues and priorities for management and research (CCD Internal Report No. 14: Synthesis Report—Information on Critical Habitats in the Coastal Zone, 1986). In May of 1986 the CCD conducted an inter-agency workshop on the management of Sri Lanka's coastal habitats. The workshop's objectives were:

- a) To review management objectives for each type of coastal habitat;
- b) To review and rank the major management issues for each habitat;
- c) To identify the research that will be most helpful in understanding how to better manage each habitat;
- d) To identify on-going management efforts and research;
- e) To identify the management initiatives that can be implemented immediately or in the near future.

Forty-nine participants representing governmental agencies concerned with the management of coastal habitats and non-governmental organizations concerned with environmental conservation attended the workshop. The workshop proceedings are available from the CCD (CCD Internal Report No. 15: Report on Workshop on Management of Coastal Habitats in Sri Lanka, 1986).

The findings, policies and management strategies which follow are an outcome of the previously described process. The process of developing integrated strategies for management of Sri Lanka's coastal habitats will continue into the future. Its success will require the continued cooperation and involvement of governmental and non-governmental agencies concerned about

coastal habitats and their uses, and of the people who rely on these habitats for their livelihood and way of life.

4.1.2 Identification and Characterization of Sri Lanka's Natural Coastal Habitats

Coastal habitats considered in this Plan are coral reefs, estuaries and lagoons, mangroves, seagrass beds, salt marshes, barrier beaches, spits, and dunes. Estimates of the aerial extent of each habitat type are shown in Table 4.1. Other coastal habitats such as sandstone reefs are not specifically addressed in this Plan because of a lack of information. Also, the relationship between coastal habitats and fish populations and their dynamics are not discussed. A separate governmental agency exists specifically for fisheries management. It should be noted, however, that fishery productivity depends largely upon the proper management of the coastal habitats discussed in this chapter.

While the six coastal natural habitats are discussed separately, this does not imply they are independent units. Coastal natural habitats are linked together by a complex web of direct and indirect interactions. Disruption of any one of these interactions has effects on the others.

Land use practices in river basins which empty into coastal waters also have a major impact upon coastal habitats. These are not specifically addressed, as the CCD currently has no jurisdiction over such activities. However, successful management of coastal habitats will require coordination with authorities responsible for upland activities.

4.1.3 Managing Sri Lanka's Natural Coastal Habitats

Management of human activities within coastal habitats is a challenging task. Management is most meaningful when it is geographically specific and based on well understood links between human activities and changes within a natural system. Unfortunately, these links are often poorly understood.

The known uses of the six coastal habitats are classified under each habitat type as non-ex-

tractive, extractive and transformative to facilitate discussion and public awareness with respect to conflicts among them. The non-extractive uses refer to activities such as recreation, research and education which do not necessarily involve removal of material from the habitats. Extractive uses involve removal of renewable materials such as fish, coral and mangrove wood. Transformative uses result in structural, functional or topographic changes, for instance, in landfill of estuaries. There is a degree of overlap among the uses, for instance, a non-extractive use such as discharge of wastes into an estuary may cause eutrophication and thereby produce a transformation in ecosystem functioning. Similarly an extractive use which causes excessive depletion of renewable resources such as coral mining results in transformation of a habitat.

This chapter of the Plan defines management issues in each coastal habitat, identifies specific management objectives, and identifies initiatives that must be adopted in order to address these issues (management policies). Regu-

latory policies for the management of Sri Lanka's coastal habitats are set forth in Section 4.2 and 4.3. The CCD's management policies for coastal natural areas rely on regulatory and non-regulatory initiatives such as enhanced intergovernmental coordination, research to more fully understand important coastal problems, and educational activities that enhance coastal resource users' understanding about the need for management.

4.2 MANAGEMENT OBJECTIVES AND POLICIES

OBJECTIVE 4.2.1

The CCD will, where possible, preserve coastal habitats and natural features of exceptional value.

Policy 4.2.1.1 The CCD will prohibit or require modification of development activities where there is a reasonable probability that significant degradation will occur in existing marine

Table 4.1

Extent of Coastal Habitats by District (in hectares)

DISTRICT	MANGROVES	SALT MARSHES	DUNES	BEACHES, BARRIER BEACHES, SPITS	LAGOONS, BASIN ESTUARIES	OTHER WATER BODIES	MARSHES
Colombo	39	-	-	112	-	412	15
Gampaha	313	497	-	207	3442	205	1604
Puttalam	3210	3461	2689	2772	39119	3428	2515
Mannar	874	5179	1458	912	3828	2371	308
Kilinochchi	770	4975	509	420	11917	1256	1046
Jaffna	2276	4963	2145	1103	45525	1862	149
Mullativu	428	517	-	864	9233	570	194
Trincomalee	2043	1401	-	671	18317	2180	1129
Batticaloa	1303	2196	-	1489	13682	2365	968
Ampara	100	127	357	1398	7235	1171	894
Hambantota	576	318	444	1099	4488	1526	200
Matara	7	-	-	191	-	234	80
Galle	238	185	-	485	1144	783	561
Kalutara	12	-	4	77	87	476	91
TOTAL EXTENT	12189	23819	7606	11800	158017	18839	9754

SOURCE: CCD Internal Report No. 13: Report on the preparation of maps indicating coastal habitats, 1986.

NOTE: The project included an area of approximately 2 km inland from the coastline. Sources of data were existing maps available at the Survey Department and air photographs for some areas. The maps were not ground truthed.

sanctuaries and bird and wildlife sanctuaries in the Coastal Zone. The CCD may, from time to time, designate additional sites as areas of exceptional value with a view to having them declared as conservation areas under the Fauna and Flora Protection Ordinance.

Policy 4.2.1.2 The CCD will cooperate with other relevant governmental and non-governmental agencies to develop protection and management plans for natural areas of exceptional value.

OBJECTIVE 4.2.2

The CCD will promote sustainable development of resources found within coastal natural habitats. Since such development may sometimes degrade natural habitats, it is the objective of the CCD to mitigate the adverse impacts of development.

Policy 4.2.2.1 It is CCD policy to promote inter-agency cooperation in development planning in order to minimize adverse impacts on coastal natural habitats.

Policy 4.2.2.2 It is CCD policy to prohibit or require modification of development activities where there is a reasonable probability that significant degradation or destruction of the coastal habitat is likely to occur. In considering the impacts of proposed activities, the CCD will be especially concerned about the impacts listed in Table 4.2.

Policy 4.2.2.3 It is CCD policy to encourage and directly sponsor scientific research on coastal natural habitats as it relates to CCD management objectives.

Policy 4.2.2.4 It is CCD policy to promote awareness of the nature and significance of coastal natural habitats.

Table 4.2
Potential Impacts of Particular Concern to the CCD, by Coastal Habitat

<i>Coastal Habitat</i>	<i>Impacts of Particular Concern to the CCD</i>
1. Coral Reefs¹	Physical damage to coral reefs and collection of reef organisms beyond sustainable limits Increases in freshwater runoff and sediments Introduction of waterborne pollutants
2. Estuaries/Lagoons	Encroachment Changes in sedimentation patterns Changes to the salinity regime Introduction of waterborne pollutants Destruction of submerged and fringing vegetation Inlet modifications Loss of fishery habitat
3. Mangroves	Changes in freshwater runoff, salinity regime and tidal flow patterns Excessive siltation Introduction of pollutants Conversion of mangrove habitat and over harvesting of resources
4. Seagrass Beds	Physical alternations Excessive sedimentation or siltation Introduction of excessive nutrients or pesticides
5. Salt Marshes (Tidal Flats)	Degradation of bird habitat or seed fish collection sites Obstruction of storm water runoff
6. Barrier beaches, Sand Dunes and Spits	Sand mining Erosion Dune migration

¹ See also Policy 3.2.3.1 which prohibits the breaking of reefs, collecting of debris and mining of coral.

4.3 COASTAL HABITATS IN SRI LANKA

CORAL REEFS

a) DEFINITION

Coral reefs consist of a large rigid structural mass of calcium carbonate formed by the cemented skeletal remains resulting from the successive growth and development of hermatypic corals. Coralline algae also contribute to the structural foundation of the reef. The corals constitute the more important component since they give vivid colour and impressive three dimensional form to the reef.

b) NATURE AND SIGNIFICANCE

Coral reefs in Sri Lanka front 2 to 3 percent of the nation's total shoreline. They are mostly of the fringing type, meaning they occur adjacent to shore and grow from the sea floor usually on a nucleus of rock, e.g. Hikkaduwa. Barrier reefs, which are ridges of corals lying some distance from shore and running parallel with it, are rare in Sri Lanka. Examples of barrier reefs are the formations at Vankalai and Silavathurai. Both fringing and barrier reefs dissipate wave energy and are important for coastal stability and as a source of beach material (see also Chapter 3). This was geographically demonstrated when coral mining was stopped in the Vanderloos Bay area, and beach building became evident within two years.

Coral reefs occur in shallow coastal waters that are clear and free from excessive freshwater and nutrients. Growth of corals is tied to the presence of microscopic symbiotic plants in their body walls. These plants require sunlight that passes through the clear, shallow water. According to NARA surveys, 166 species of hermatypic (reef building) corals of varied shape and size have been recorded from Sri Lanka waters. The staghorn coral (*Acropora* spp.) is the dominant species.

Spatial heterogeneity is a key reef characteristic providing diverse living opportunities for a multitude of plants and animals. This spatial heterogeneity is lost when corals are broken or

removed at a rate exceeding their regenerative capacity. Loss of spatial heterogeneity inevitably results in a general decrease in the diversity of coral reef organisms. The growth rate of corals is slow and varies between 2 cm per year for the boulder-like brain coral and 20 cm per year for branching corals.

When physical damage occurs, its consequences can be rapid and obvious. Coral reefs can become masses of rubble encrusted by algae no longer having the vibrant colour, beauty and productivity that once characterized them. The Hikkaduwa reef dramatically shows physical damage to reefs.

Reef degradation by pollution, however, is insidious and the manifestation of damage occurs over a prolonged period. This process is seen in some of the reefs at Vanderloos Bay where white patches on boulder corals, on close examination, correspond to areas where corals have died. In Polhena, retting of coconut husks in the intertidal region has led to the destruction of coral reefs. Once the living component is removed and the capacity for self repair lost, the structural foundation of a coral reef is rapidly eroded by wave action.

c) ACTIVITIES SUPPORTED

Coral reefs in Sri Lanka support a variety of uses, which are briefly summarized in the following paragraphs.

Non-extractive uses

Tourism: Coastal tourism is a major economic activity in Sri Lanka and one that is likely to grow (see also Chapter 5). Living coral reefs provide an attraction for recreation and are important for maintaining the white beaches that tourists cherish. Local employment and income directly related to coral reef viewing include operation of glass bottomed boats, trade in reef products and rental of underwater gear.

Science and Education: Since coral reefs are located nearshore they are easily accessible for study and research. Research on coral reefs is being conducted by NARA, the University of Colombo, and the University of Kelaniya.

Extractive uses

Coral Mining: The extent and economic significance of coral mining in Sri Lanka is described in Chapter 3. This is the human activity causing greatest damage to Sri Lanka coral reefs.

Ornamental Fish and Reef Products: Collection and export of coral reef fish and shells earns a substantial quantity of foreign exchange. Quantitative data on this industry is lacking but this trade is thought to have seriously depleted many reefs.

Fisheries: Angling and fishing with spear guns are relatively small-scale activities on Sri Lanka's coral reefs. Destructive commercial fishing with set nets and explosives are also carried out at reefs along the eastern and southern coasts.

Transformative uses

Anchorage: Fishermen living in the vicinity of coral reefs recognize the convenience of anchoring their mechanized boats in the sheltered waters located behind coral reefs. Reefs are sometimes breached with explosives in order to gain access to these sites.

d) MANAGEMENT ISSUES

The management of coral reefs for sustainable yields requires that their spatial heterogeneity be preserved and that the reef organisms be protected. The following have been identified as important for the management of coral reefs for sustainable yields.

- Better enforcement of existing legislation for the prohibition of coral mining;
- Provision of alternative sources of employment to those engaged in coral mining;
- Location and exploitation of alternative sources of lime for industrial use;
- Better control of reef blasting for provision of navigational access to fishing boats with a view to minimizing reef damage;
- Control of collection of ornamental fish and other reef organisms to ensure that collection is kept within sustainable limits;
- Regulation of activities that contribute to in-

creased sedimentation and freshwater inflow and pollution in the vicinity of coral reefs;

- Better enforcement of existing legislation and drafting new legislation for the prohibition of destructive methods of fishing.

e) MANAGEMENT OBJECTIVES

The basic management objective for coral reefs is, where possible, to preserve them. More specifically the objectives for the management of coral reefs are:

- To preserve reefs as unique living resources which are part of Sri Lanka's natural heritage, as well as for their importance in maintenance of fisheries and as a natural buffer against coastal erosion.
- To maintain reefs as a scientific, educational and tourist resource.
- To ensure that removal of reef organisms, such as aquarium fish, does not exceed sustainable levels.

4.3.1 MANAGEMENT POLICIES FOR CORAL REEFS

Policy 4.3.1.1 Breaking of reefs, collecting of debris and mining of coral is prohibited in the Coastal Zone.

Policy 4.3.1.2 Limited collection of coral may be permitted by the CCD if the collection is for valid scientific research purposes.

Policy 4.3.1.3 In considering proposed development in the vicinity of coral reefs, the CCD will ensure that adverse impacts of increases in freshwater runoff and sediments and the introduction of waterborne pollutants will be minimised.

