Revised

Coastal Zone Management Plan, Sri Lanka

1997

Coast Conservation Department

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Ministry of Fisheries and Aquatic Resources Development

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Cover *Front:* *Top left:* *Beach resorts are numerous on the south coast*
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Photographs	Alan White unless otherwise noted
Illustrations	Prasanna Weerakkody
Translation (Sinhala)	Athula Wijayasinha
Translation (Tamil)	Neela Thayaparan

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Foreword

Sri Lanka is endowed with a scenic, diverse and resources rich coastal area. Mangroves, estuaries, coral reefs, seagrass beds and beaches so common along Sri Lanka's coastline are among the most naturally productive ecosystems in the world. Many people depend directly on these resources for their livelihood. The coastal areas also provide preferred living space and an easily accessible source of material such as sand, wood, coral and lime stone. The 67 Assistant Government Agent Divisions - Divisional Secretariats with a coastal boundary is economically, extremely significant. The coastal region itself is one of the most densely populated areas, and most of the principal transportation insfrastructure, tourist related facilities, are located within this area. Furthermore, 80 per cent of the total annual fish production comes from this zone. These factors amply demonstrate the need to manage the coastal zone in order to ensure that the carrying capacity of the zone and its resources are not surpassed. Many examples of the devastation and degradation of the environment caused by lack of sufficient planning and management in the past, can be seen in our coastal zone.

Natural processes such as monsoon storms cause severe damage to the coastal areas resulting in great losses to houses, hotels, roads and railway lines. Erosion, the main problem in our coastal areas is a natural process which is aggravated by human interventions. The natural process in the coastal areas, as elsewhere, are in state of dynamic equilibrium. They are never in a permanently balanced, static condition. Our understanding of the dynamics of this area is as yet incomplete. Science however, is rapidly pushing forward the frontiers of knowledge giving us an ever increasing insight into nature. It is our duty towards the future generations to utilise current knowledge in the planning of human activities in the coastal zone, so that they will harmonise with nature. This plan provides the framework for it.

Many have contributed to the preparation of the Coastal Zone Management Plan. I commend the officers of the Coast Conservation Department for the effort they have put in to produce this document. The CZM Plan 1997 revision was approved by the Cabinet of Ministers on September 10, 1997. Compliance with the guidelines given in the plan will ensure that our coastal resources which are prime national heritage will be wisely utilised for the benefit of the nation.

The richness, and the bio-diversity of the coast and its environs, need to be managed and protected for the benefit of future generations.

Mahinda Rajapakse
Minister of Fisheries and Aquatic Resources Development

October 5, 1997

Preface

This is a "second generation" Coastal Zone Management Plan. This plan has been developed to address some coastal issues not covered by the first generation plan of 1990. At the same time, the experience gained through the implementation of the 1990 plan along with the present development trends in the country, have helped refine the policies and the guidelines of this plan.

The Revised Coastal Zone Management Plan, Sri Lanka 1996, has been prepared in accordance with section 12 of the Coast Conservation Act No. 57 of 1981. It has been submitted to the Coast Conservation Advisory Council for review and was made available for public comments before submission to Cabinet. This Revised 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. It sets out policies and regulations for the legally defined coastal zone; and presents planning guidance for a larger area. 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. The plan also addresses the loss and degradation of archaeological, historical and cultural monuments and sites and areas of recreational and scenic value. In addition, coastal pollution from industrial discharges and urban wastes is addressed.

The potential impacts of global atmospheric warming which may lead to sea level rise are covered in this plan. Coast erosion is a primary issue to Sri Lanka and is dealt with through preventive measures. These measures are equally valid for coast erosion control whether sea level rise occurs or not. If it does, the policies and actions of this plan will be even more important.

This second generation plan has been influenced by continuing problems of coastal resources degradation in Sri Lanka. New policies reflect the need to devolve responsibility for resources management to local government and communities when practical. Some of the strategies described herein have been tested and refined in the last five years since the initial plan was adopted. Others, such as Special Area Management, are relatively new and are being tested and refined.

The effective implementation of this plan depends on the efforts of many agencies and individuals from within and outside the government. The plan offers a direction of action for all concerned parties. It is intended as a practical guide.

H.N.R. Perera
Director, Coast Conservation

Acknowledgments

The preparation of this revised plan has been made possible by the combined efforts of many dedicated persons, all of whom cannot be mentioned. Those with important roles in the plan drafting and revision process were:

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Mr. Indra Ranasinghe, Deputy Manager, Coast Conservation Department;
Dr. Kem Lowry, Professor of Urban and Regional Planning, University of Hawaii;
Dr. Alan White, Project Manager, Coastal Resources Management Project;
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Mr. H.J.M. Wickremeratne, Project Manager, Coastal Resources Management Project;
Mr. R.A.D.B. Samaranayake, Manager, Coastal Resources Development,
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Mr. Mervyn Wijeratne, former Coastal Resources Management Project Administrator.

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Central Environmental Authority
Ceylon Tourist Board
Department of Archaeology
Department and Ministry of Fisheries and Aquatic Resources Development
National Aquatic Resources Agency
Urban Development Authority

Special thanks are due to the members of the Coast Conservation Advisory Council and members of local government and the public who commented on the plan in the review stage. The contributions made by many professionals, scientists and developers through their participation in the several workshops and seminars which were conducted as a part of the plan revision effort, is gratefully acknowledged.

Finally, the guidance and support provided by the Honorable Minister and the Secretary to the Ministry of Fisheries and Aquatic Resources Development and the efforts of the staff of the Coast Conservation Department and the Coastal Resources Management Project of the University of Rhode Island in the preparation of this plan is gratefully acknowledged.

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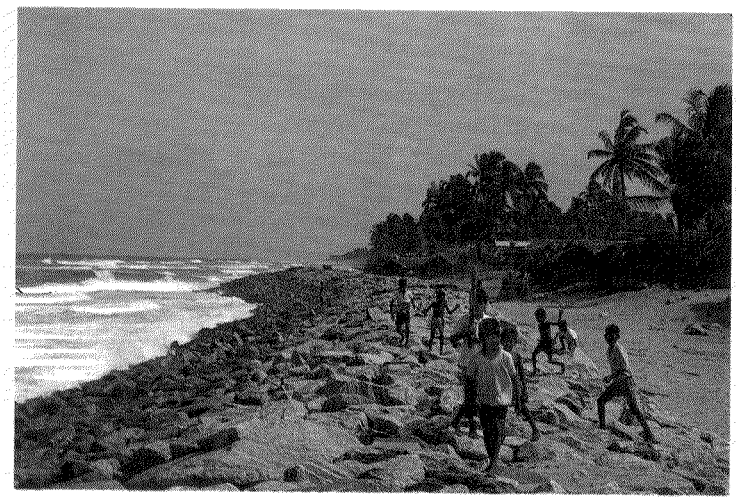
List of Acronyms and Abbreviations

AGA	Assistant Government Agent
APC	Areas of Particular Concern
BHK	BHK Consultancy Engineering of Netherlands
BOD	biochemical oxygen demand
CCA	Coast Conservation Act
CCAC	Coast Conservation Advisory Council
CCD	Coast Conservation Department
CEA	Central Environmental Authority
cm	centimeter
COD	chemical oxygen demand
CRC	Coastal Resources Center
CRMP	Coastal Resources Management Project
CTB	Ceylon Tourist Board
CZM	Coastal zone management
DANIDA	Danish International Development Agency
DCC	Director of Coast Conservation
FD	Forest Department
DS	Divisional Secretary
DWLC	Department of Wildlife Conservation
EIA	Environmental Impact Assessment
EPL	Environmental Protection Licenses
ERM	Environmental Resource Management Incorporated
GN	Grama Niladhari
GTZ	German Technical Cooperation Agency
ha	hectare
GSL	Government of Sri Lanka
IEE	Initial Environmental Examination
IPZ	Industrial Promotion Zones
IUCN	International Union for Conservation of Nature and Natural Resources
kg	kilogram
km	kilometer
m	meter
MP-CEM	Master Plan for Coast Erosion Management
MSL	mean sea level
NARA	National Aquatic Resources Agency
NARESA	Natural Resources, Energy and Science Authority
NAREPP	Natural Resources and Environmental Policy Project
NEI	Netherlands Economic Institute
PCB	polychlorinated biphenyl
ppm	parts per million
Rs.	Rupees
SAM	Special Area Management
spp	species
sq	square
UDA	Urban Development Authority
UNESCAP	United Nations Economic and Social Commission for Asia and the Pacific
USACE	United States Army Corps of Engineers
USAID	United States Agency for International Development
UNDP	United Nations Development Program
WTO	World Tourism Organization

Revetments, essential in some areas, are expensive to build and maintain



Mangroves, a valuable coastal resource, require management

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

Chapter 1

INTRODUCTION

1.1 The Need for Coastal Zone Management in Sri Lanka

Sri Lanka's coastal area--defined as coterminous with the 67 divisions of the Assistant Government Agents--contains:[27, 32]

- 24 percent of the land area and 32 percent of the 1981 population;
- About 65 percent of the urbanized land area;
- Approximately 80 percent of the hotel rooms;
- Fisheries that produce about 30 percent of the animal protein crucial to the diet of the populace and nearly 80 percent of the annual fish production;
- About 67 percent of the nation's industrial facilities;
- Habitats critical to the sustained production of fisheries, the maintenance of good water quality, and scenic values important to both residents and tourists; and,
- Rich biodiversity reserves including coral reefs, seagrass beds and mangroves.