Policy 4.3.1.4 CCD will cooperate with other governmental agencies to map and develop a zoning system for coral reefs that identifies areas for preservation and establishes categories of allowable uses for other reef areas. Priority attention will be given to reefs currently utilized for recreation and tourism. (A multiple use zoning plan for the Hikkaduwa Marine Sanctuary has been formulated by NARA).

ESTUARIES AND LAGOONS

a) DEFINITIONS

An Estuary is a semi-enclosed coastal body of water, which has a free connection with the sea, and within which sea water is measurably diluted by freshwater derived from land drainage. From a management point of view, the estuaries in Sri Lanka need to be subdivided as basin estuaries and riverine estuaries, since the main management issues for the two types are fundamentally different.

Basin Estuaries form where rivers discharge into relatively shallow expanded basins which in turn connect with the sea, e.g. Negombo Lagoon, Puttalam Lagoon. Numerous coastal bodies of water that are named as lagoons (Puttalam Lagoon, Negombo Lagoon, Chilaw Lagoon, Jaffna Lagoon, Batticaloa Lagoon) are basin estuaries.

Riverine Estuaries are formed by rivers discharging directly into the sea by way of relatively narrow channels, e.g. Kelani Ganga estuary, Nilwala Ganga estuary.

Lagoons are coastal bodies of water containing brackish water which are either permanently separated from the sea or are connected with the sea only during part of the year.

b) NATURE AND SIGNIFICANCE

Sri Lanka's estuaries and lagoons are shown in Figure 4.1. Many of these estuaries are closely linked with the major urban centers along the coast. As populations increase and urban expansion continues, the estuaries, in addition to their natural functions, are required to support a widening range of human activities.

Sri Lanka's estuaries support a wide range of commercially important organisms that contribute both to estuarine and nearshore fisheries. It is important to note that some 90 percent of organisms of commercial importance captured in estuaries and lagoons arrive as migrants from the sea. This productivity depends largely on the estuary's mix of fresh and marine waters in providing and renewing nutrients, organic materials and oxygen, and water circulation patterns

that provide high mixing rates. Sand transported by rivers into the sea by way of riverine estuaries is important to beach maintenance.

The eventual fate of basin estuaries and lagoons is extinction by sedimentation, stabilization of shoals by vegetation, barrier formation by longshore drift or opening up of an estuary mouth by erosion to form a bay. The pace of extinction depends primarily upon geomorphology but can also be affected by human activities.

c) ACTIVITIES SUPPORTED

Sri Lanka's estuaries and lagoons acquire economic significance because of the many human uses they support. Their fisheries provide employment to a significant proportion of the coastal community.

Non-extractive uses

Estuaries and lagoons are used as harbours, disposal sites for sewage and industrial effluents, recreation, science and education, some forms of aquaculture and for transport. Estuaries have provided anchorage for both trading and fishing vessels since historical times and continue to do so today. Both sewage and industrial effluents are discharged into estuaries in the vicinity of urban areas (e.g. Kelani Ganga, Negombo Lagoon) and industrial centers (e.g. Negombo Lagoon, Valaichchenai Estuary). Some estuaries (e.g. Negombo Lagoon, Bentota Ganga, Bolgoda Lake) are important for tourist recreation. Sri Lanka's estuaries and lagoons are the major focus of research and education in marine science since access is possible with minimal expenditure. Raft culture of mussels and oysters is being conducted on an experimental scale in Trincomalee Bay, Puttalam Lagoon, Ratgama Lake and Mirissa harbour. Timber is transported along the Kelani Ganga estuary. There have been recent efforts also to link Puttalam and Colombo by way of the Dutch Canal and the Hamilton Canal.

Extractive uses

Fishing is undoubtedly the most important extractive use of estuaries and lagoons, as it provides employment to thousands of coastal resi-

Figure 4.1
Basin Estuaries and Lagoons

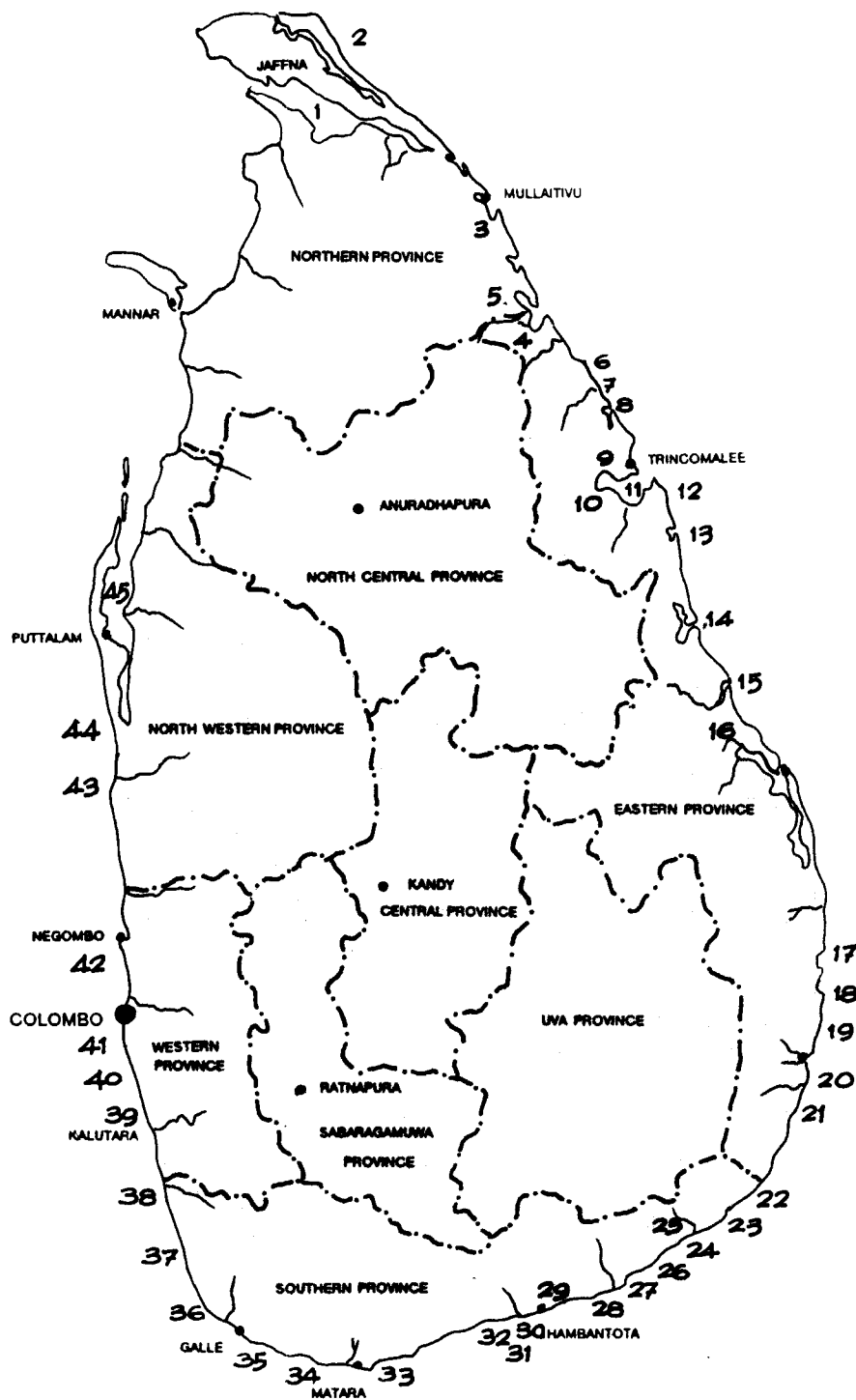


Figure 4.1
Basin Estuaries and Lagoons

1. Jaffna Lagoon
2. Thondaimannar Lagoon
3. Nanthi Kadal
4. Kokkilai
5. Nayar
6. Kuchchaveli
7. Periyakarachchi
8. Sinnakarachchi
9. Uppuweli
10. Thambalagam Bay
11. Koddigar Bay
12. Ilakkantai
13. Ullakkalie Lagoon
14. Upaar Lagoon
15. Vandeloos Bay
16. Batticaloa Lagoon
17. Periya Kalapuwa
18. Thandiadi Kalapuwa
19. Komari Kalapuwa
20. Arugam Bay
21. Okandawara Bay
22. Palutupana Mahalewaya
23. Bundala Lewaya
24. Embilikala Lewaya
25. Malala Lewaya
26. Koholankola Lewaya
27. Maha Lewaya
28. Karagan Lewaya
29. Lunama Kalapuwa
30. Kalametiya Kalapuwa
31. Kahanda Kalapuwa
32. Rekawa Kalapuwa
33. Mawella Lagoon
34. Dondra Kalapuwa
35. Koggala Lake
36. Ratgama Lake
37. Madampe Lake
38. Dedduwa Lake (Bentota)
39. Kalutara Lagoon
40. Bolgoda Lake
41. Lunawa Lagoon
42. Negombo Lagoon
43. Chilaw Lagoon
44. Mundal Lake
45. Puttalam Lagoon

dents and these numbers are increasing. For instance in 1972, the total number of fishermen dependent on the fishery from Negombo Lagoon was 1,684. In 1983, this number had increased to more than 2,000, while catch per unit effort appears to be decreasing.

Sand mining in riverine estuaries in the western and south-western coastal sectors has been estimated to provide direct employment to some 1,900 persons. Construction work at nearby urban centers is highly dependent upon this estuarine sand (see Chapter 3).

Seed fish/shrimp collection demand will increase as coastal aquaculture expands in accordance with state policy. The small scale aquaculturist will depend upon estuaries as a primary source of fish and seed shrimp. At the same time, polychaete extraction from estuaries will also increase to keep up with demand for broodstock feed at commercial shrimp hatcheries.

Ornamental fish collection from estuaries provides employment as well as supplementary incomes to members of coastal communities in the vicinity of estuaries such as Negombo Lagoon, Bolgoda Lake and Trincomalee Bay. Although estimates are not available, the total number of people so employed is considered to be substantial.

Transformative uses

Estuarine habitat conversion: The human activities which result in estuarine habitat conversion in Sri Lanka are desalination, landfill and some forms of aquaculture.

Desalination of some estuaries and lagoons has occurred through implementation of development plans or as the result of non-integrated planning. For example, in Thondaimannar Lagoon desalination was attempted with the objective of providing irrigation; but the project was subsequently abandoned. Freshwater from irrigation systems associated with Udawalawe Dam was discharged into Kalametiya Lagoon again in the interests of agricultural expansion. Both projects failed to produce anticipated results, and the consequences were loss of estuarine habitat and fishery productivity.

Landfill reduces portions of an estuary's effective water area. Landfill in estuaries and lagoons is most often carried out for housing construction projects or for urban expansion. Examples include Munnakkara, which is a stabilized shoal in Negombo Lagoon that has been expanded by landfill for housing. Siltation of peripheral areas has increased, resulting in an expansion of mangroves. Encroachment by mangroves into areas of open water has also oc-

curred at Koggala Lagoon where a sand barrier blocks the lagoon mouth. Sections of Trincomalee Bay have been filled for construction of industrial projects. Individuals residing on the shoreline sometimes encroach into the estuaries to increase their land holdings.

Pond aquaculture and pen culture also transform segments of estuaries and lagoons. Some 7.2 hectares in Batticaloa Lagoon have been converted into a pond by dykes constructed in a shallow area. Pens constructed in Puttalam Lagoon, Bolgoda Lake and in Negombo Lagoon have restricted the availability of the lagoons for community use.

d) MANAGEMENT ISSUES

The factors that result in estuarine habitat degradation are not discrete. Usually they interact and often their adverse impacts are synergistic. Shoal formation, for instance, not only decreases the water area, but it also decreases the substratum available for growth of seagrasses and in turn decreases available feeding and breeding grounds for several species of fish. Major management issues in Sri Lanka's estuaries and lagoons include:

- **Maintenance of water area:** Natural processes as well as human activity cause reduction in effective water area of estuaries and lagoons. Natural processes include sedimentation and encroachment by shoreline vegetation. Human activities such as encroachment, poor soil management in upland agriculture, deforestation, and damming of rivers can and often do change the quantity and patterns of sedimentation and cause accelerated filling of estuaries and lagoons.
- **Maintenance of water quality:** Available information on water quality in estuaries and lagoons in Sri Lanka is limited. Recognized causes of degradation in estuarine/lagoonal water quality are changes in the quantity and timing of freshwater inflow, discharge of industrial effluents, discharge of domestic sewage and garbage, dumping of waste oil from mechanized boats and agricultural runoff.
- **Maintenance of fishery and sand resources:** Regulation and control of exploitation of fish-

ery and sand resources and use of destructive fishing techniques are priority management issues.

Maintaining a free connection with the sea:

The main functions of estuaries and lagoons and other coastal habitats are delivery of sediments and nutrients to downstream habitats, and provision of nursery and feeding grounds for fishery organisms. Continuation of these functions depends upon a free connection between the sea and estuary.

However, a distinction has to be made between basin estuaries and riverine estuaries as the major human uses of these two types are different. The primary activity in the former is fishing while in the latter is sand mining. Management measures must take this into account.

e) MANAGEMENT OBJECTIVES

The objectives for the management of estuaries and lagoons include maintenance of fishery habitat, maintenance and where possible restoration of water quality, protection of recreational values, and regulation of sand mining to levels that do not have an adverse impact on beach replenishment.

4.3.2 MANAGEMENT POLICIES FOR ESTUARIES AND LAGOONS

Policy 4.3.2.1 In considering proposed development within or adjacent to estuaries or lagoons, the CCD will ensure that impacts due to encroachment, sedimentation, desalination and pollution are minimised.

Policy 4.3.2.2 The CCD will cooperate with other governmental and non-governmental agencies to develop special area management plans for selected estuaries and lagoons.