Coastal areas are increasingly threatened by natural processes such as storm surges that cause severe coastal erosion along portions of the southwest coast.[8] They are also threatened by human activities that increase erosion and pollution, and degrade valuable habitats that serve a source of food and livelihood for many coastal residents.

This plan describes the strategies employed by the Coast Conservation Department (CCD) to reduce or mitigate the worst environmental problems affecting Sri Lanka's coastal areas.

1.2 The Need for a Revised Coastal Zone Management Plan

This plan revises and updates the Coastal Zone Management (CZM) Plan adopted by the Cabinet of Ministers in April 1990. Law requires revision of the CZM plan every five years. The original CZM Plan outlined a strategy for mitigating adverse impacts of development activities on coastal erosion, natural habitats and important scenic and historic sites.[5] It was the culmination of an exemplary vision and years of work.

1 Introduction

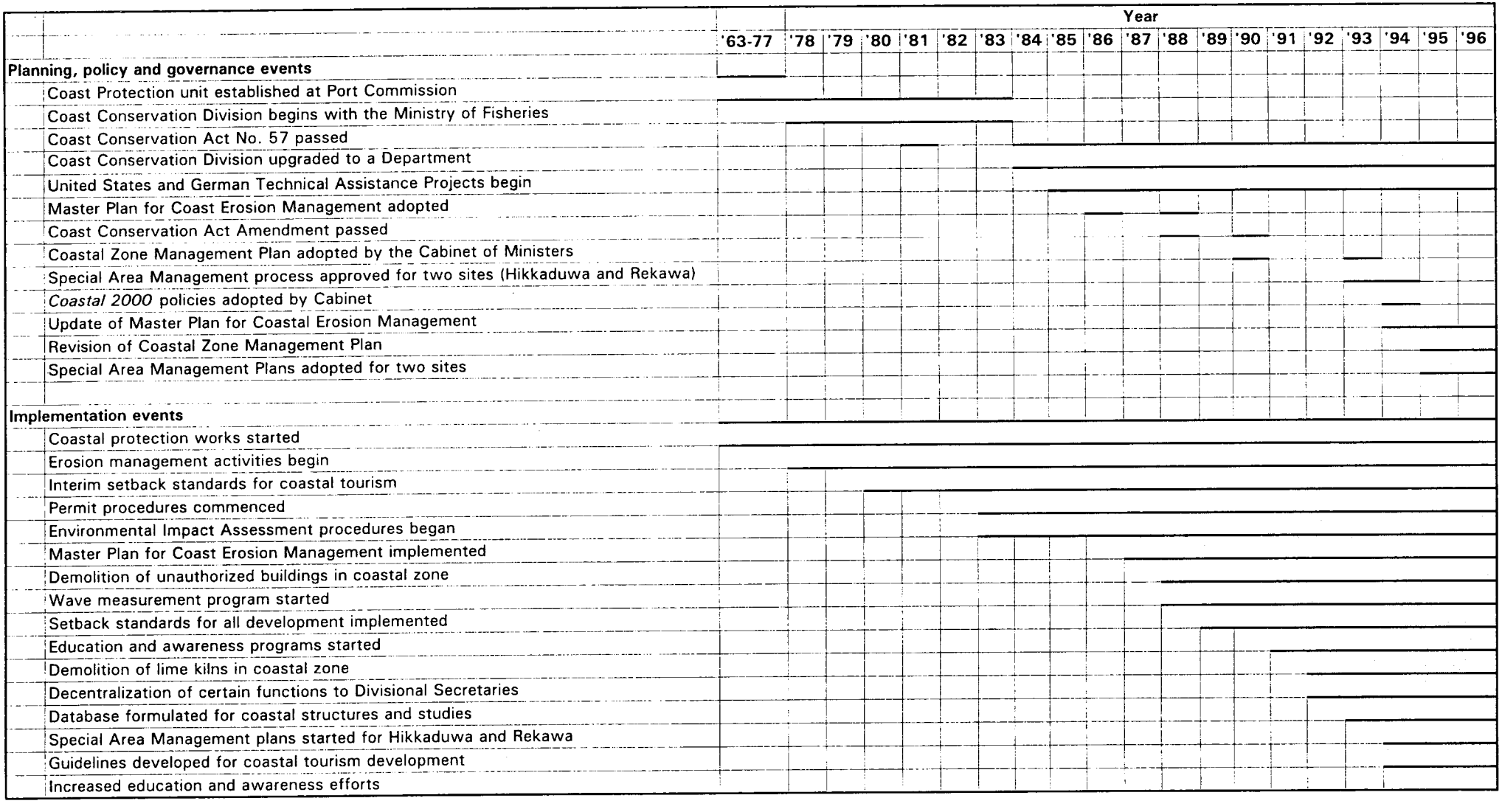
Interest in coastal management in Sri Lanka dates from the 1920s. The original management emphasis was coastal erosion control, but the proliferation of revetments, groins, piers, and fishing harbors constructed by different public agencies and private businesses increased rather than reduced erosion control problems. To bring some order to erosion control, a Coast Protection Unit was established in the Colombo Port Commission in 1963. Recognizing the need to develop a more comprehensive approach to coastal management of which coastal erosion control would be one part, the leadership of the Coast Protection Unit lobbied for the creation of a coastal management agency with a broader management mandate. These efforts resulted in the creation of the Coast Conservation Division (now Department) within the Ministry of Fisheries in 1978 (Figure 1.1).

The leadership of the Coast Conservation Division sought to establish the legal framework for a comprehensive approach to coastal management. They developed and lobbied for the approval of the Coast Conservation Act (No. 57) of 1981. This law gave CCD responsibility for designing and constructing coastal erosion control structures. Second, it required the design and implementation of a process for regulating development in the coastal zone. Anyone proposing "development activities" within a coastal zone defined as extending 300 m inland from the mean high water mark was made subject to permit requirements implemented by CCD. In addition, the law required CCD to undertake scientific and socio-economic surveys of coastal trends and conditions that would provide relevant information to prepare a coastal zone management plan (see references for studies contributing to CZM).

Once the coastal permit system was in operation, CCD staff's focus shifted to the development of the CZM plan. After the background studies and analyses had been completed, it was still not obvious what the substantive emphasis in the plan should be or what role CCD should play. Three factors, in particular, constrained the choice of substantive emphasis in the plan. First, the plan had to be based on a recognition that Coast Conservation was just one of more than 10 agencies with jurisdictional responsibilities for coastal management. The plan and any management strategy that was part of the plan had to acknowledge these jurisdictional boundaries. Second, the plan would have to be regarded as 'legitimate'; as dealing with coastal resource management issues in socially and politically acceptable ways. Third, the plan had to be based on a realistic assessment of CCD's capacity to directly manage development activities affecting coastal resources or to induce, coerce or coordinate management activities by others. In view of limited personnel and funds, CCD staff knew that the management program they designed would have to be selective and focused.

CCD planners chose to focus on a limited set of coastal resource management problems: coastal erosion; degradation and depletion of coral reefs, estuaries and lagoons, seagrass beds, dunes, mangroves, salt marshes, barrier

Figure 1.1. Major coastal zone management planning and management events in Sri Lanka since 1963[5,28,29]



beaches and spits; and loss of valuable historic and cultural resources in the coastal zone. Coastal erosion was emphasized because it was central to CCD's historic management mission. Degradation and depletion of coastal habitats and loss of historic and cultural sites were selected because of their urgency and because CCD's primary management tool, the regulation of development activities by permit, made it possible to mitigate some of the impacts occurring to these resources. The plan presented CCD's management programme to address these problems. It also identified what might be done by other government (and non-government) organizations and the public to address coastal problems and identified research activities of immediate importance. The plan was completed in 1989 and adopted by the Cabinet of Ministers in 1990.