MANGROVES

a) DEFINITION

Mangroves are salt-tolerant, woody, seed-bearing plants ranging in size from small shrubs to tall trees. They occur along sheltered intertidal coast-

lines; and in association with estuaries and lagoons. Although mangroves occur on saline soils they have the usual plant requirements of freshwater, nutrients and oxygen.

b) NATURE AND SIGNIFICANCE

Estimates of mangrove cover in Sri Lanka range from a low of 6,000 hectares to a high of 13,000 hectares. The CCD inventory estimated a total of 12,189 hectares of mangroves. This is a small percentage of Sri Lanka's total low energy coastal habitat (i.e. salt marshes, tidal flats, estuaries, lagoons). Since tidal amplitude in Sri Lanka rarely exceeds 75 cm, mangroves occur as a narrow intertidal belt and extend less than a kilometer landwards from the mean low water tidal level. There are 14 species of true mangroves and 12 species of mangrove associates in Sri Lanka. Because mangroves can grow on soil that is saline, often anaerobic and sometimes acidic, they out-compete plant species that are less tolerant of these conditions. Mangrove growth, however, requires freshwater, nutrients, oxygen and sunlight as do all other plants.

The most extensive mangrove stands occur in the Puttalam, Batticaloa, Trincomalee, Jaffna and Gampaha districts. They are absent along exposed shorelines affected by seasonally high wave energy in the southwestern, southern and north-eastern coastal sectors. Some dense localized stands occur in association with Koggala Lagoon and Kalametiya Lagoon which are lagoons that are more or less separated from tidal influence. The mangrove ecosystem can be a major source of food and nutrients to estuarine, lagoonal and nearshore coastal waters, and provides a nursery for the early stages of commercially important crustaceans and fish.

Mangroves stabilize shorelines against erosion, both in estuaries as well as along some segments of the eastern coast where their presence inhibits wave damage. Mangrove stands also help control runoff thereby reducing siltation in estuaries and seagrass beds.

c) ACTIVITIES SUPPORTED

Mangroves support a number of uses—some subsistence and some commercial—critical to

the welfare of some coastal communities. Permits are being issued for cutting down mangroves in certain areas by respective Government Agents under the provisions of the Forest Ordinance. More recently, mangrove areas have become the target for major development projects. The major activities supported by mangroves are as follows:

Non-extractive uses

Science and Education: Scientific research on mangroves has been promoted by a number of UNDP/UNESCO mangrove projects. The Universities of Colombo, Kelaniya and Peradeniya, NARA and the Forest Department are all engaged in various aspects of mangrove research. Mangrove ecology involving field work is now an essential component of university as well as pre-university curricula.

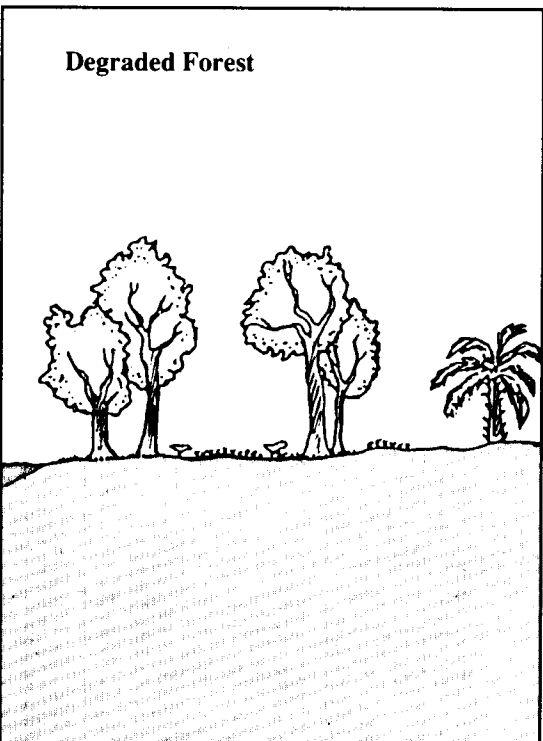
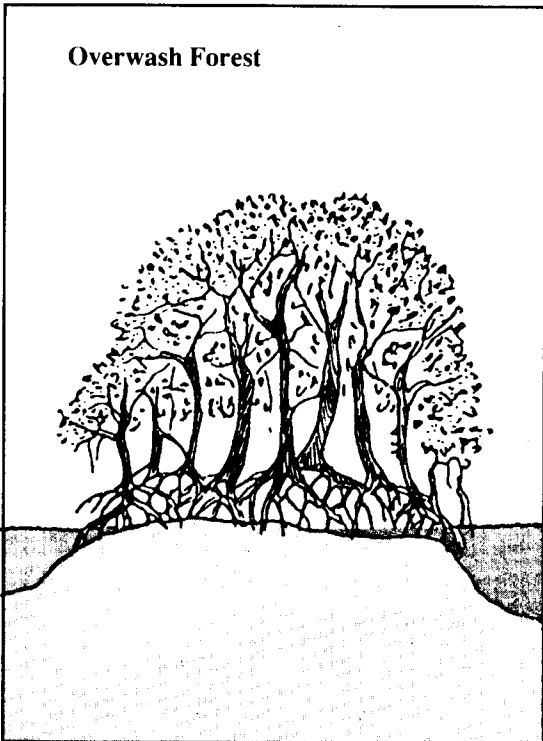
Extractive uses

Mangrove Harvest: Mangroves are widely harvested both through subsistence and commercial scale operations. Such harvests can be managed for sustainable yield. Mangrove firewood is used for domestic cooking, mangrove beams and poles are used for housing construction and fishing, branches are used for brush pile fishing, mangrove tannins are used for nets, and other parts for medicines, beverages, and green-leaf manure. Organized extraction of firewood for sale at urban centers (e.g. Jaffna), firing of bakeries (e.g. Puttalam), kilns (e.g. Batticaloa), and illicit distilleries (e.g. Chilaw) are resulting in harvests that exceed locally sustainable levels.

Transformative uses

Mangrove Conversion: The extent of mangrove conversion in Sri Lanka is not documented. Land reclamation for coconut and paddy cultivation are the major activities causing habitat conversion. Land reclamation for housing and urban expansion is occurring in the vicinity of coastal urban centers (e.g. Negombo, Trincomalee). Coastal aquaculture is a major cause of mangrove conversion in other countries. Brackish water aquaculture activities are increasing in Sri Lanka.

Figure 4.2
Mangrove Forest Types



d) NATIONAL MANGROVE COMMITTEE

A National Mangrove Committee has been established in the Natural Resources, Energy and Science Authority (NARESA) of Sri Lanka as the focal point to coordinate research and management of the island's mangrove ecosystems. The National Mangrove Committee is composed of representatives from the CCD and other governmental agencies and universities.

e) MANAGEMENT ISSUES

- Ensuring that exploitation of mangroves are contained within the acceptable limits, commercial extraction should be discouraged while extraction for traditional use within acceptable limits could be permitted. In this regard, grant of permits by the Government Agents under the Forest Ordinance needs to be reviewed. Since fringing mangroves are indispensable because of their fisheries' nursery function as well as providing a supply of detritus and nutrients, a total prohibition of mangrove extraction within a belt of specified dimension has to be implemented.
- Meeting demands for development in mangrove areas might involve confining development activity only to degraded mangrove forests. Such mangrove areas will have to be defined taking into consideration functional and social criteria in addition to biological criteria.
- Regulation of activities that contribute to increased siltation, pollution, changes in salinity regime, and tidal patterns in the vicinity of mangroves.

f) MANAGEMENT OBJECTIVES

The objectives for the management of mangroves are to preserve the mangroves as an important habitat for wildlife, a nursery for fish, a nutrient trap, and to enable extraction at a sustainable level.

4.3.3 MANAGEMENT POLICIES FOR MANGROVES

Policy 4.3.3.1 In considering proposed developments within or in the vicinity of mangroves within the Coastal Zone, the CCD will ensure that impacts of freshwater runoff, excessive siltation, oil pollution, and conversion of mangrove habitats are minimised.

Policy 4.3.3.2 The CCD will participate in the Sri Lanka National Mangrove Committee.

Policy 4.3.3.3 In carrying out its management responsibilities for development activities within or adjacent to mangrove habitats within the Coastal Zone, the CCD will pay due regard to the guidelines developed by relevant national agencies.

SEAGRASS BEDS

a) DEFINITION

Seagrass beds are composed of rooted, seed-bearing, marine plants (halophytes). They occur in shallow, nearshore coastal waters that are sheltered from high wave energy, and in estuaries and lagoons. The seagrasses, epiphytes and the abundant detritus found in seagrass beds together comprise a highly productive habitat that supports a large quantity of commercially important organisms.

b) NATURE AND SIGNIFICANCE

Seagrass beds are abundant along Sri Lanka's coast, although their locations and extents have not been precisely mapped and estimated. They form dense underwater meadows, the edges of which may be glimpsed during low tide. Seagrass meadows perform a number of natural functions. First, they provide relief on an otherwise featureless substratum, allowing epiphytic organisms to obtain sites for attachment and providing nesting habitat for numerous species of fish. They also provide habitats for the endangered dugong and the protected green sea turtle. Seagrass beds supply food to a wide variety of animals. Some herbivorous fish (e.g. parrot fishes) directly consume the leaves, while others, particularly

juvenile fish, feed upon epiphytes, and still others including some penaeid shrimp species feed upon grass detritus. Lastly, seagrass binds sediment and stabilizes it against erosion.

The major portion of marine fisheries production in Sri Lanka is obtained from the nearshore coastal waters along the northwestern and northeastern coasts. These are also the areas where seagrass beds are most extensive. The linkage between seagrass beds and fisheries production is direct and critical, but not quantified nor always recognized.

c) ACTIVITIES SUPPORTED

Non-extractive uses

Sediment stabilization: Dense seagrass foliage sharply decreases current speed at the water-sediment inter-phase and prevents sediment displacement.

Science and education: Because of the accessibility of estuarine seagrass beds, both research and university student projects are focussed on seagrass ecology.

Fishing: Seagrass beds along Sri Lanka's northwestern and northeastern coasts play an important role in supporting Sri Lanka's valuable nearshore coastal fisheries in this region. Some 13,000 fishing craft use this region as a fishing ground, using mostly bottom trawls and gillnets. The highest catch rate for demersal fishing recorded in Sri Lanka, 100 kilograms per hour, was obtained in the sector north of the Mannar Peninsula where seagrass beds are most dense.

Extractive uses

Polychaete harvests: Polychaete worms which are used as broodstock feed in commercial shrimp hatcheries are harvested from selected seagrass beds. The extent of such harvests are not known.

Direct harvests: A small scale direct use of seagrass is for fodder at some locations in the Mannar district.

d) MANAGEMENT ISSUES

The major management issues related to seagrass beds stem from activities that destroy the vegeta-

tion. The following have been identified as important for ensuring sustainable yields.

- Regulation of trawling to ensure that the types of gear used do not damage seagrass beds.
- Control of activities that affect estuarine seagrass beds, such as polychaete extraction and small mesh dragnet operations, to ensure that their breeding and nursery habitat functions are not disrupted.
- Regulation of development activities that could result in the release of sediment that could smother and destroy the vegetation.

e) MANAGEMENT OBJECTIVES

The objectives for the management of seagrass beds are to preserve seagrass beds as fisheries habitat and habitat for dugong and sea turtles.

4.3.4 MANAGEMENT POLICIES FOR SEAGRASS BEDS

Policy 4.3.4.1 In considering proposed development in the vicinity of seagrass beds, the CCD will ensure that physical alterations are prohibited, and excessive sedimentation or siltation, and introduction of nutrients or pesticides are minimised.

Policy 4.3.4.2 The CCD will identify a zoning scheme for utilization of seagrass beds that will enable fishing to co-exist with movements of the dugong and the green sea turtle.

SALT MARSHES

a) DEFINITION

Salt marshes consist of herbaceous, salt resistant plants growing in sandy or muddy tidal flats in arid areas which are periodically inundated by sea water. Salt marshes are common characteristics of coastal areas in the temperate region and they are generally replaced in the tropics by mangroves. Nevertheless, in some areas, tropical versions of salt marshes occur.

b) NATURE AND SIGNIFICANCE

Salt marshes in Sri Lanka mainly occur in regions where the dry season is prolonged as in the north,

northwest, northeast and southeast. Whereas the salt marshes in the northern regions occur mainly on exposed tidal flats, in the south they occur largely in the shelter of sand dunes.

Salt marsh vegetation in Sri Lanka typically occurs as sparse, short growths interspersed with scrub mangroves. In the Mannar district where tidal flats are more extensive, marsh vegetation contains up to 56 species. In the vicinity of Mundel Lake, there are salt marsh—mangrove associations. One theory for this type of salt marsh—mangrove association is suggested by changes that have occurred in mangrove stands in the Jaffna district. When the canopy is removed by firewood extractors, the soil becomes dehydrated and hypersaline, allowing salt marsh vegetation to develop at the site.

The major natural functions of salt marshes are nutrient supply to nearshore coastal waters, provision of bird habitat, supply of seed fish for coastal aquaculture and as a discharge area that absorb storm water runoff.

c) ACTIVITIES SUPPORTED

Salt marshes are not heavily utilized in Sri Lanka at the present time. However, in the future they are likely to be the focus for activities which require habitat conversion.

Non-extractive uses

Salt marshes support some tourism, bird watching, science and education activities. Bird watching by Sri Lankans and by tourists usually occurs on tidal flats that are associated with water bodies which serve as a habitat for migratory waterfowl.