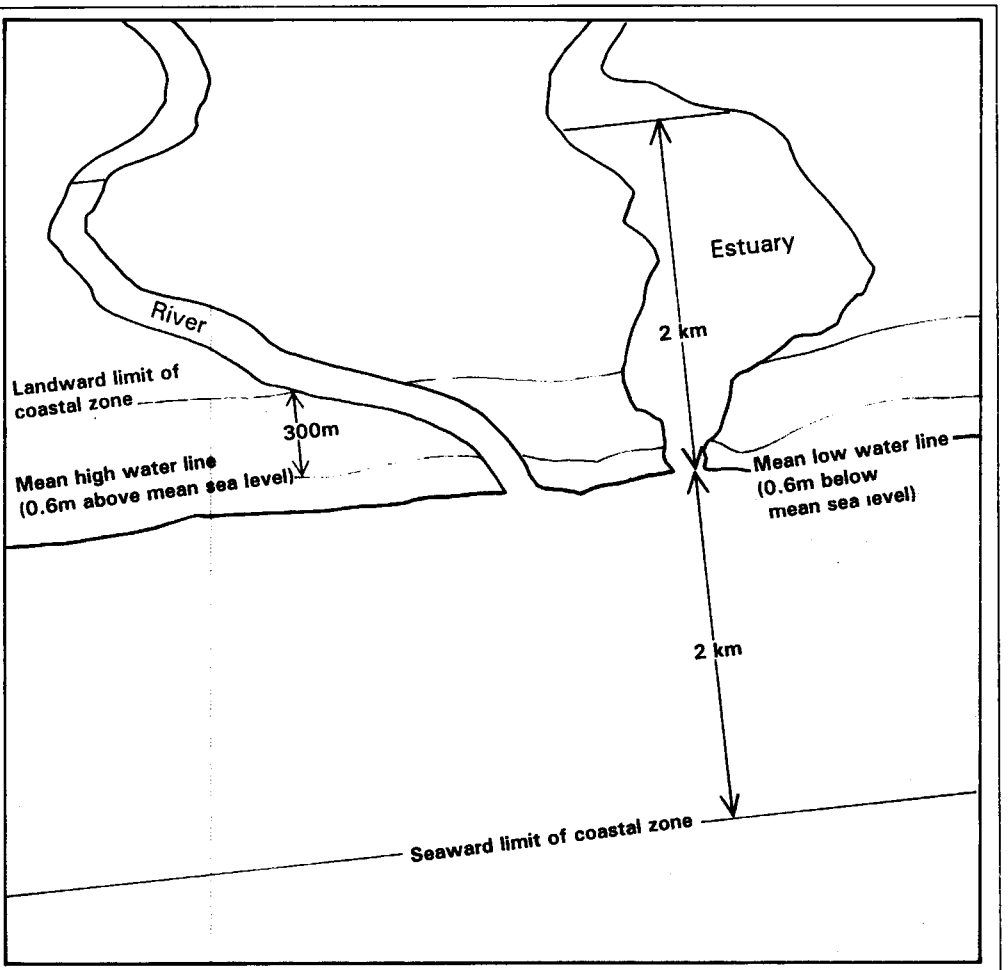
1.3 Coastal Zone Management Plan Implementation Since 1990

Even before the initial CZM plan was formally approved by government, CCD staff were reviewing coastal permit applications, meeting with developers, enforcing coastal setback requirements, constructing coastal protection works, meeting with representatives of other agencies to review projects and to design collaborative management strategies, organizing coastal management awareness projects in the schools and a variety of other implementation activities. This initial period of plan implementation has resulted in several notable achievements:

- More than 2,700 coastal permit applications have been reviewed;
- Environmental Impact Assessment (EIA) requirements have been imposed in 10 cases;
- Over 3,000 meters of coastal works have been constructed by CCD in compliance with the Master Plan for Coast Erosion Management;
- Coastal permit compliance rates have averaged more than 87 percent in one of the most rapidly developing areas;[26]
- Offshore coral mining has decreased more than 50 percent on the southwest coast;
- Coral kilns have been effectively removed from the legal coastal zone;
- Authority to issue minor coastal permits has been delegated to the Divisional Secretaries;
- Site specific Special Area Management planning processes have been initiated at two sites, Rekawa and Hikkaduwa.

Although the CZM plan has been in effect for a relatively short time, the Coast Conservation Act requires that the plan be revised every four years. Plan revision has been shaped by other factors as well. Experience in implementing the permit system, devolution of CCD regulatory responsibilities, increasing economic activity in the coastal zone, a major policy review incorporated in *Coastal 2000: A Resource Management Strategy for Sri Lanka's Coastal Region,*[32]

increased public awareness and education and the development of the Special Area Management program have all shaped the plan revision process. This has provided the impetus for a focus on new coastal problems, the development of new policies, and the design of additional coastal management strategies.[50]



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

"The area lying within a limit of three hundred meters landward of the Mean High Water Line and a limit of two kilometers seaward 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 points [defined by the mean low water line] thereof and shall include waters of such rivers, streams and lagoons or any other body of water so connected to the sea."

(The coastal zone is shown shaded)

Figure 1.2. The Sri Lanka coastal zone

Permit System

Since 1983, CCD's permit system has been its primary means for managing development activities that may increase coastal erosion, degrade or deplete coastal habitats or result in the loss and degradation of historic, cultural or scenic resources in the coastal zone. Development activities requiring permits include residential and commercial construction, recreational structures, roads, sewage treatment plants, dredging, grading, sand mining, and breaching of sand bars. Fishing, cultivation of crops, planting of trees and construction and maintenance of coastal protection works by CCD are not included in the definition of development activities. Permits are required for development activities within the designated coastal zone (Figure 1.2). CCD may call for an Environmental Impact Assessment for development activities which might have significant negative impacts on coastal conditions or resources.

Table 1.1 Applications approved for coastal permits, 1983-1995

Year	'83	'84	'85	'86	'87	'88	'89	'90	'91	'92	'93	'94	'95	Total
Houses	4	33	40	206	100	108	97	95	87	208	97	60	68	1203
Sand Mining	10	72	103	87	60	82	63	274	70	19	42	29	20	931
Hotels	1	0	5	2	3	2	0	7	7	63	48	30	27	195
Miscellaneous	2	0	14	10	12	37	18	30	39	359	85	47	100	753

Since 1983, CCD has reviewed more than 2,700 applications for permits. The number and types of development activities for which permits have been sought is shown in Table 1.1.

House construction and sand mining are the principal type of development activities for which permits have been sought. Since 1990, an increasing number of permits have been sought for coastal hotels. About 98 percent of all permit applications are eventually approved. The high rate of approval obscures the degree to which CCD has been able to influence the quality of coastal development by attaching conditions to permits requiring scaled-down or redesigned projects or by encouraging some applicants to withdraw their applications for projects not likely to be approved.

One aspect of the implementation of the permit system has proved to be controversial: the setback requirements. Setbacks are an effective and inexpensive method of coast protection. However, some coastal developers argue that setbacks deprive them of the full economic use of their property. In particular, they have argued that the setback provisions in the initial plan did not, in all cases, reflect actual coastal dynamics at particular coastal sites. For this

second plan, new setback requirements have been developed. A variable setback line has been established based primarily on erosion rates. These setbacks distinguish between a reservation area and a restricted area, with more rigorous development provisions in the former area. This distinction allows for rigorous regulatory requirements for large permanent structures, and more flexible requirements for smaller, less permanent structures. New setback lines have been drawn which more accurately reflect coastal dynamics.

The permit system has made it possible to mitigate some of the impacts of the largest and most visible projects. The prominence of the permit system--and CCD's willingness to impose rigorous design requirements in controversial cases--has also helped to create an increased awareness of coastal management in the country. It has also proved to be a useful device for coordinating the development review of other agencies. On the other hand, the administration of a permit system from Colombo has not been a useful means of managing individual small-scale mangrove harvesting or lagoon-encroachment activities whose cumulative effects can be severe. For these activities, other management strategies have been devised (see Chapter 7: Special Area Management).

Devolution of the Permit System

CCD staff recognized from the initiation of the permit system that eventually the volume of permit applications and the relatively minor nature of some coastal projects requiring permits would necessitate some delegation of permit authority. Centralized permit processing was seen as a necessary first step to test and refine the permit system. In 1992, after several training programs for local officials, permit authority for minor permits was delegated to the Divisional Secretaries. Minor permits include dwelling houses and related structures with a floor area of less than 1,000 square feet and small scale commercial structures (less than 350 square feet) in the restricted coastal setback area. Minor permits also include removal of sand bars to prevent flooding and small scale sand mining (less than two cubes from locations specified by CCD). Divisional Secretaries are required to inform the Director, CCD on a periodic basis regarding the types and numbers of minor permits issued.

Policies to Promote Integrated CZM

In 1989, the Coast Conservation Department and the Coastal Resource Management Project initiated 19 studies on the future of coastal management in Sri Lanka on topics such as agriculture, mining, fisheries, urbanization, and nutritional status of the population. All the papers shared a common

geographic focus on the coastal region of Sri Lanka and concerned sustainable coastal resource use issues. The reports were synthesized in *Coastal 2000: A Resource Management Strategy for Sri Lanka's Coastal Region*,[32] which was endorsed by the Cabinet in 1994. In addition to providing much information about coastal conditions, it made several broad recommendations:

- A second generation coastal resources management program must be implemented simultaneously at national, provincial, district and local levels and must actively involve the private sector.
- Special Area Management plans must be developed and implemented at specific geographic sites of ecological and economic significance.
- Monitoring and research programs must be undertaken to find answers to specific resource management problems concerning the utilization of coastal habitats, fisheries, water quality, mineral resources, an sites appropriate for aquaculture and tourism.
- The institutional and human resource capacity to address the management problems must be strengthened.
- Public awareness and education should be priorities for all aspects of the program.

These and other more specific recommendations provide much of the context for this revised plan.

Increasing Economic Activity in the Coastal Region

The coastal region comprises 24 percent of the land area of Sri Lanka but economic activities in the region account for 40 percent of the gross domestic product.[41] Industrial development constitutes a significant portion of increased economic activity. Ninety percent of industrial units are located in coastal areas. Three products accounted for 83 percent of the total industrial output and 72 percent of total industrial employment in 1989: (1) food, beverages and tobacco; (2) clothing and leather products; and (3) chemicals, petroleum, coal and plastic products.[32]

In view of the government's industrial development policies and the attractiveness of Sri Lanka for foreign industrial investment, managing urban and industrial wastes are of increasing importance. Urban pollutants--heavy metals, petro-chemicals, sediments and fecal matter--degrade marshes, estuaries, lagoons and coral reefs and threaten the sustainability of near shore fisheries. Increasingly polluted river and ground water also increases exposure to water-borne pathogens. Increasing urbanization and industrialization have combined to make water quality an important issue to be addressed by coastal managers and others.[14]

A second significant economic trend is the steady improvement in the tourism industry. In 1982, the last year prior to the national civil strife, tourism

was the second largest foreign exchange earner. It declined in the decade following, but has become a major source of domestic income again. More than 80 percent of resort hotel rooms are in coastal areas. Applications for coastal permits for hotels increased from 10 in 1990 to 60 in 1993.

Increasing coastal tourism development creates the need for strategies for locating coastal structures in ways that will minimize adverse impacts. Guidance on location and design is provided by *Environmental Guidelines for Coastal Tourism Development in Sri Lanka.*[43] The proliferation of coastal tourism facilities also creates the need for larger-scale area plans in which the development of such facilities can be better coordinated with roads, sewers and other infrastructure.[47]

Special Area Management Planning

The first ten years of coastal management in Sri Lanka meant CCD construction of coast protection works, interagency collaboration, public education, and, in particular, the regulation of development activities by permit. Regulating development by permit has allowed the CCD to block some projects likely to have adverse consequences on coastal resources and to impose conditions on other projects to reduce or mitigate impacts.

A permit system works reasonably well for big, visible projects such hotels and aquaculture operations. However, many coastal habitats in Sri Lanka are being degraded or depleted by the cumulative effects of individual coastal users not necessarily subject or even aware of the permit system. The collective impacts of many individual decisions to cut mangrove fuel wood, to fill in a few square meters of a lagoon to create space for a house or to dump waste in a stream can, over time, severely degrade a fish habitat.

A comprehensive strategy was needed to cope with the impacts of these individual resource use decisions and conflicts over an area that might include resources not in the legally designated coastal zone. That strategy is Special Area Management (SAM).

One of the principal tenets of SAM planning is that it is community-based and collaborative. That is to say, resource use decisions are made by and for the residents living in a designated SAM planning area in collaboration with local and national government officials. Residents, resource users and government officials engage in a process of identifying resources and resource use patterns, considering goals for resource use and determining strategies for locally-based project management. The process of plan development takes several years.[49]

Recognizing the need for locally-based collaborative management, the CCD identified 21 potential SAM planning sites (Chapter 7). Two pilot SAM projects began in 1993 at Hikkaduwa and Rekawa. The community resource user groups have been organized and environmental profiles have been prepared. Site plans were designed through a participatory and transparent process. Lessons from these SAM planning efforts will determine how many other similar projects will be developed in the next few years.

The Special Area Management planning initiative is a reflection of the management lessons that have been learned by CCD staff since the initial plan was developed. Increasingly rapid economic growth in coastal areas---and the impacts that attend that growth---require new management tools and greater collaborative management efforts with other agencies and with the public. While regulation is important, it must be complemented by approaches that rely on the wisdom of those who are closest to the resources and are most intimately aware of the consequences of resource degradation.[55]

1.4 The Scope of the Revised Plan

This plan has been revised over an eighteen month period during which the CCD and the Coastal Resources Management Project (CRMP) reviewed the main objectives, policies and activities of the 1990 CZM Plan. The review process included several national workshops to review setback regulations, incorporate pollution control strategies, and make the plan more consistent, efficient and practical.

The objectives of this revised Plan are to:

- Identify coastal problems that will be the primary focus of attention of CCD during the next four years;
- Indicate why these problems are important;
- Present CCD's management programme to address these problems;
- Identify what should be done by other government and non-government organizations to reduce the scope and magnitude of coastal problems;
- Identify research activities of immediate importance to the management of coastal resources.

This plan, like its predecessor of 1990, outlines interventions to reduce coastal erosion which may be exacerbated by sea level rise (Chapter 2), minimize depletion and degradation of coastal habitats (Chapter 3), and minimize loss and degradation of archaeological, historical and cultural monuments and sites, and recreational and scenic areas (Chapter 5). Chapter 4 on reducing coastal pollution is new. Chapter 6 outlines the coastal regulatory system. Chapter 7 describes the Special Area Management planning and management process. Chapter 8 summarizes the objectives, policies and actions to be implemented by CCD and sets forth the priorities for action.

1.5 The Coast Conservation Department Coastal Management Strategy in Brief

The primary policies and techniques likely to be emphasized by CCD over the next four years are set forth in Table 1.2. These are the policies for which management activities can be employed without significant additions in resources or supporting activities from other agencies. These policies and techniques constitute the core coastal management strategy of CCD.

Table 1.2 Policies and management techniques which comprise the core coastal management strategy of the Coast Conservation Department

Policy	Management Technique*
Erosion Control	
A. Regulate development suitability at specific sites	Education, Permit
B. Ensure proper location in relation to the shoreline	Setback, Education
C. Regulate amount, location and timing of sand mining	Permit, Devolution
D. Build coast protection structures at appropriate locations	Master Plan for Coast Erosion Management
E. Regulate private construction of groins, revetments	Permit
F. Limit construction in erosion prone areas	Building setbacks
Habitat Protection	
A. Regulate location/use of development activities relative to valued habitats	Education, Permit, Special Area Management
B. Regulate discharges which may affect habitats	Permit, Education, Special Area Management
C. Reduce resource use conflicts	Special Area Management
Coastal Pollution	
A. Regulate discharge of waste and residues from new development activities	Permit
Archaeological, Historical, Religious, Cultural and Scenic Sites	
A. Regulation of development activities in relation to valued sites	Permit

* More than one management technique is normally used to implement a given policy, only primary techniques are listed.

1 Introduction

A dynamic shoreline presents management challenges

Coastal erosion and irregular discharge of effluents are problems

Chapter 2

COASTAL EROSION MANAGEMENT

2.1 Findings

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 being spent annually to cope with the loss imposed by coastal erosion, while millions more are being spent on measures to reduce coastal erosion. These costs, however, do not reflect the personal losses, disruption and inconveniences imposed by coastal erosion.[5]

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 m^2 of coastal land are lost each year. Of this amount, about 95,000-160,000 m^2 are lost annually from the 137 km segment that extends from the mouth of the Kelani River (just north of Colombo) to Thalawila (Kalpitiya Peninsula).[5]

Coastal erosion in Sri Lanka is not new. Legends and narratives of coastal related erosion go back over 2,000 years, including references in the historical chronicle 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 groins. However, by the 1970's erosion control came to be regarded as constituting part of a broader programme of coastal resources management.

Coastal erosion is the result of powerful natural forces that humans can only partially control. Most shoreline protection structures 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. Such approvals and understanding are even more important now if sea level rise becomes a reality.

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 defenses 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 in ten to fifteen years.[11,44]

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. 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.

Table 2.1 Coastal erosion and accretion rates in Sri Lanka[3]

Sector	District	Coastline in km	Erosion, percent of coast	Erosion rate m/year	Accretion, percent of coast	Accretion rate m/year	Net erosion m/year	Net loss 100 m^3/year
West	Puttalam	300	30 - 40	0.3 - 0.4	30 - 60	0 - 0.1	0.2 - 0.4	60 - 120
	Gampaha	40	45 - 50	N.A - 1.0	10 - 20	0 - 0.1	0.9 - 1.0	35 - 40
South West	Colombo	40	20 - 25	0 - 0.1	N.A	N.A	0 - 0.1	0 - 5
	Kalutara	40	70 - 80	0.1 - 0.5	20 - 30	0 - 0.1	0 - 0.4	10 - 20
	Galle	75	60 - 65	N.A - 0.3	0 - 10	0 -0.1	0.2 - 0.3	10 - 20
South	Matara	55	N.A- 88	0.9 - 1.0	N.A	N.A	0.9 - 1.0	40 - 50
	Hambantota	135	40 - 50	N.A - 0.2	10 - 20	0-0.1	0.1 - 0.2	20 - 30
East	Amparai	110	40 - 50	N.A - 0.2	10 - 20	0-0.1	0.1 - 0.2	20 - 25
	Batticaloa	100	N.A- 60	0.1 - 0.2	N.A- 20	0-0.1	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	0 - 20	0.2 - 0.3	0 - 0.1	0 - 10
North	Jaffna	275	60 - 70	N.A - 0.3	0 - 20	0.1	0.2 - 0.3	30 - 90
	Mannar	155	60 - 70	N.A - 0.5	0 - 20	0.2	0.3 - 0.5	70 - 80
All Country		1,585	45 - 55	0.30 - 0.35	10 - 25	0 - .15	0.2 - 0.35	300-500

N.A. Information not available

Note: Figures should be treated as indicative because of site specific variations which cannot be accounted for in broad coastal segments; figures for southwest coast were updated by CCD in 1995

Despite these favorable 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 2.1 and Figure 2.1.