Extractive uses

Grazing, waterfowl hunting and fish seed (milkfish) collection are also carried out in salt marshes. Grazing on salt marsh pasture is a relatively small-scale traditional activity. Hunting of waterfowl, which is illegal in Sri Lanka, has intensified in recent years to meet the demand, reportedly from tourist hotels. Collection of seed of milkfish from tidal pools situated in salt marshes in the Mannar District has been continuing since the 1960s.

Transformative uses

Since historical times, salt pans have been constructed on tidal flats with salt marsh vegetation. Such salt pans are situated in Hambantota, Trincomalee and Puttalam Districts. Shrimp aquaculture is a transformative use which is being actively promoted at the present time and it is likely to expand. The majority of sites selected for aquaculture projects have been salt marsh vegetation/scrub mangroves. Currently, this activity is limited to the Puttalam district. Dyke construction which impedes flow of storm water runoff is likely to increase the probability of flooding inhabited areas.

d) MANAGEMENT ISSUES

The salt marshes in Sri Lanka are a coastal habitat which can support development, and are currently viewed as preferred locations for salt pans and coastal aquaculture. However, the impact of such habitat conversion must be carefully evaluated and the amount of habitat to be devoted to such uses determined according to an integrated development plan. The adoption of proper site selection criteria and the development and implementation of required mitigation measures is essential.

e) MANAGEMENT OBJECTIVES

- To ensure the maintenance of salt marshes as important waterfowl habitat, as a buffer which protects coastal settlements from flooding (by storm water runoff and tidal surges) and where they help to protect an estuary or lagoon from chemical pollution in runoff from land.
- To ensure sustainable multiple use of salt marshes.

4.3.5 MANAGEMENT POLICIES FOR SALT MARSHES

Policy 4.3.5.1 In considering developments in or adjacent to salt marshes, CCD will ensure that the development will not significantly degrade important bird habitats or seed fish collection sites or significantly obstruct storm water runoff.

Policy 4.3.5.2 The CCD will support activities

to map distribution and extents, clarify ownership, and identify types and scales of development that can be accommodated on particular salt marsh areas in a manner harmonious with ecological and social needs.

Policy 4.3.5.3 The CCD will support research that will assist in identification and rehabilitation of particular sites by mangrove reforestation.

BARRIER BEACHES, SPITS AND DUNES

a) DEFINITION

Barrier beaches and spits: Barrier beaches are accumulations of unconsolidated sediment transported to shore by waves and moulded into a form that lies across a body of water and isolates it from the sea (e.g. Koggala Lagoon). Spits are essentially incipient barrier beaches that project from shore in the direction of dominant drift and are free at one end (e.g. the shoal that builds seasonally at the mouth of Negombo Lagoon).

Dunes: Dunes are wind blown accumulations of sand which are distinctive from adjacent landforms such as beaches and tidal flats. Although they resemble beaches they differ mainly with respect to absence of tidal effect. Dunes are unstable unless covered by vegetation.

b) NATURE AND SIGNIFICANCE

Barrier beaches and spits: Certain reaches of Sri Lanka's coastline consist of barrier beaches that isolate lagoons and swamps from the sea, and spits that partially enclose estuaries. Some of these formations have extensive dunes associated with them as at Kalpitiya. Other barrier beaches are free at both ends and form islands (e.g. Karaitivu). Barrier beaches predominate along the southern and southwestern coasts while spits are more common along the western and eastern coasts.

Sri Lanka's most prominent spits occur along the western and eastern coasts, forming in the direction of longshore drift. Most spits are unstable, regularly shifting position, and changing the location of estuarine inlets. For instance, the inlet of Batticaloa has moved to its present posi-

tion from a previous location 5 km south. Spits that obtrude into estuaries are especially unstable (e.g., the spit at the Kalu Ganga estuary). Some extensive spits (e.g. Kalpitiya) have been stabilized and are inhabited by relatively large populations.

Coast protection and sand supply are the major natural functions of barrier beaches and spits (see Chapter 3). In addition, some segments of beaches serve as nesting areas for sea turtles (e.g. Kosgoda). The dynamic spits that form seasonally at estuarine inlets obstruct natural water flow patterns, often resulting in the flooding of low-lying lands (e.g. Kalu Ganga and Maha Oya estuaries), and in decreased fishery productivity. For example, fishery yields at Koggala Lagoon declined sharply after a spit expanded into a barrier beach and sealed off the inlet.

Dunes: Prominent sand dunes in Sri Lanka are found along portions of the southern northeastern and northwestern coasts. Extensive dune systems stretch between Mullaitivu and Point Pedro, and Ambakandawila, Kalpitiya, Kirinda and Sangamakande Points.

The formation and persistence of dunes depends on the delivery of sand to the dune by wind and retention of sand by moisture and vegetation cover. Removal of vegetation results in dune migration as experienced in Manalkadu, Point Pedro in 1950.

Dunes serve as protective barriers particularly during storm conditions. Lowering of the dune by mining or by creating access to the beach decreases their effectiveness as barriers (e.g. Uswetekeiyawa).

c) ACTIVITIES SUPPORTED

Barrier beaches and spits

Non-Extractive uses

Fishing communities traditionally use barrier beaches and spits for beach landing of fishing craft, drying of fish and gear, defecation and housing. More recently, coastal tourism and recreation have emerged as prominent uses. In some instances conflicts between the new and traditional uses of beaches have occurred.

Extractive/Transformative uses

Mining of beach sand, a major extractive use, is discussed in Chapter 3. Spits that form seasonally at estuaries are breached (e.g. Maha Oya, Kalu Ganga) to prevent flooding. Such transformations need to be repeated annually. Other spits are removed to facilitate recruitment of juvenile shrimp and fish to the estuary after a barrier forms (e.g. Kokkilai Lagoon).

Dunes

Transformative uses

Housing construction is expanding into dunes at several locations (e.g. Hambantota, Ambakandawila). Both houses and temples are constructed at the dune system at Point Pedro. Agriculture and grazing are traditional activities of some importance in the dune habitat. Both activities result in the removal of natural dune vegetation and thereby indirectly contribute to removal of sand by wind.

Extractive uses

Sand mining for construction is the major extractive use of dunes, particularly at Point Pedro. Industrial mining of dune sand is gaining importance in Hambantota.

d) MANAGEMENT ISSUES

Barrier beaches and spits

Erosion is the major issue for beach habitat management (Chapter 3). In addition, barrier beaches and spits are threatened by faecal pollution in areas where there are temporary or permanent human settlements or where hotel operators are illegally discharging raw sewage/wastewater. Increased coastal development has also resulted in greatly reduced public access to beaches in several areas.

Dunes

Control of activities that contribute to destabilization of dunes is a major management issue. Destabilization of dunes occur because of unplanned construction activities and removal of sand and vegetation.

e) MANAGEMENT OBJECTIVES

Barrier beaches, spits and dunes:

The major objectives for the management of barrier beaches, spits and dunes are:

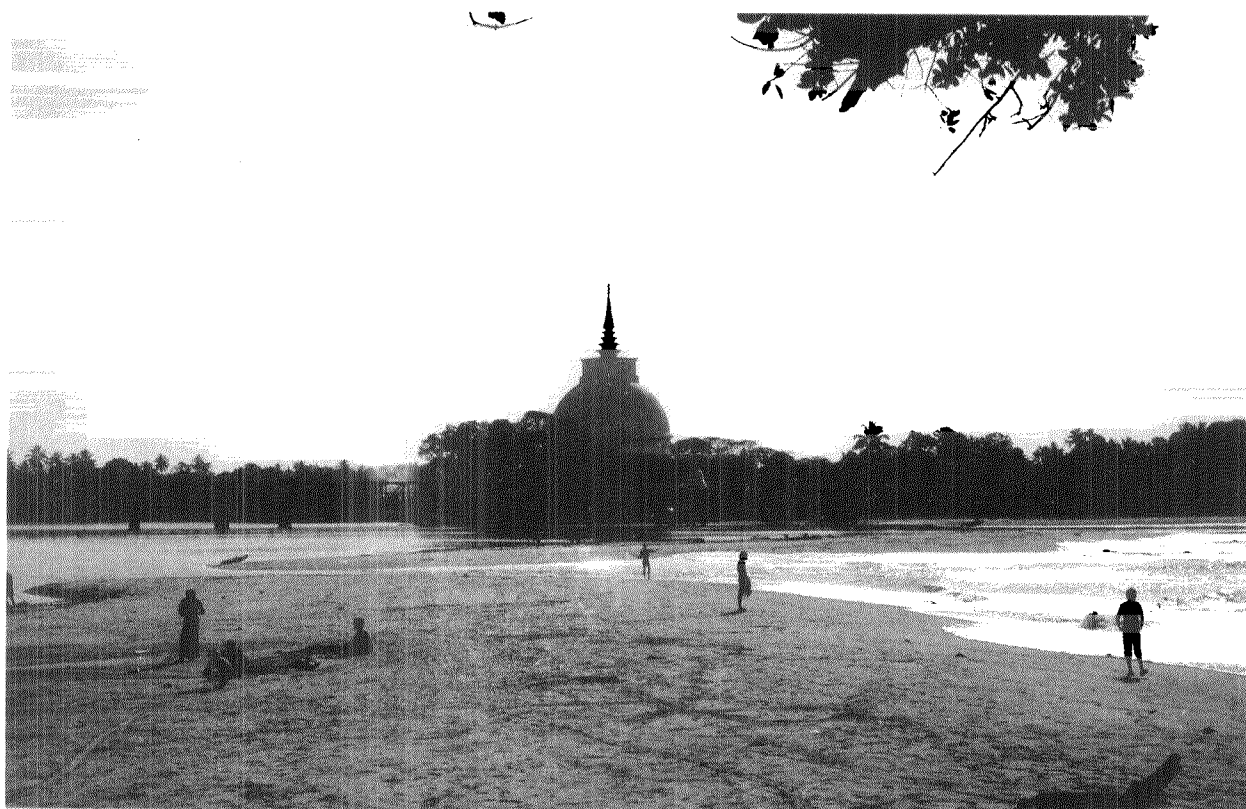
- To minimise human-caused erosion of beaches, spits and destabilization of dunes;
- To protect open space and aesthetic values for residents and tourists (see Chapter 5);
- To minimise use conflicts between traditional and new uses of beaches and dunes.

4.3.6 MANAGEMENT POLICIES FOR BARRIER BEACHES, SPITS AND DUNES

Policy 4.3.6.1 The CCD will support, promote and implement activities related to management of barrier beaches and spits in a manner that will be harmonious with social needs and ecological functioning of brackish water bodies.

Policy 4.3.6.2 The CCD will support, promote and implement activities that will be harmonious with dune stability.

Loss and Degradation of Archeological, Historical and Cultural Sites and Recreational and Scenic Areas



5.1 FINDINGS

5.1.1 Nature of the Problem

Sri Lanka's Coastal Zone contains many and diverse sites of archaeological, historical, and cultural significance. These sites provide valuable evidence of the pattern and progress of Sri Lankan culture and represent part of Sri Lanka's common heritage. Sri Lanka's Coastal Zone is also a place of great scenic beauty. Coastal landscapes and seascapes form variegated vistas of aesthetic beauty. Among these are picturesque bays, lagoons and coral reefs, wide sandy beaches,

sometimes with palm groves in the fringes, rocky terrain tumbling down to the beach, a few foci of water-trapped rock fissures functioning as seasonal blowholes, and wide salterns and lagoons abounding in birdlife.

The cultural and scenic resources of Sri Lanka's Coastal Zone make it a focus for its citizens' cultural and recreational activities. These same resources support the nation's important tourism industry. In 1985, which was a poor year for tourism, this industry generated earnings of Rupees 2,239 million and directly employed over 23,000 individuals.

Today, many of Sri Lanka's important archaeological, historical and cultural sites are threatened with inappropriate development. In some locations, important scenic areas are being degraded and public access to the shore obstructed. When archaeological or historical sites are destroyed, they are lost forever. Problems of loss and degradation result from both natural and human causes. Over time, structures exposed to weather deteriorate unless they are carefully protected. Unplanned and poorly planned development have degraded scenic areas, limited access to public places, and interfered with local fishing activities.

The Coast Conservation Act requires that the CCD Coastal Zone Management Plan should address itself to the preservation of important archaeological, historical and cultural sites, as well as the Coastal Zone's scenic beauty and important recreational areas. This will require the CCD to work in close cooperation with other governmental and non-governmental agencies concerned with the preservation of these resources.

5.1.2 Identification and Characterization of Sri Lanka's Important Archaeological, Historical and Cultural Sites, and Scenic and Recreational Areas

The first requirement for the preservation of important sites is their identification. In 1985, the CCD commissioned an inventory (CCD Internal Report No. 9, 1986: Inventory of Places of Religious and Cultural Significance and Areas of Scenic and Recreational Value I {Kalpitiya-Kirinda} and CCD Internal Report No. 10, 1986: Inventory of Places of Religious and Cultural Significance and Areas of Scenic and Recreational Value II {north and east coasts}), of the following types of sites within the Coastal Zone:

- Places of archaeological, historical and cultural significance;
- Areas of scenic and recreational value.

Information for the inventory was collected using the following sources:

- A library survey;
- Interviews with knowledgeable individuals;

- Review of survey maps and other early maps and illustrations;
- Field investigations. Site visits were not, however, made in the northern and eastern sections of the Coastal Zone from Puttalam to Kirinda (clockwise), hence sites in this area still require field investigation.

Archaeological, historical and cultural sites were categorised as follows:

- A. Monuments and sites of notable antiquity, historical associations, aesthetic value and/or those which are the focal point of religious activities; (*high priority*)
- B. Monuments and sites older than 50 years which are also of some added historical, aesthetic and/or popularity value;
- C. Religious monuments of recent origin, without any special aesthetic or popularity value.