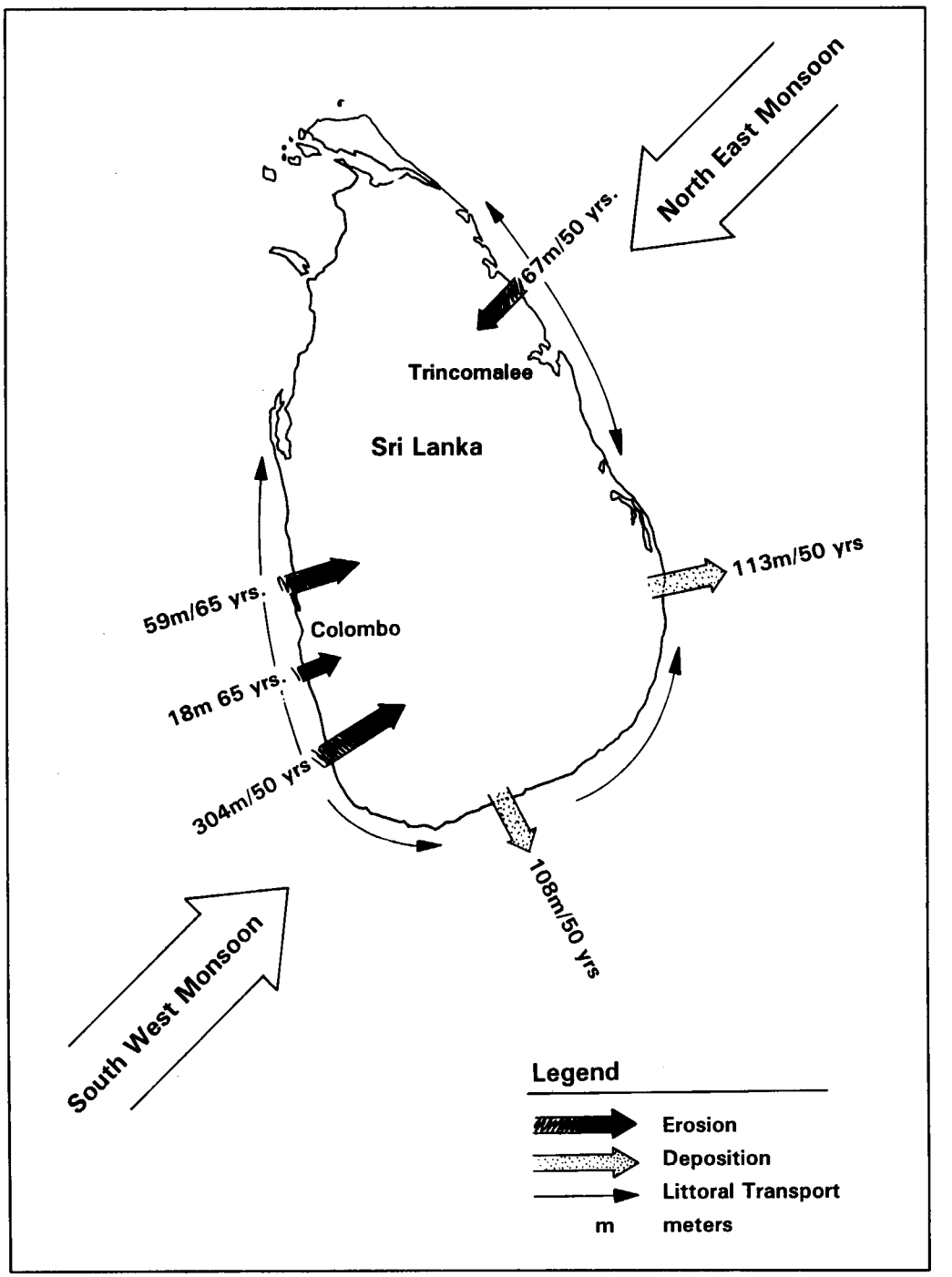


Figure 2.1. Erosion rates on southwest coast in 1995

It is important to recognize that erosion is highly localized and within each coastal 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 coastal erosion in Sri Lanka is not unusual when compared to world trends.

Problem Causes

a) Natural Processes and Sea Level Rise

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 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.[44] Storms can result in sudden and dramatic changes to a beach. However, in many instances, such changes are only seasonal and the beach will recover after a period of calm weather. These processes are illustrated in Figure 2.2.

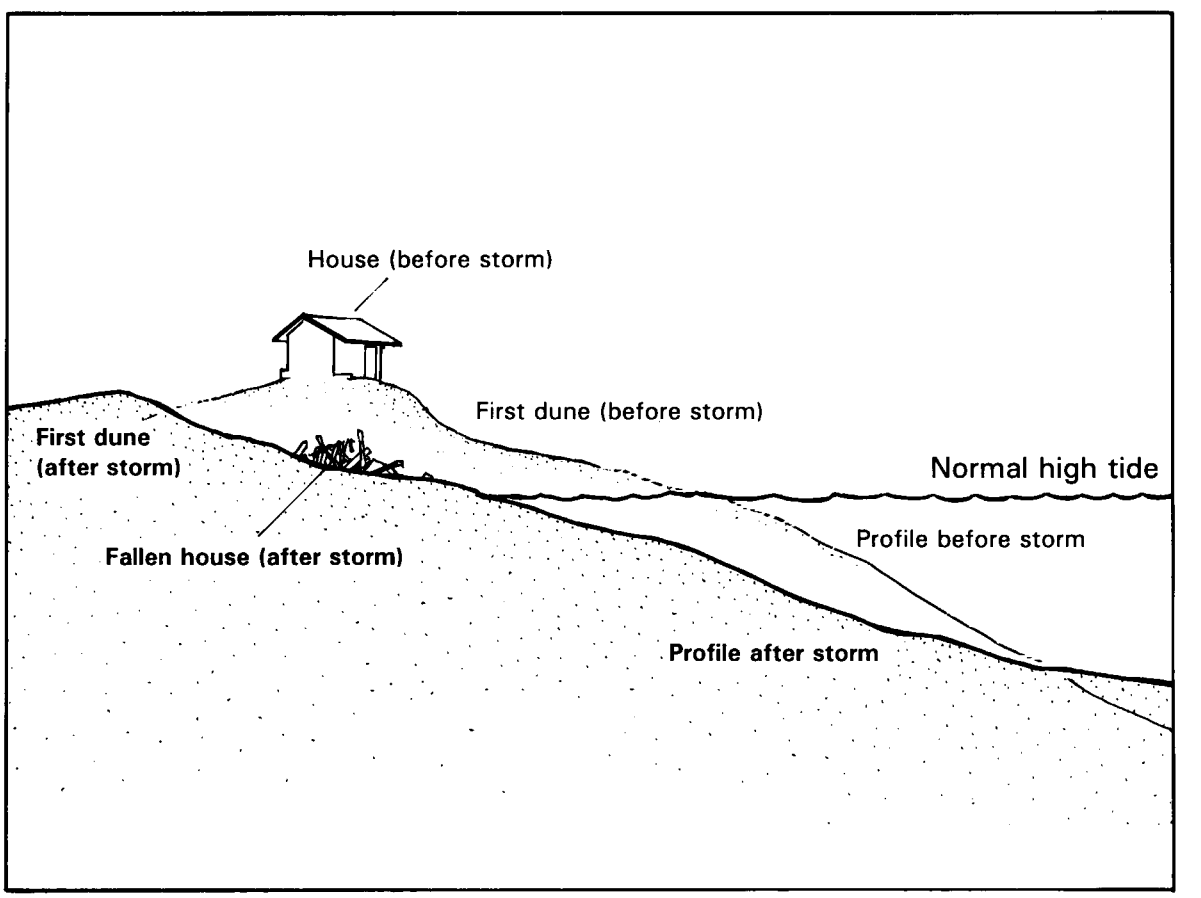


Figure 2.2 Short-term erosion caused by wave action

Waves, wave induced currents and other sea currents (e.g. tidal) are the dominant natural processes which cause sand transport in the foreshore and under certain conditions, coastal erosion. Therefore, these processes have to be known and understood in order to predict shoreline development trends and to design coast erosion management schemes. The structural design of coast defence structures is based on the wave loads as well as on tidal and current conditions. Therefore a substantial knowledge of the wave climate including that of statistical distribution of characteristic wave parameters is of great importance in coastal engineering.

A comprehensive directional wave measuring programme was carried out at the South coast of Sri Lanka during the period February 1989 to September 1996. The data demonstrates the importance of directional wave climate studies as the waves at the south and west Coast are characterised by two different wave systems. These are the long period swell from almost due south in deepwater throughout the year, with small differences of the wave heights, and the other is the shorter period sea waves which are generated as a result of the local monsoon winds. It was realized that particularly at the south west coast a small variation of the mean wave direction can result in different nearshore conditions and even an opposite net longshore drift.

Growing beaches and shorelines are fed or nourished by material that has been transported from some where 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 2.3.

Over the long-term, shoreline retreat occurs in response to rising sea level. During the last major ice-age about 18,000 years ago, the sea level fell an average of about 100 m 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 now rising faster than in the past.[31] Recent estimates of global mean sea level rise vary from 0.3 to about 1 meter or 1.0 mm - 1.5 mm per year during the next century. This will have significant effects on low lying coastal areas resulting in shoreline retreat, erosion, flooding and salt water intrusion.

Barrier spits are located at most river outlets along the coastal reaches of the country, especially from Hambantota to Chilaw. These barrier spits average 1.0 m - 2.0 m above MSL, and are natural barriers against salt water intrusion in time of dry weather and low runoff. A rise in the sea level will erode these spits and allow additional salt water intrusion both upstream of rivers and via the ground water table.[34]

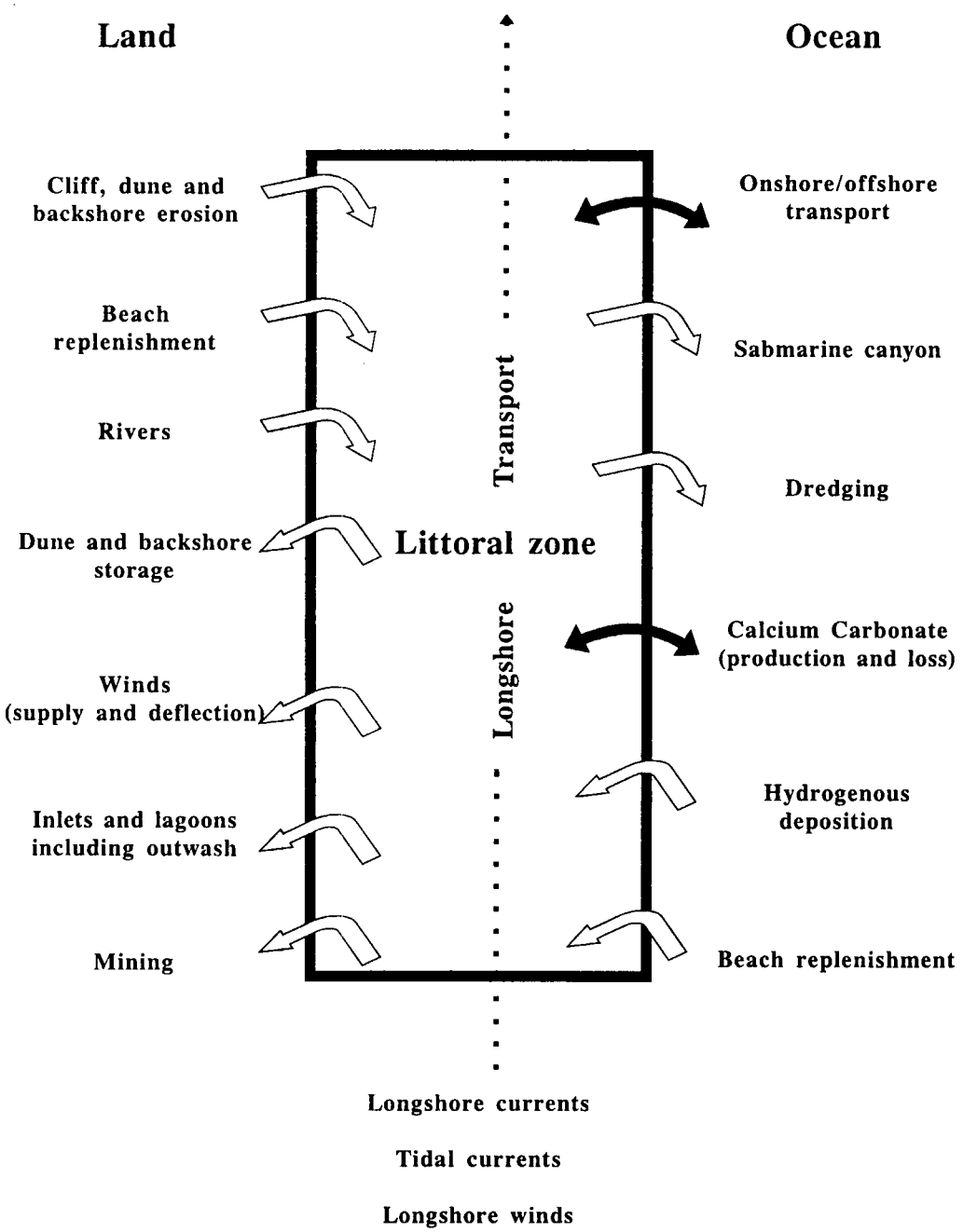


Fig. 2.3

Figure 2.3 Sources of inputs and losses to the littoral sand budget [48]

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 significantly to erosion of some segments of Sri Lanka's coast are summarized in Table 2.2.

Table 2.2 Activities contributing to coastal erosion in Sri Lanka

Causal Agent	Process	Effect	Examples
Beach sand mining	Reduction of sand in beach maintenance system threatening renewal	Increased erosion	Panadura, Lunawa, Angulana and Palliyawatta
River sand mining	Reduction of sand in beach maintenance system threatening renewal	Increased erosion of adjacent beaches and of river banks	Kalu Ganga, Kelani Ganga and Maha Oya
Inland coral mining	Conversion of productive land into waterlogged area	Development of inland waste dumps and abandoned pits, reduction of coastal stability by creation of low-lying areas	Akurala, Kahawa, Ahangama and Midigama
Collection of coral from beaches	Reduction of beach nourishment material	Increased erosion	Ambalangoda to Hikkaduwa, Midigama, Ahangama and Polhena
Reef breaking or dynamiting for mining or fishing	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 and Nilaveli
Improperly sited groins, harbours, revetments, jetties	Interference with natural sand transport processes	Erosion in some places, accretion in others	Beruwala and Kirinda Fishery Harbours
Improperly sited coastal buildings	Interference with dynamics of coastal processes	Loss of structures, other impacts due to retreat	Hikkaduwa, Bentota, Beruwala, Negombo
Removal of coastal vegetation	Exposed area subject to more rapid rates of wind erosion	Erosion, retreat	Palliyawatta, Koggala, Polhena, Negombo

c) Sand Mining

Sand mined from Sri Lanka's coastal areas and rivers is used by the construction industry. Sand mining in a river lowers its bottom, causes bank erosion and reduces the supply of sand to the coast. The river bed and the banks will show continuous erosion when the extraction rate nears or exceeds

the natural productions. In these circumstances there may be a sharp drop in supply to the coast. The reduction of supply to the coast and direct mining from the beach lead to recession of the coast, gradually spreading from the river mouth and the locations of beach mining. The effects of mining combines with the effects of sea level rise. Any volume of sand extracted from the active parts of the rivers and the coast is lost to the entire system. No natural process can replace it.

Excessive mining and inappropriate location 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 taken from an area without causing erosion problems either at the site or at downdrift locations.

The erosion of the river banks and coast can be prevented by protection work. It has been estimated that the damage, in the form of land loss and/or protection comes to Rs. 25 to 30 million per annum or Rs. 9.00 per m^3 of sand mined.[31]

The ongoing recession and depletion of sand in the river beds and along the coast will cause deepening of the rivers and estuaries; enlargement of the mouths of rivers and other coastal inlets, and the creation of new inlets by breaching of the coastal barrier. These processes will allow:

- The sea (tides, saline water) to intrude deeper in to the coastal plains;
- Increased flooding originating from the sea;
- Disappearance of coastal vegetation;
- Salt intrusion, especially during dry seasons; and
- Changing water quality causing negative impacts on aquatic fauna and habitats.