5.1.3 SITES OF ARCHAEOLOGICAL SIGNIFICANCE

a) Definition

Sites of archaeological significance are all ancient sites, buildings and other structures, artifacts and other cultural sites datable to the year 1850 or earlier, which are already declared as archaeological sites and monuments, or are eligible for inclusion in the above.

b) Nature and Significance

The inventory identifies 26 sites of pure archaeological value and 65 sites which also have historical and/or cultural significance as high priority archaeological sites. Of these sites, those considered more important from the point of view of age or current public focus and aesthetic and popularity value are listed in Table 5.1 and their locations shown on Figure 5.1. Of these 91 sites, only 14 are declared sites of the Archaeology Department.

The sites and monuments of pure archaeological value include pre-historic sites (Usangoda, Bundala), and protohistoric sites (Pomparippu). In the second category, broadly classified as historic sites, are such entities as forts (e.g. Kalpitiya, Negombo, Mannar, etc.),

ports (e.g. Kalpitiya, Negombo, Mannar), most of the Buddhist monastic sites (e.g. Kirinda, Hudumahavihara) and some churches (e.g. Galle Fort Dutch Church).

Pre-historic sites such as that of Ussangoda are undisturbed sites with much potential. Test excavations at the Bundala site have revealed very valuable data on pre-historic man in Sri Lanka, dating back to about 27,000 years. The protohistoric (Megalithic) sites which have yielded black and redware pottery and burials (urn and cist) can be dated between the 3rd century B.C. and 3rd century A.D. Of these sites, several excavations have been conducted at Pomparippu, while some others have been subjected to surface examination only. The data yielded so far, and any future findings, will be most significant for the study of this formative phase in Sri Lankan history. Among the historic sites, the ancient ports and forts reveal information on secular activities such as trade and commerce, and internal and external political relations in the past. The religious monuments such as ancient Buddhist monasteries, Portuguese and Dutch churches and Hindu shrines located within the coastal belt provide details of their respective religious, architectural and artistic traditions as manifested in Sri Lanka through the ages.

5.1.4 HISTORICAL SITES AND MONUMENTS

a) Definition

Historical sites and monuments are all ancient sites, buildings and other structures, artifacts and other cultural property which are more than 50 years old. These include all archaeological reserves and sites which are eligible to be declared as reserves but still are functional.

b) Nature and Significance

The inventory identifies 253 historical sites and monuments in the Coastal Zone. Of these, 171 are of type A, 72 are of type B and 10 are of type C. (Types A, B, and C are described in 5.1.2). The sites considered more important from the point of view of age, current public focus and aesthetic and popularity value are indicated in

Table 5.1 and Figure 5.1. These include such edifices as buddhist monasteries, hindu kovils, (Muthumariamman kovil, Vishnu kovil, Udappuwa), devales (Seenigama), christian and catholic churches (Dutch church at Kalpitiya, St. Anne's Talawila), forts (Kalpitiya, Galle), secular buildings (Whist Bungalow, Mutwal, Closenberga, Galle), harbours (Colombo, Galle, Batticaloa), shipwrecks (Akurala, Galle and Trincomalee), esplanades and parks (Gordon Gardens, Galle Face), lakes (Beira Lake), air bases (Koggala) and resthouses (Tangalle).

Each site or edifice possesses its own intrinsic qualities and values, and requires recognition in planning development activities in its vicinity. The importance of archaeological sites and some historical sites and monuments has been discussed. In addition, many buildings included in this category are of national importance for their architectural and artistic qualities. For instance, buddhist shrines at Telwatta, Batigama, Samudragiri Vihara, Rekawa, etc., depict significant maritime artistic traditions of the Kandyan style in their murals. The architectural design of the cluster of stupas at Veheranamaya is unique. Some of the churches, such as, St. Anne's at Talawila, dates from about the 17th century. The location of the catholic church and hindu shrines in close proximity at Udappuwa, testifies to the close association and togetherness that existed between followers of different faiths in Sri Lanka.

The Fort at Galle is a living town which displays old Dutch character and architectural style to this day. Some of the secular buildings in Colombo (and other cities), such as, President's House and Parliament building are significant vestiges of Colonial architecture. The Dutch hospital in Colombo Fort is a unique piece of architecture and is the finest and only example of its kind the world over. Shipwrecks, though not very old, are of significant historical value. Sri Lanka's esplanades and parks are of recreational as well as of historical value.

5.1.5 SITES AND MONUMENTS OF CULTURAL SIGNIFICANCE

a) Definition

All archaeological and historical sites and monu-

Figure 5.1
Sri Lanka's Archeological, Historic and Cultural Sites Within the Coastal Zone

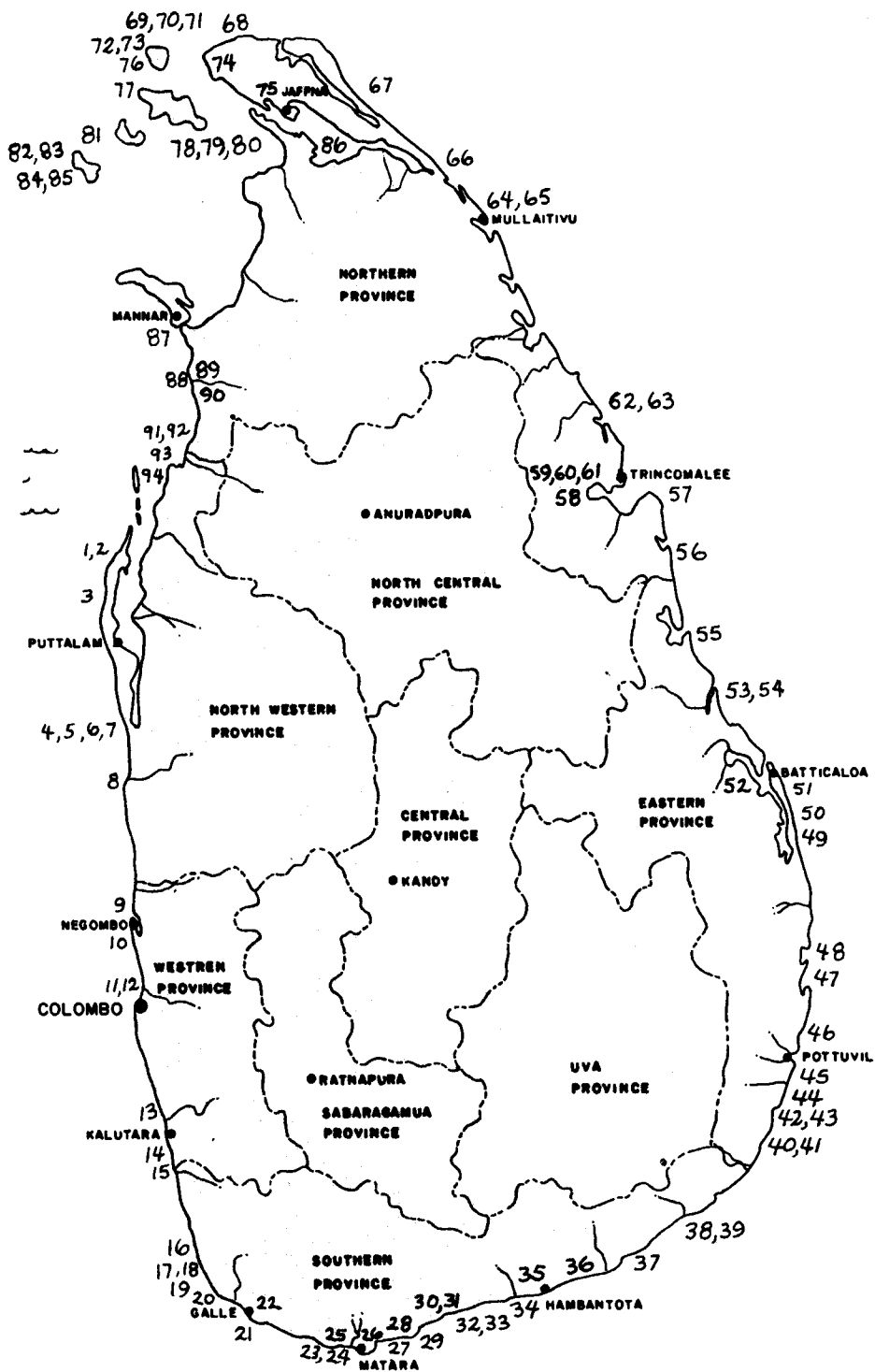


Table 5.1
High Priority Archeological, Historical and Cultural Sites Within the Coastal Zone

NO.	PLACE	TYPE*	GRAMA SEVAKA DIVISION NAME	GRAMA SEVAKA DIVISION NUMBER
<i>PUTTALAM DISTRICT</i>				
01	Dutch Church**	A/C	Sinnakudirippu	631
02	Dutch Fort**	A/H	Sinnakudirippu	631
03	St. Anne's Church	H/C	Mudalaipali	625/620
04	Sri Mariamman Kovil	H/C	Udappuwa	594
05	Mohideen Jumma Mosque	H/C	Udappuwa	594
06	St. Xavier's Church	H/C	Udappuwa	594
07	Vishnu Devala	H/C	Udappuwa	594
08	Ayyanar Kovil	H/C	Karukkaponai	582
<i>GAMPAHA DISTRICT</i>				
09	Negombo Fort	A/H	Munnakkare	156
10	Our Lady of Sindathri	H/C	Duwa	162A
<i>COLOMBO DISTRICT</i>				
11	Whist Bungalow	H/C	Modera	02
12	Siva Devalaya	H/C	Modera	02
<i>KALUTARA DISTRICT</i>				
13	Rankoth Viharaya	H/C	Pattiya North	685
14	Kechchimale Mosque	H/C	Paranakade	753/757
15	Duwa Viharaya	H/C	Moragalla	760/761
<i>GALLE DISTRICT</i>				
16	Sri Subadraramaya**	A/H/C	Balapitiya	89
17	Dutch Church School	A/H	Maha Ambalangoda	82
18	Modera Devalaya	C/H	Maha Ambalangoda	82
19	Sinigama Devalaya	H/C	Sinigama	64
20	Galle Fort**	A/H	Galle Fort	96D
21	Wella Devalaya	H/C	Talpe South	132
22	Closenberga	H/C	Magalla	99
<i>MATARA DISTRICT</i>				
23	Samudragiri Viharaya	H/C	Mirissa South	406
24	Samudratira Viharaya	A/H/C	Kamburugamuwa	408
25	Fortress of Matara	A/H	Ginigasmulla	416
26	Vishnu Devalaya	H/C	Devinuwara West	433A
27	Simhasana Kovil	H	Devinuwara South	433
28	Talgashena	A/H/C	Gandara East/Gandara West	437/437A
29	Gurukanda Viharaya	A/H/C	Batigama	451A

** Protected Monument

* A - Archaeological Value

H - Historical Value

C - Cultural Value

Continued...Table 5.1...Historical and Cultural Sites Within the Coastal Zone

NO.	PLACE	TYPE*	GRAMA SEVAKA DIVISION NAME	GRAMA SEVAKA DIVISION NUMBER
<i>HAMBANTOTA DISTRICT</i>				
30	Rest House (Old Wing)	H/C	Kotuwegoda	458
31	Fort of Tangalle	A/H	Kotuwegoda	458
32	Vehera-Namaya	H/C	Bata-Ate	562
33	Ussangoda	A	Lunama	555
34	Godawaya	A	Walawa	586
35	Bundala	A	Bundala	604
36	Telulla**	A/H	Bundala	604
37	Kirinda Vihare**	A/H/C	Kirinda	601
38	Patanagala	A	Magama	602
39	Palatupana Fort**	A	Kirinda	601
<i>AMPARA DISTRICT</i>				
40	Megalithic site	A	Kumana	1
41	Samuddha Vihara (Kumana)	A/C	Kumana	1
42	Megalithic site (Panama)	A	Panama	2
43	Okandamalai	A	Panama	2
44	Velayutha Swamy Kovil	C/H	Panama	2
45	Muhudu-Maha-Vihara**	A	Pottuvil Div. 1	3
46	Arugam Bay Port	A	Pottuvil Div. 1	3
47	Sagamankanda	A	Komari	9
48	Chitra Velayutha Kandaswamy Kovil	H/C	Thirukkivil	10
<i>BATTICALOA DISTRICT</i>				
49	Dutch Fort**	A/H	Koddaikallar Div. 1, 2	113
50	Kannaki Amman Kovil	H/C	Eruvil	115
51	Jamiul Lafireen Mosque	H/C	Katankuddi Div. 1	167
52	Batticaloa Fort	A/H	Puliyantivu	179
53	Sittandi	A	Valaichchenai Tamil Div.	205
54	Periya Kaduveikarai	C/H	Valaichchenai Tamil Div.	205
55	Panchankerni Historical Site	A	Mankerni	211
<i>TRINCOMALEE DISTRICT</i>				
56	Illangaturai Port	A/H	Ichchilampattai	214
57	Monastic Site	A	Nawathkanikadu	215B
58	Tampalakamam	A	Tampalakamam South	228A
59	Tirukoneswaram Kovil	A/H	Trincomalee Town	244B
60	Fort Fredrick	A/H	Trincomalee Town	244B
61	Fort Ostenberg	A/H	Trincomalee Town	244B
62	Kuchchaveli	A	Kuchchaveli	239
63	Sithi Vinayakar Kovil	C/H	Kuchchaveli	239