A survey of the location, extent and socio-economic issues related to coastal sand mining from Puttalam to Dondra Head conducted by the CCD in 1984 was updated in 1991.[12,33] This area includes most of the major sand mining locations in Sri Lanka. The 1991 study revealed that approximately 576,938 cubes (1,633,700 cubic meters) of sand were mined from the coastal region. This indicates a 14 percent or 69,072 cube increase in 1991 over 1984. The number of sand miners had increased from 1,762 in 1984 to 2,891 in 1991. The sand extracted by site in 1984 and 1991 from the rivers and the coastal zone is quantified in Table 2.3.[12]

Table 2.3 Location and estimated volume of sand mining (Puttalam to Dondra Head)[5,12, 33]

Location	Number of landing sites 1984	Number of cubes* removed 1984	Percent of total	Number of landing sites 1991	Number of cubes* removed 1991	Percent of total	Change
River Sand							
Deduru Oya	2	22,896	4.00	9	2,841	0.5	-20,055
Maha Oya	61	111,720	21.00	122	221,242	35.4	+109,522
Gin Oya	2	79,445	15.00	5	4,652	0.7	-74,793
Kelani Ganga	181	222,771	43.00	427	226,240	36.1	+3,469
Kalu Ganga	67	46,667	9.00	1[illegible]	46,010	7.3	-657
Madu Ganga	2	799	0.30	[illegible]	4,384	0.7	+3,585
Gin Ganga	41	21,563	4.00	101	70,557	11.3	+48,994
Nilwala Ganga	7	2,005	0.70	3	1,012	0.2	-993
Sub Total	363	507,866	97.00	844	576,938	92.2	+69,072
Sea Sand							
Ratmalana-Walauwatta	5	768	0.10	5	2,184	0.3	+1,416
Ratmalana-Weliwatta	3	2,592	0.50	3	1,820	0.3	-772
Lunawa	3	576	0.10	3	8,424	1.3	+7,848
Egoda Uyana	3	672	0.10	--	--	--	--
Lunawa Beach Road	1	240	0.05	1	5,616	0.9	+5,376
Angulana	8	1,716	0.30	8	2,496	0.4	+780
Panadura	2	1,080	0.20	2	11,648	1.9	+10,568
Nalluruwa	15	3,756	0.70	15	1,820	0.3	+1,936
Talpitiya	6	2,988	0.60	6	7,800	1.2	+4,812
Malanwatuna	3	1,422	0.30	3	2,912	0.5	+1,490
Madampagama	1	104	0.03	--	--	--	--
Wellawatte-Hikkaduwa	2	392	--	--	--	--	--
Hediwela	--	--	--	1	1,092	0.2	--
Mirissa South	--	--	--	2	1,092	0.2	--
Wellamadama	--	--	--	3	1,820	0.3	--
Sub Total	50	15,914	3.0	52	48,724	7.8	+33,454
Grand Total	413	523,780	100		625,662	100.0	+102,526

* Cube equals 100 cubic feet or approximately 3 cubic meters

River sand is preferred for construction activities and approximately 92 percent of the sand mined (1991) comes from the rivers. The Kelani Ganga and Maha Oya are the largest sources of river sand and together account for 77 percent of the river sand harvested in the study area. The above study further revealed that shoreline mining provided 48,724 cubes of sand in 1991, with most mining concentrated between Talpitiya and Panadura.

Between 1984 and 1991 the consumption of river sand increased by 13 percent and consumption of sea sand increased 200 percent. However from the total sand extracted from river sources only 6 percent is from areas under CCD jurisdiction while the other 94 percent is extracted from outside the coastal zone. Due to the enforcement of CCD regulatory measures on sand removal in lower reaches of river basins, the operators have shifted their illegal sand mining to the beach.

d) Coral Mining

Coral is the principle source of lime for Sri Lanka's construction industry, supplying approximately 90 percent of the 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 four hundred years. Traditionally, only relic reefs behind beaches were mined. The growth of the construction industry since the late 1960's has stimulated the coral mining industry and led to the destruction of living reefs that serve as natural barriers against wave attack on these coasts.

Types of coral extraction in Sri Lanka include reef breaking, collection of coral rubble from the beach, and back beach mining. Reefs are also blasted to provide navigation access to fishing boats. Both coral collection from the beach and the reef breaking aggravates erosion. Besides destroying the ecologically valuable reef habitat (see Coral Reefs, Chapter 3), reef breaking reduces the size of the fringing reef and its natural ability to absorb the energy of breaking waves. Without reefs, the full force of waves strikes the shore, thus increasing the rate of erosion.

Coral rubble is one source of beach material in Sri Lanka. By collecting large amounts of coral rubble from the beach, the amount of material available for beach nourishment is reduced, accelerating erosion either locally or downdrift. Coral rubble also assists in reef building through consolidation by binding organisms which leads to new reef formation.[5, 24]

Table 2.4 Coral collected from Sri Lanka's southwestern coastal sector, 1984 and 1994[35,39]

Location	Amount (tons) 1984	Percent of total	Amount (tons) 1994	Percent of total
Inland	10,400	58	15,800	80
Sea corals	7,659	42	4,020	20
Total	18,059	100	19,820	100

In 1984, an excess of 18,000 tons of coral 1985 was extracted in the coastal reach between Ambalangoda and Dickwella.[35] By 1993 sea corals removed from the coastal zone declined to an estimated 4,020 tons per annum, a 48 percent decrease from 1984 (Table 2.4). This has resulted from the enforcement of regulations under the Coast Conservation Amendment Act of 1984. However the sea coral supply to the market has been supplemented by mining of inland coral deposits outside the coastal zone. The amount of inland coral mining has increased 52 percent from 10,400 tons in 1984 to 15,800 tons in 1994. In 1994 a total of 1473 persons were directly engaged in mining, collecting and transporting of sea corals while another 800 persons were engaged in inland coral mining activities.[15, 39]

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. The complexity of the coastal forces, and an imperfect understanding of erosion processes in a specific area, often cause shoreline protection efforts to produce only short-term improvements. They can make the long-term situation worse. Poor results often occur when coastal works are constructed in response to an emergency and when there is an insufficient understanding of natural process 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 a sound understanding of natural processes prevailing at a site, they can, apart from causing downdrift erosion, fail to meet the objectives for which they are originally planned. Examples of such failures in Sri Lanka include 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 2.4 illustrates the effect of maritime construction on sediment transport and coastal stability.

In Hikkaduwa and Negombo, 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 the opposite effect. This is because vertical walls in areas where there is significant wave action, accelerate beach erosion. Much of the energy of waves breaking on the structure is redirected downward to where the wall meets sand or earth or reflected, and erosion is increased. The reflected energy creates a scouring action near the toe of the structure and may cause the undermining and eventual collapse of the structures. Failure of steeply faced sea walls built on high energy coastlines is illustrated in Figure 2.5.

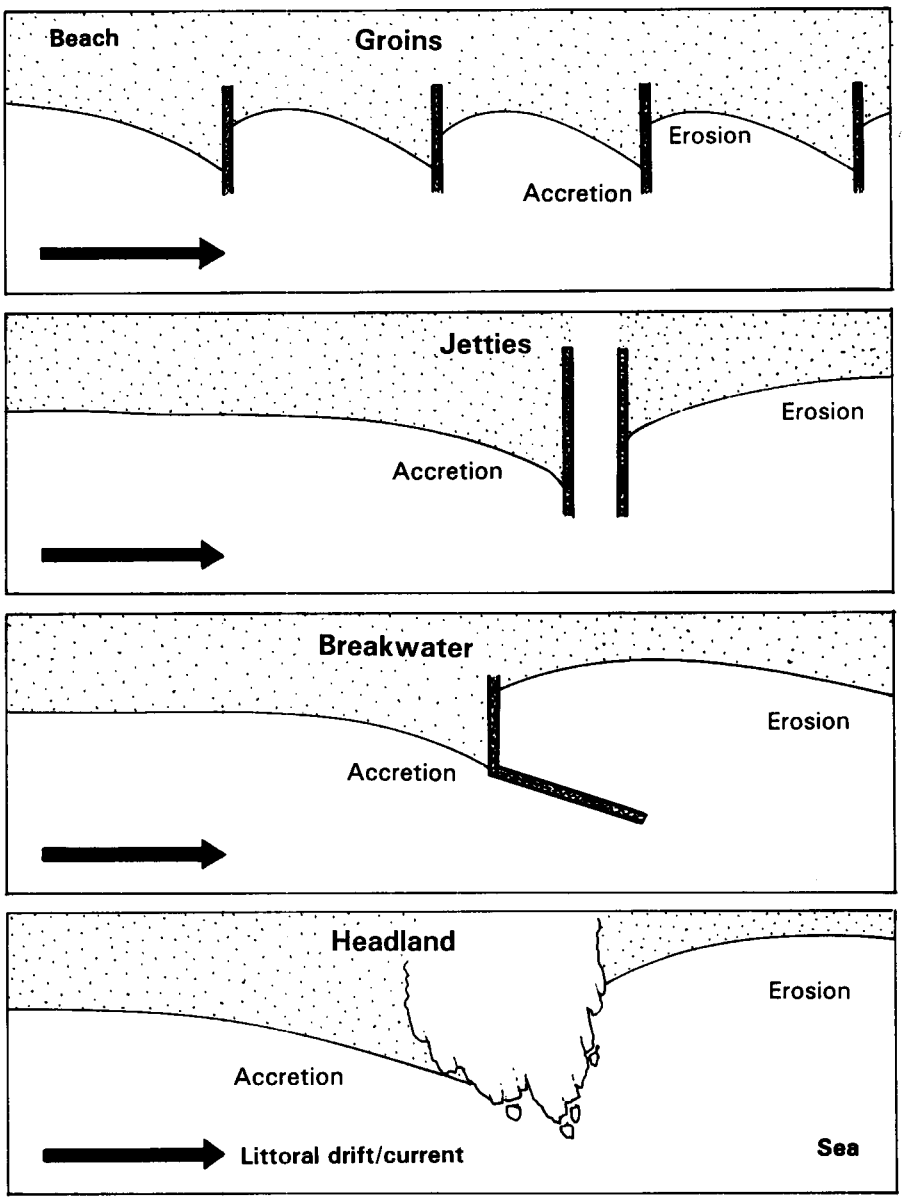


Figure 2.4. The effect of maritime construction on sediment transport and coastal stability

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.[43] 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. The planting of appropriate vegetation in eroding areas provides protection against erosion but does not, assure protection against major storms.