** Protected Monument

* A - Archaeological Value
H - Historical Value
C - Cultural Value

Continued...Table 5.1...Historical and Cultural Sites Within the Coastal Zone

NO.	PLACE	TYPE*	GRAMA SEVAKA DIVISION NAME	GRAMA SEVAKA DIVISION NUMBER
<i>MULLAITIVU DISTRICT</i>				
64	Mullaitivu Fort	A/H	Mullaitivu Town	233
65	Monastic Site - Kurundanmalai**	A	Kumulamunai	234
<i>JAFFNA DISTRICT</i>				
66	Pas Pyl Fort	A/H	Mullian	149
67	Vallipuram, Burial	A	Thunlai North	131
68	Kankesanthurai Fort	A/H	Kankesanthurai	67
69	Sambilturai Port	A	Keerimalai	64A
70	Keerimalai	C/H	Keerimalai	64A
71	Naguleswaram Sivan Kovil	H/C	Keerimalai	64A
72	Vishnu Kovil	C/H	Keerimalai	64A
73	Monastic Site-Keerimalai	A/H	Keerimalai	64A
74	Megalithic Site-Anaicottai	A	Anaicottai	40
75	Jaffna Fort**	A/H	Columbuturai	8
76	Hammenhiel Fort	A/H	Karainagar North	10A
77	Portuguese Fort	A/H	Allaippiddi	19
78	Portuguese Fort (Eyrie)	A/H	Allaippiddi	19
79	Allaippiddi	A	Allaippiddi	19
80	Portuguese Fort-Urindi Kottai	A	Allaippiddi	19
81	Naga Pooshani Amman Kovil	H/C	Nainativu	04
82	Portuguese Fort	A/H	Delft West	01
83	Dutch Fort**	A/H	Delft Central	02
84	Monastic Site-Vadiresan Kottai	H	Delft Central	02
85	Nolans Bungalow	H	Delft Central	02
86	Elephant Pass Fort	A/H	Nukavil	153
<i>MANNAR DISTRICT</i>				
87	Mannar Fort	A/H	Thonddaveli	194
88	Tambapanni Port	A	Arippu	198
89	The Doric	A/H	Arippu	198
90	Arippu Dutch Fort	A/H	Arippu	198
91	Uruvela	A	Kokkupadayan	202
92	Megalithic Site	A	Marichchukaddi	203
93	Kudiramalai	A	Pukulam	634
94	Kollan Kanatta	A	Pukulam	634

** Protected Monument

* A - Archaeological Value

H - Historical Value

C - Cultural Value

Source: CCD Internal Report No. 9. and 10, 1986: Inventory of Places of Religious and Cultural Significance and Areas of Scenic and Recreational Value, Volume I (Kalpitiya-Kirinda) and Volume II (north and east coasts).

ments are by definition deemed to be cultural sites as well. Places where rituals or other cultural events are enacted, are also considered as sites of cultural significance.

b) Nature and Significance

The inventory (see 5.1.2) identifies 253 sites and monuments of cultural significance, 34 of which are categorised as high priority sites. Of these sites, those considered more important from the point of view of age, current public focus and aesthetic and popularity value are indicated in Table 5.1 and Figure 5.1. All of these sites are tied to Sri Lanka's various religious communities.

The numerous statues (Suruwam) of christian saints and buddhist devales dedicated to folk deities like 'Devol Deviyo' are designated cultural sites. These edifices have been installed by fisherfolk for their rituals and vow-making, entreating the deities for safe return from the high seas. All catholic churches, ancient and modern, hold annual feasts which draw large crowds. St. Anne's Talawila, Our Lady of Sindrattri, Duwa (Passion Play), St. Sebastian's Negombo, are famous centers of worship, all situated by the beach. The festivals such as, the Passion Play, are closely associated with the sea. The hindu festivals connected with water-cutting rituals are also associated with the sea and at locations such as, Udappuwa (Muthumariamman kovil, Vishnu kovil).

5.1.6 SCENIC AND RECREATIONAL AREAS

a) Definition

Scenic areas: Scenic areas in the coastal belt constitute places that provide aesthetically appealing views of the beach, with uninterrupted vistas of seascape and landscape.

Recreational areas: Natural coastal areas are traditionally used both by Sri Lankans and foreign visitors for activities such as swimming, diving, surfing, boating, sports fishing, leisure walks, bird watching and relaxation.

b) Nature and Significance

The inventory (see 5.1.2) records 89 recreational and scenic areas situated within the Coastal Zone. Most of these are located along the western, southwestern, southern and the eastern coast (Table 5.2 and Figure 5.2). Sri Lanka has many fine beaches, most of them are eminently suitable for recreation. In addition, the wide sandy beaches with waves gushing and rolling in, provide uninterrupted picturesque vistas. These scenic vistas still remain in good stead except for a few places, such as, Hikkaduwa, Negombo, Arugam Bay and Kalkudah, where overdevelopment has occurred. Sri Lanka's tourism industry is centered around its scenic recreational beaches with 75.2 percent of Sri Lanka's graded hotels and 80.8 percent of hotel rooms located along the coast (Table 5.3).

Whilst many of Sri Lanka's important scenic and recreational areas remain pristine, others have been degraded. For example, beaches in the Mount Lavinia to Dehiwela area and at Hikkaduwa are littered with garbage, and sewer pipes carrying human wastes empty directly onto the beach. In Mawella Lagoon and along the Tangalle coasts, coconut husk-retting pits pollute the water. In some instances, the very quality of the resources, which made them significant, have been degraded due to incompatible uses and over exploitation. For example, coral mining for the lime industry constitutes a major threat to the sea beach and coral reefs along the southwestern and southern coasts. This together with unplanned tourism development are major factors in the deterioration of the beauty of the beach in Hikkaduwa.

5.2 MANAGEMENT OBJECTIVES AND POLICIES

OBJECTIVE 5.2.1

It is the objective of the CCD to, within the Coastal Zone, preserve and protect Sri Lanka's significant archaeological, historical and cultural sites and areas of scenic beauty.

Policy 5.2.1.1 Preservation of Sri Lanka's significant archaeological, historical and cultural

Figure 5.2
Sri Lanka's Recreational and Scenic Sites Within the Coastal Zone

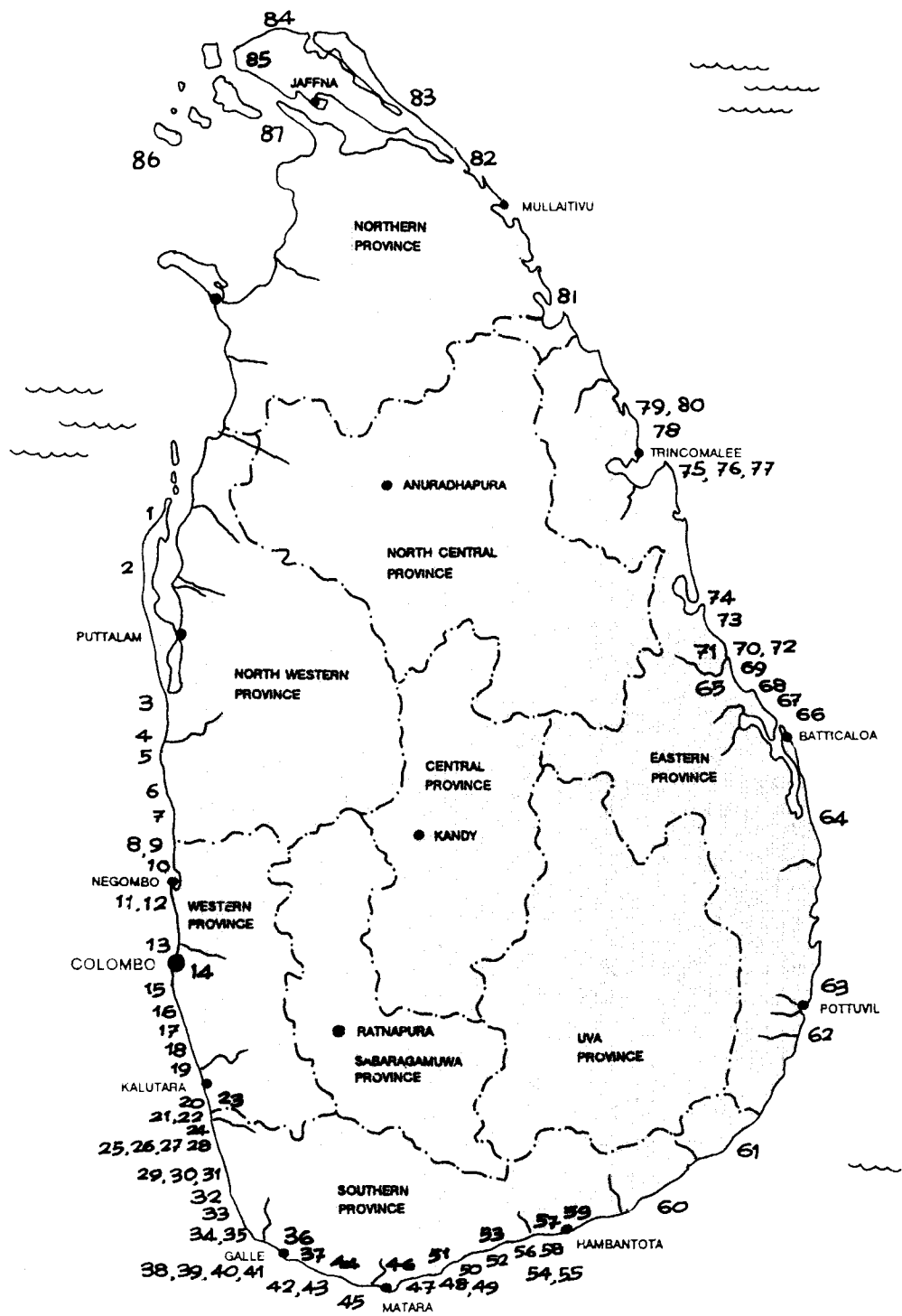


Table 5.2
Scenic and Recreational Sites Within the Coastal Zone

PLACE	TYPE*	GRAMA SEVAKA DIVISION NAME	GRAMA SEVAKA DIVISION NUMBER
ZONE 1 (Kalpitiya-Chilaw))			
1. Kandakuliya	S/R	Kuringipitti	629
2. Talawila Beach	S/R	Mudalaipali	625/620
3. Udappuwa Sand Spit	S	Udappuwa	594
4. Karukkuponae Beach	S/R	Karukkuponae	582
ZONE 2 (Chilaw-Negombo)			
5. Chilaw Beach	R	Sea Beach (Chilaw)	577
6. Teppanpola Beach	R/S	Marawila	512
7. Wennappuwa Beach	R	Ulhitiyawa	492
8. Waikkal Beach	R/S	Sindrathriya	481
9. Lewis Place Beach	R	Ettukala/Wellaweediya	73/158
10. Negombo Beach	R	Munnakkara	156
ZONE 3 (Negombo-Colombo)			
11. Talahena Beach	R	Talahena	163
12. Kepungoda Beach	S/R	Kepungoda	163A
13. Uswetakeiyawa Beach	R	Uswetakeiyawa	167
ZONE 4 (Colombo-Panadura)			
14. Galle Face Green	R/S	Slave Island	21
15. Wellawatta-Mt. Lavinia	R	Wellawatta (S) Dehiwela Mt. Lavinia	47/540/541
ZONE 5 (Pandura Bentota)			
16. Panadura Beach	R	Pattiya (N/S)	685/686
17. Wadduwa-Talpitiya Beach	R/S	Talpitiya Wadduwa (W)	697/699
18. Abrew Road Beach- Nagas-Handiya	R	Kalutara (N)	717
19. Kalutara Sandspit	S	Kalutara (N)	717
20. Maggona Bay	S	Maggona (W)	742
21. Polkotuwa Beach	S	Polkotuwa	748
22. Kechchimalai Mosque Area	S/R	Paranakade	753/757
23. Moragalla Beach	R	Moragalla	760/761
ZONE 6 (Bentota-Galle)			
24. Bentota Spit & Estuary	S/R	Pahurumulla	Div. 1
25. Godagala-Induruwa Beach	S/R	Angagoda Yalegama	2/8

* S - Scenic Value R - Recreational Value

Continued...Table 5.2...Scenic and Recreational Sites Within the Coastal Zone

	PLACE	TYPE*	GRAMA SEVAKA DIVISION NAME	GRAMA SEVAKA DIVISION NUMBER
26.	Aturuwella Beach	S/R	Yalegama	8
27.	Kaikawala/Naya-Handu- Gala Beach	S/R	Kaikawala	9
28.	Babungala-Arangala Beach	S/R	Induruwa	10
29.	Kosgoda Sand Spit	S/R	Nape	16
30.	Ambalangoda Beach	S/R	Maha Ambalangoda	82
31.	Akurala Beach	R	Akurala	76
32.	Hikkaduwa Beach & Coral Gardens	R/S	Wewala/Waulagoda	57/58
33.	Patuwatha-Narigama Beach	R	Narigama, Thiranagama Patuwatha	56/54/53
ZONE 7 (Galle-Dondra)				
34.	Galle Fort	S/R	Galle Fort	96D
35.	Closenberga	S	Magalla	99
36.	Rumassala Headland	S	Unawatuna West	137
37.	Unawatuna Bay	S/R	Unawatuna (E-W), Talpe (S)	138/132/137
38.	Koggala Beach	R	Koggala	144A
39.	Devale Kanda	S	Ahangama East	156
40.	Yakkinnige Duwa (Island)	S	Ahangama East	156
41.	Kapparatota Bay	S	Kapparatota	386
42.	Weligama Bay	S/R	Galbokka, Mahaweediya	385/382/382
43.	Polwatumodera Beach	S/R	Polwatumodera	308
44.	Mirissa Bay	S/R	Mirissa South	406
45.	Polhena Beach	R	Polhena	412
46.	Ginigasmulla Beach	S/R	Ginigasmulla	416
ZONE 8 (Dondra-Kirinda)				
47.	Dondra Light House Area	S	Devinuwara South	433
48.	Talalla Beach	R	Talalla South	438
49.	Naigalkanda-Dickwella Beach	R	Batigama	451/452
50.	Kudawella Blow Hole	S	Kudawella West	466A
51.	Sinimodera (Mawella Bay)	S/R	Sinimodera	468
52.	Pallikudawa Beach	S/R	Unakuruwa	469
53.	Paraiwella Beach	R	Kotuwegoda	458
54.	Sitarakala Blow Hole	R	Kotuwegoda	458
55.	Rekawa Lagoon & Bay	S	Rekawa	463
56.	Kalametiya Lagoon & Bay	S/R	Hatagala	563
57.	Ussangoda	S	Lunama	555
58.	Karagam Lewaya	S	Walawa	586
59.	Hambantota Beach	S/R	Hambantota	584
ZONE 9 (Kirinda-Batticaloa)				
60.	Kirinda Headland	S	Kirinda	601
61.	Yala National Park	S/R	Kirinda, Kumana	601/1

* S - Scenic Value R - Recreational Value

Continued...Table 5.2...Scenic and Recreational Sites Within the Coastal Zone

PLACE	TYPE*	GRAMA SEVAKA DIVISION NAME	GRAMA SEVAKA DIVISION NUMBER
62. Panama Beach	R	Panama	2
63. Arugam Bay Beach	S/R	Potuvil	3
64. Kalmunai Beach	R	Kalmunai T.C.	61
65. Punnaikudah Bay	R	Eravur	192 Div. 3
66. Palaiyadithona Beach	R	Chanthiveli	200
ZONE 10 (Batticaloa-Foul Point)			
67. Kiran Beach	R	Kiran	203
68. Kalkudah Bay	S/R	Kalkudah	204
69. Passikudah Bay	S/R	Kalkudah	204
70. Valachchenai Estuary	S	Valachchenai (T)	205
71. Thenadi Bay-Elephant Point	S	Valachchenai (T)	205
72. Irrichchal Island	S	Mankerni	211
73. Sallativu Island	S	Mankerni	211
74. Vakarai Sand Spit & Lagoon	S/R	Vakarai	212
ZONE 11 (Foul Point-Chempionpattu)			
75. Clappenberg Hill	S	Vellaimanal	229
76. Trincomalee Harbour Area	S/R	Trincomalee Town	244/244A/244B
77. Trincomalee Beach Road	R	Trincomalee Town	244B
78. Nilaveli Beach	R	Kumpurupiddi Nilaveli Sampaltivu	240/241/242
79. Red Rock Beach	S/R	Kumpurupiddi	240
80. Pirates Cove	R	Kuchchaveli	239/237
81. Kokkilai Lagoon	S	Kokkilai	225
ZONE 12 (Chemionpattu-Mannar)			
82. Chundikulam Sanctuary	S	Chundikulam Mulliyan	141/149
83. Manalkadu Sand Dunes	S	Kudattanai-Karaiyur	142
84. Senthankulam Beach	S/R	Myliddy Coast	72A
85. Casuarina Beach	S/R	Karainagar North	10A
86. Castle Beach	S/R	Delft Central	2
87. Kalmunai Point	S/R	Kavutharimunai	172
88. Toddakkadu (Mannar Beach)	S/R	Thoddakkadu	189A
89. Wilpattu National Park	S/R	Marichchukaddi Pukulam Pomparippu	203 634 635

* S - Scenic Value R - Recreational Value

Source: CCD Internal Report No. 9, and 10, 1986: Inventory of Places of Religious and Cultural Significance and Areas of Scenic and Recreational, Value I (Kalpitiya-Kirinda) and Value II (north and east coasts).

sites and areas of scenic beauty in the Coastal Zone is a high priority of the CCD.

Policy 5.2.1.2 The CCD will only permit development in the vicinity of designated high priority archaeological sites when it follows Archaeology Department guidelines for the preservation of archaeological sites. These guidelines prohibit development within 200 m of the designated sites. High priority archaeological sites are listed in Table 5.1. Additional sites may be included by the CCD from time to time.

Policy 5.2.1.3 The CCD shall require modification of, or shall prohibit, proposed developments within the Coastal Zone where it finds a reasonable probability of adverse impacts on important archaeological, historical, cultural sites and scenic areas. Adverse impacts are those which can reasonably be expected to diminish or destroy those qualities of the site that make it significant.

Policy 5.2.1.4 The CCD will cooperate with the Archaeology Department and other relevant governmental and non-governmental agencies to develop protection and preservation plans for archaeological, historical and cultural sites, and significant scenic areas.

Policy 5.2.1.5 It is the policy of the CCD to promote awareness of the nature and significance of coastal archaeological, historical and cultural sites, and their scenic beauty.

OBJECTIVE 5.2.2

It is the objective of the CCD to maintain the physical and cultural resources upon which high quality recreation and the country's tourism industry are based.

Policy 5.2.2.1 The CCD will permit development of tourist hotels within the Coastal Zone in the locations and in accordance with the guidelines cooperatively developed by the CCD, the Ceylon Tourist Board, and the Urban Development Authority.

Policy 5.2.2.2 The CCD will require that public access is not impeded by recreational/tourist developments.

Policy 5.2.2.3 The CCD will cooperate with other governmental and non-governmental agencies in designating, planning for, and managing coastal and recreational areas, and coastal and marine parks.

Table 5.3
Graded Hotel Accommodations—
1986 Second Quarter

Region	No. of Hotels	No. of Rooms
Colombo City	22	2,611
Greater Colombo	24	1,547
South Coast	46	3,439
East Coast	<u>2</u>	<u>91</u>
TOTAL IN COASTAL ZONE	94	7,688
Other Regions	<u>31</u>	<u>1,821</u>
GRAND TOTAL	125	9,509
Percent in Coastal Areas	75.2	80.8

Source: Ceylon Tourist Board Monthly Bulletin on the Performance of the Tourism Sector, June 1986

Towards Better Management of Coastal Resources



6.1 BACKGROUND

The Coastal Zone Management Plan presented in this document is a major step forward in the management of Sri Lanka's Coastal Zone. It provides a framework for the formulation and implementation of a comprehensive Coastal Resources Management Programme. Much has been learned in the five year process of developing this Plan and regulating development activities in the Coastal Zone through the interim permit procedure as specified in the Coast Conservation Act.

At the time the Coast Conservation Act was drafted, the primary concern was coast erosion

and the management of human activities contributing to same. The need for management of coastal resources was of less concern. This is reflected in the present provisions of the Coast Conservation Act. The CCD, therefore, decided to formulate a comprehensive and integrated plan for coastal resources management adopting an incremental approach to plan development. This chapter identifies major constraints which make planning and implementation of an integrated management programme for coastal resources difficult. It also proposes corrective measures to be taken for rational management of coastal resources. They include legislative and administrative changes, and investment in research and education.

6.2 PROPOSED REVISIONS TO THE LEGAL FRAMEWORK

6.2.1 The Coastal Zone

The Coastal Zone as currently defined does not include most coastal habitats in their entirety, (i.e. only portions of lagoons and estuaries fall within the Coastal Zone). This means that in some parts of an estuary or stand of mangroves, development activities are regulated whereas in other parts they are not. Consequently, the CCD is restricted to management of activities within the portions of coastal features falling into the defined Coastal Zone and not to the management of a system as a whole. The definition of the Coastal Zone should be amended to read as follows:

The Coastal Zone means that area lying within a limit of three hundred meters landwards of the Mean High Water Line and a limit of two kilometers seawards of the Mean Low Water line and in the case of rivers, streams, lagoons, or any other body of water connected to the sea either permanently or periodically, the landward boundary shall extend to a limit of two kilometers measured perpendicular to the straight baseline drawn between the natural entrance point thereof and shall include riparian land lying within a three hundred meter parallel to the maximum flood water level of such rivers, streams and lagoons or any other body of water so connected to the sea. It shall also include any contiguous areas of land or water as may be specified by the Minister in charge of the subject of coast conservation.

6.2.2 Development Activity

The present definition of development activity focuses primarily on activities likely to alter the physical nature of the Coastal Zone. Many activities that do not directly alter the physical nature of the Coastal Zone could have severe adverse impacts on the environmental quality of the Coastal Zone. Hence, the definition of development activity needs to be amended to also cover activities that change or adversely effect the environmental quality of the Coastal Zone.

6.2.3 Punitive Action Relating to Unauthorized Structures

The Act provides authority for the Director of the CCD to demolish unauthorized structures. It does not provide the Director with authority to take any steps other than demolition of the entire structure. In cases where the demolition of the entire structure is not necessary, provision should be made to enable the Director to specify modifications including the demolition of portions of the structure in order to regularize such unauthorized constructions.

Provisions should also be made to enable the Director to order the suspension or termination of utility services such as electricity and water supply to unauthorized structures. Such deterrent action would force the developer to comply expeditiously with an order made by the Director.

6.2.4 Acquisition of Land within the Coastal Zone

The Act does not contain provision whereby the Director could acquire land within the Coastal Zone. The effects of implementing setbacks and other regulatory measures may reduce the value of privately owned blocks of land or render them valueless for development purposes. There are also State-owned lands in the coastal front, which are not effectively used by the State agencies that presently own them. The inclusion of provisions in the Act enabling the Director to acquire land and/or for vesting of State-owned land in the Director would facilitate better management of such land.

6.3 PROPOSED REVISIONS TO THE ADMINISTRATIVE FRAMEWORK

6.3.1 Functions of the CCD

The CCD as presently constituted is charged with the responsibility for coast protection and coastal zone management. The magnitude of the coast erosion problem more often than not tends to obscure the CCD's responsibility for coastal zone management. There is a lack of awareness

amongst governmental agencies and coastal dwellers that coast erosion is primarily a natural phenomenon and it is not possible either in practical or economic terms to 'hold the line' against the sea along the entire coastline of Sri Lanka. The fact that the financial investments for coast protection are far greater than those on coastal management tends to reduce the attention paid to the latter programme in terms of allocation of resources. In terms of returns from these investments, the benefits from coastal zone management though not immediately visible, far outweigh those from coast protection.

In the present context, it is not possible to divest the CCD of its responsibility for coast protection. There is, however, the need for a shift of emphasis from coast protection to erosion management. The CCD Master Plan for Coast Erosion Management is one step in that direction. The need to plan future development with a realistic appreciation of the erosion potential of respective coastal reaches must gain acceptance if the present level of investment on coastal protection is to be reduced. There is also the need to strengthen the capability of the CCD in coastal zone management, and over a phased period of time, to divest it of the responsibility for construction of protective structures. The CCD's **primary** role should be in planning and management.

6.3.2 Devolution of Functions

The two major programmes implemented by the CCD are the Coastal Erosion Management Programme and the Coastal Resources Management Programme. Funds for these two programmes are allocated in the government budgets to the CCD and the Director of CCD is held accountable for disbursement of these funds. The formulation and the implementation of the programmes are done currently by the CCD. There is some consultation with the district political and administrative authorities and the concerned non-governmental agencies. In the main, however, decision making is done by the CCD.

Inadequacy of involvement and participation by the beneficiaries of the programmes and the district political and administrative authorities leads to a lack of understanding of the pur-

poses of the programmes and to resentment when certain restrictions are imposed on development activity.

There is provision in the Coast Conservation Act for delegation of the powers of the Director to the Government Agents of the districts. However, such delegation without ensuring that adequate expertise is available at the local level will be a futile exercise. It is, therefore, necessary that the engineering and planning cadres of the CCD are strengthened to make it possible for the CCD to post specialist officers to the districts to upgrade their capacity in management.

It is further proposed that these two programmes be de-centralized to enable greater participation by the districts in planning and implementation of the programmes. Financial provision could be made in the district budgets for expenditures connected with planning and implementation of the programmes. Allocation of Central Government funds, preferably, should be supported by contributions from district revenues. With the implementation of the Provincial Council system it will be possible to raise local funds to meet part of the costs of management.

6.4 THE FINANCIAL FRAMEWORK

6.4.1 Programmes/Activities to be Financed

The implementation of the Coastal Zone Management Plan would require expenditure of moneys for the following programmes/activities:

- a) Revision of CZMP. The Coast Conservation Act provides for periodic revisions of the Plan;
- b) The administration of the permit and appeals procedure. This is a sizeable component of the activities to be carried out under the Plan;
- c) Acquisition of coastal lands for management purposes;
- d) Rehabilitation of coastal lands and natural habitats to improve environmental quality;
- e) Management of coastal erosion using appropriate erosion control techniques;
- f) Conducting research and studies for a better

understanding of the problems of Coastal Zone resources management and to identify appropriate solutions;

- g) Conducting programmes of education, information and publicity to promote public awareness and elicit support;
- h) Other activities connected with or incidental to the foregoing.

6.4.2 Government Budgetary Allocations

Some of the programmes/activities listed in 6.4.1 are currently financed through the CCD Budget, both Capital and Recurrent (see Table 6.1).

In addition, there is some financing through Decentralized Budgets mainly for coast erosion management, and expenditures by other government agencies (CEA, NARA, etc.) mainly for studies and research. The recurrent expenditures in the CCD Budget are not presented here.

6.4.3 An Investment Programme

Preparation of an Investment Programme at this stage may be premature. In the course of implementation of the Plan it is necessary to:

- a) Project future funding requirements for implementation of proposed programmes/activities;
- b) Indicate possible sources of financing—central, district or local government funds, allocations in budgets of government agencies concerned with coastal resources management, levies on development, etc.

6.4.4 Levies from Developers

In regard to the question of levies from developers in the Coastal Zone, it is desirable that the regulatory system (royalties, quotas, licences, etc.) be used to meet certain objectives of the Coastal Zone Management Plan and at the same time to raise funds. The following principles could be followed in making these levies:

- a) There is a necessity to regulate exploitation of natural resources by imposing levies on users of these resources. Originally, natural resources were considered public gifts, free to all;
- b) The levies should be on a sliding scale differentiating between traditional small-scale use having little adverse impact on coastal zone resources, and large-scale commercial operations having adverse impacts.
- c) The revenues accruing from such levies could be used to finance expanded allocations in Central Government or Decentralized Budgetary funds for coastal resources management.

Table 6.1
Government Budgetary Allocations

1986 - 1990 (Capital)	
Coastal Zone Management	
Planning	
Administration of the permit system	
Research and Studies	
Education, Information etc.	
Consolidated Funds	Rs. 7 m.
USAID Funds	<u>Rs. 15 m.</u>
TOTAL	Rs. 23 m.
Coastal Erosion Management	
Consolidated Funds	Rs. 39 m.
DANIDA aid (stage 1)	Rs. 320 m.
DANIDA aid (stage 2)	Rs. 380 m.
W. German Aid	<u>Rs. 70 m.</u>
TOTAL	Rs. 809 m.

6.5 RESEARCH AND EDUCATION

6.5.1 Lack of Information of Relevance to Management

There is relatively little site specific information available on Sri Lanka's coastal resources, the human activities that affect them or the guidelines that should be followed in order to mitigate the effects of human activities. The resulting lack of relevant information limits the specificity and efficacy of management. It is, therefore, necessary that research activities of direct and immediate relevance to pressing management problems be carried out.

A considerable volume of information relating to human activities (i.e. sand mining, coral mining) has been gathered by the CCD as a part of the coastal planning effort. The CCD will have to undertake and/or support additional research programmes that target specific items of direct relevance to its management programme. Such research will focus, in the immediate future, mainly on geographically defined coastal habitats, so that special area management plans can be drawn up for areas with the most pressing management problems.

6.5.2 Public Awareness and Education

Whilst there is a greater level of public awareness today on the need for the management of coastal resources, much more needs to be done. Public awareness and support is a pre-requisite for any natural resources management programme. There is also a need to educate regional and local level administrators on the inter-relationship and linkages between coastal habitats. The CCD will,

therefore, sponsor public awareness and education programmes that will focus on the general need for management of coastal resources with particular reference to geographically specific habitats. Such programmes will involve participation of provincial and district administrators, school children, citizen groups and non-governmental groups concerned with environmental management.

6.6 The Future

These are the perspectives for the future. The current Plan is designed to address a few well-defined management issues. The management strategies will have to be tried out and their success tested over time. It has already been stated that the Plan is an incremental one. As experience is gained in the course of implementation, the Plan will be modified and developed. A Coastal Resources Management Programme is primarily for the people. It will succeed only with their support.

Appendices

List of Studies, Surveys and Inventories Carried Out by the CCD

Glossary

Specimen Application Form

List of Studies, Surveys and Inventories Carried Out by CCD

1. Alternative employment for those who are engaged in the coral mining industry (from Ambalangoda to Dickwella), (1979). (CCD Internal Report 1)
Conducted by the Peoples Bank Research Department.
2. A Survey of the Coastal Zone—Colombo University (Volume 1 & 2), (1981). (CCD Internal Report No. 2.)
Conducted by the University of Colombo.
3. Socio-economic survey of the coral mining industry (from Ambalangoda to Dickwella), (1984). (CCD Internal Report No.3.)
Conducted by A. Premaratne, CCD.
4. Survey of exploitation of sand and seashell resources in the coastal areas from Kalpitiya to Dondra, (1984). (CCD Internal Report No. 4.)
Conducted by the Peoples Bank Research Department.
5. Preliminary inventory of reefs, (1984). (CCD Internal Report No. 5.)
Conducted by Dr. G.H.P. de Bruin, Former Director (Research), Ministry of Fisheries.
6. Survey of historical coastline changes in selected areas, (1984). (CCD Internal Report No. 6.)
Conducted by Prof. C.M. Bandara, Department of Geography, University of Peradeniya.
7. Topographic survey of the reef extending from Mt. Lavinia to Galle Face Hotel, (1985). (CCD Internal Report No. 7.)
Conducted by Dr. G.H.P. de Bruin, Former Director (Research), Ministry of Fisheries.
8. Survey of incompatible coastal uses (a pilot survey conducted in Matara and Negombo), (1985). (CCD Internal Report No. 8.)
Conducted by Dr. S.K. Pinnawela, Department of Sociology, University of Peradeniya.
9. Inventory of Places of Religious and Cultural significance and areas of scenic and recreational value I (Kalpitiya-Kirinda), (1986). (CCD Internal Report No. 9.)
Conducted by Prof. P.L. Prematilleke, Department of Archaeology, University of Peradeniya.
10. Inventory of Places of Religious and Cultural significance and areas of scenic and recreational value II (north and east coasts), (1986). (CCD Internal Report No. 10.)
Conducted by Prof. P.L. Prematilleke, Department of Archaeology, University of Peradeniya.
11. Administrative Jurisdiction, Economic Activities and Resources in the Coastal Zone (from Puttalam to Hambantota), (1986). (CCD Internal Report No. 11.)
Conducted by A. Premaratne, CCD.
12. Study on the proposed ban on coral mining and the possibility of using Dolomite as a substitute, (in preparation). (CCD Internal Report No. 12.)
Conducted by Dr. D. Hewagama, Department of Economics, University of Peradeniya.
13. Preparation of maps indicating coastal habitats, (1986). (CCD Internal Report No. 13.)
Prepared by the Lanka Hydraulic Institute in collaboration with the Survey Department.
14. Synthesis Report—Information on Critical habitats in the coastal zone, (January-May 1986). (CCD Internal Report No. 14.)
Prepared by Dr. J.I. Samarakoon, Department of Zoology, University of Kelaniya and Dr. L. Pinto, Department of Botany, Open University.
15. Report on Workshop on Management of Coastal Habitats in Sri Lanka, (May 1986). (CCD Internal Report No. 15.)

Glossary of Terms

Accretion: The build-up of land, over a period of time. Accretion may be natural or it may be promoted by human activity.

Aquaculture: Fisheries production achieved through human intervention involving physical control of the organisms at some point in their life cycle other than at harvest, and where ownership of the harvest is legally ensured.

Area-specific management plan: A set of rules and guidelines that are designed for achievement of prescribed objectives with respect to a geographically defined extent of land and water.

Anaerobic: Absence of oxygen. Some water logged soils lack oxygen (anaerobic soil). Some micro organisms can live in environments that lack oxygen (anaerobic organisms).

Blow hole: An aperture or gap through which air and water driven by waves can move with force.

Current: A flow of water within and relative to the large body of water through which it flows.

Current, longshore: The inshore current moving essentially parallel to the shore, usually generated by waves breaking at an angle to the shoreline.

Current, tidal: The current caused by the tides.

Canyon, submarine: Large, steep-walled valleys carved in the continental shelves and slopes.

Demersal fish: Fish that live in association with the bottom of the sea and other water bodies.

Devale: A place of worship dedicated to a particular deity.

Eutrophication: Enrichment of water by nutrients. Generally eutrophication results in production of very large populations of plants which rapidly die and cause oxygen depletion during their putrefaction.

Epiphyte: Organisms that grow upon a plant.

Geomorphology: The study of the classification, description, nature, origin and development of present landforms.

Groyne: A structure usually built at right angles to the shore, to interfere with sand drifting (see longshore drift) and to promote accretion on-shore.

Halophyte: A salt tolerant plant.

Herbivorous fish: Fish that feed on plants.

Kovil: A temple at which Hindus worship.

Lewaya: A depression in the coastal land belt with highly saline soil.

Lithology: The description of the physical character of rock.

Littoral sand budget: Quantities of sand gained and lost by a seashore during a specific period.

Longshore drift: The movement of material along the shore by waves and currents.

Mahawamsa: Chronicle of Sri Lanka's history covering the period 6th century BC to 4th century AD.

Mean Sea Level: The level of the seawater surface averaged over the last 19 years.

Mean High Water Line: The level of the sea 0.6 meters above mean sea level.

Mean Low Water Line: The level of the sea 0.6 meters below mean sea level.

Revetment: A facing of stone, concrete or other material built to protect an embankment or shore structure from wave-caused erosion.

Synergistic impacts: Combined influence of events where the effect of the combination of events surpasses the sum of the effects of individual events.

Vihara: A Buddhist shrine or temple.

Zooxanthellae: Microscopic plants that live within the tissue of coral polyps.

Application for a Permit to engage in a development activity

(In terms of section 14(3) of the Coast Conservation Act No. 57 of 1981.)

1. Full Name of Applicant _____
(Surname) (Other Names)
2. Postal Address _____
3. i) Nature of Development Activity proposed to be engaged in _____
ii) Location of such Development Activity _____
4. Has the area been subject to erosion or accretion in the recent past

Yes EROSION No	Yes ACCRETION No
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5. How is the land utilized at present _____
6. Has any application for this purpose been made to any other Govt. Agency (e.g. Govt. Agent, Local Authority, Tourist Board, Urban Development Authority etc.). If so, give details

7. Any other particulars of relevance _____

I hereby certify that the particulars furnished by me in this application are true and correct. I am aware that if any particulars herein are found to be false or incorrect, my application will be liable to dis-qualification.

Signature of Applicant

Date _____

INSTRUCTIONS

i) Nature of Development Activity

- a) "Development Activity" is defined in the Coast Conservation Act as follows:

"Any activity likely to alter the physical nature of the Coastal Zone in any way, and includes the construction of buildings and works, the deposit of wastes or other materials from outfalls, vessels or by other means, the removal of sand, coral, shells, natural vegetation, seagrass or other substances, dredging and filling, land reclamation, and mining or drilling for minerals, but does not include fishing."

- b) "Coastal Zone" is defined in the Coast Conservation Act as follows:

"That area lying within a limit of three hundred metres landwards of the Mean High Water Line and a limit of two kilometres seawards of the Mean Low Water Line and in the case of rivers, streams, lagoons, or any other body of water connected to the sea either permanently or periodically, the landward boundary shall extend to a limit of two kilometres measured perpendicular to the straight baseline drawn between the natural entrance points thereof and shall include the waters of such rivers, streams and lagoons or any other body of water so connected to the sea."

- c) If the application is for the construction of any structures, the design drawing from the foundation up to the first floor above ground must be forwarded along with this application.
- d) If the application is for dumping or removal of any material from the coastal zone, volume of material to be dumped or removed, duration of such activity, and the method of removal or dumping should be described in detail in this application.

ii) Location of Activity

- a) Three copies of a Survey Plan prepared by a Licensed Surveyor, indicating the location of activity must be forwarded along with this application. The plan should indicate the line of High Water and the limit of permanent vegetation (e.g. coconut trees; other timber trees; screw-pine; pandanus, or similar shrubs. Beach creepers should not be considered as permanent vegetation.)

(FOR OFFICE USE ONLY)

Permit Application No.

1. Date of receipt of application: _____
2. Reference Plans, Reports and other Documents received: _____
3. If any additional information was requested, details of such requests: _____

4. If the observation of any other Agency were requested details of such requests: _____

5. Whether a Permit is granted: Yes No
6. If a permit is granted:
 - a) No. of the Permit: _____
 - b) Date of Permit: _____
 - c) Validity Period: _____
 - d) Date of Expiry: _____
 - e) Conditions attached (if any): _____

7. If permission is denied, reasons for such denial: _____

Signature and Designation of Authorized Officer

Date: _____

Application for a renewal of Permit to engage in a development activity

(In terms of section 18(2) of the Coast Conservation Act No. 57 of 1981).

1. Number of the Permit for which this renewal application is made: _____
2. Expiry date of such Permit: _____
3. Name of Applicant: _____
4. Postal Address: _____
5. Reasons for renewal: _____
6. Period for which renewal is required: _____
7. What percentage of the development activity for which the original permit was issued has been completed:

I certify that the particulars furnished by me in this application are true and correct. I confirm that the conditions stated in the original permit have been strictly adhered to by me. I am aware that if any particulars contained herein are found to be false or incorrect, my application will be liable to disqualification.

Signature of Applicant

Date _____

(Note: Renewal application must be made one month prior to expiry of the permit issued for the purpose.)

(For Office Use Only)

Permit Application No.

1. Date of application: _____
2. If any additional details were requested, details of such request: _____

3. Whether a Renewal of Permit was allowed: _____ Yes No
4. If a renewal is granted:
 - a) No. of the Renewal Permit: _____
 - b) Date of Permit: _____
 - c) Validity period: _____
 - d) Date of expiry: _____
 - e) Conditions attached (if any): _____
5. If permission is denied, reasons for such denial: _____

Signature and Designation of Authorized Officer.

Date _____

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**Renewal of a Permit for a Development Activity issued under Part III
Section 14 of the Coast Conservation Act No. 57 of 1981**

Original Permit No. _____

Permit Renewal No. _____

Name of Permit Holder: _____

Postal Address: _____

Period for which renewal is allowed: _____

Conditions of Renewal: _____

Signature & Designation of Authorized Officer.
(Issued for and on behalf of the Director/ Coast Conservation)

Date _____

1 CP 07937-2,500 (83/08) DEPT. OF GOVT. PRINTING, SRI LANKA

Permit No. _____

Postal Address: _____

Nature of Development Activity: _____

Location of Development Activity:_____

Province _____

District _____

Local Authority _____

Particulars of Survey Plan submitted by applicant:

Duration of Permit: _____

Conditions Attached: _____

Signature & Designation of Authorized Officer
(Issued for and on behalf of the Director/Coast Conservation)

Date _____

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