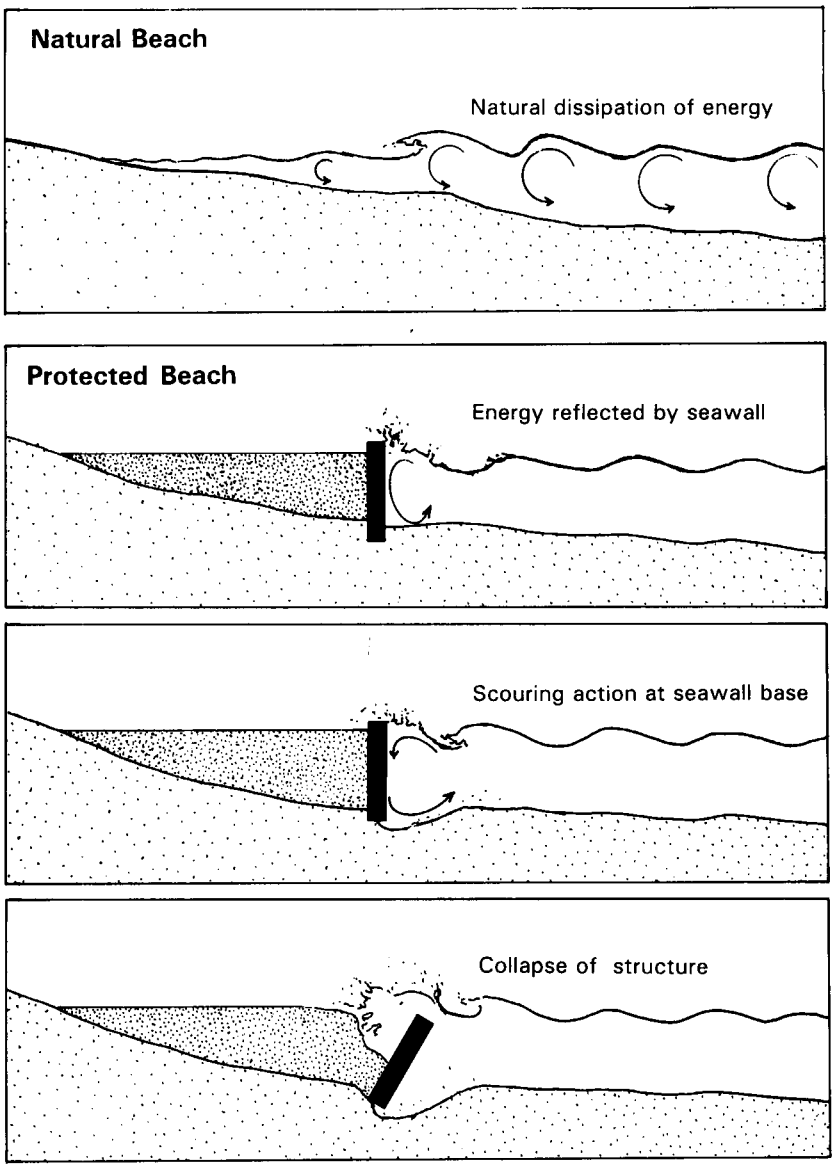


Figure 2.5. Failure of steeply faced sea walls built on a high energy coastline

Managing an Eroding Shoreline

Management of human activities and development along an eroding shoreline is difficult. Often, it is not possible, to protect 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 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 include:[5]

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

Erosion management activities of CCD consist primarily of installation 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 are discussed in Chapter 6.

Sri Lanka has made a significant financial investment in protecting its shoreline. More than 373 million rupees since 1970 have been invested in the most commonly used shoreline protection structures of revetments and groins. In addition, sand nourishment has been utilized in restricted areas. Existing lengths of shoreline protection works are summarized by coastal sector in Table 2.5.

Table 2.5. Length of existing effective shoreline protection works

Coastal sector	Total length (meters) 1996
Revetments	
West coast	5,633
Southwest coast	25,698
South coast	3,920
Total	**35,271**
Groins	
West coast	2,135
Southwest coast	2,912
South coast	663
Total	**5,710**

A revetment provides protection only to the length of the coastline it covers, and a groin, if effective, to about three times its length. Hence, all the protective structures so far built in these sectors provide effective protection only to approximately 52 km of coastline; whereas approximately 270 to 380 km of coastline in these sectors are considered erosion prone areas. Thus investment in structures protects only between 18 and 25 percent of the shoreline that requires protection.

2.2 Solutions for Managing an Eroding Shoreline

Short-term Solutions

Coastal erosion may occur irrespective of geographical location, time and season. In such instances a short term solution may be adopted to curtail the emergency situation in the absence of long term beach stabilization schemes. Because of the need to protect life and property from emergency situations, the CCD may implement short term solutions depending on the site specific problem. The potential impact of such solutions on the adjacent areas will be taken into account from the coast conservation perspective, before such protection works are undertaken. In providing short term solutions for emergency situations, CCD will give priority to protection of public property. However, CCD may allow any private or other public agency to implement short term coast protection measures in compliance with CCD criteria and guidelines. Examples of such short term measures are sand bag protection, gabion revetments, boulder revertments and upland protection by dumping graded material.

Long-term Solutions

Long term solutions are planned coastal stabilization schemes formulated on the basis of coastal engineering information. This process involves comprehensive research, time, expertise, planning, funding and political acceptance. As a long term solution for coastal erosion, CCD developed a Master Plan for Coast Erosion Management in 1986.

a) Master Plan for Coast Erosion Management

The Master Plan for Coast Erosion Management (MP-CEM) was prepared with the assistance of the Danish Government (DANIDA). The MP-CEM identifies erosion prone sites along the coast where structural solutions to the erosion problem are appropriate. Two coast protection schemes Negombo and Moratuwa, have been completed under "DANIDA Stage One" (1987-1989) stabilizing 16 kilometers of coast at a cost of Rs. 322 million. The Negombo scheme (7 km of coastline) consists of 400,000 cubic meters of beach nourishment, 4 offshore breakwaters, and 2 groins, while the Moratuwa scheme (9 km of coastline) consists mainly of the construction of some 5000 meters of revetments including rehabilitation of existing revetments. Under the "DANIDA Stage Two" (1990-1992), a further Rs. 520 million was spent to undertake schemes to protect the main coastal road between Beruwala and Weligama at points where it is threatened by erosion.

Apart from the two DANIDA projects, a further Rs. 700 million has been estimated for the protection of key areas as indicated in Table 2.6.

The German Technical Assistance Agency (GTZ) has also provided assistance for strengthening the CCD database on the coastal situation and CCD's capacity for wave measurement; pilot projects for coast protection; equipment; maintenance and structures and environmental education and training. The GTZ provided Rs. 120 million in the stage I (1990-1991); Rs. 90 million in stage II (1991-1993) and Rs. 90 million in stage III (1994-1995).[50]

Table 2.6 Approximate cost of implementing selected long term stabilization schemes

Key Area	Rs. Million
Hikkaduwa	190
Beruwala-Bentota	170
Kalutara	140
Colombo North	130
Maha Oya- Lansigama	120
Total	750

Commencing in 1986, the Government of Sri Lanka planned to invest, with bilateral assistance, more than Rs 1,200 million to implement the recommendations of the Master Plan for Coast Erosion Management.[3] This expenditure provided protection to a total of 155 km of Sri Lanka's coastline. This still leaves 160 to 225 km of erosion prone coastline in western, southwestern and southern areas where coast erosion will have to be accepted as a given. Here development activities and human settlements need to be planned accordingly.

b) Nonstructural solutions

The Coastal Zone Management Plan has clearly identified the necessity of adoption of structural and nonstructural solutions to curb the erosion problem. However, in the implementation of the Master Plan for Coast Erosion Management more emphasis has been given to structural solutions. The implementation experience of the CCD revealed that structural solutions alone will not curtail the coastal erosion problem in full. Therefore it is important to place more emphasis on adoption of nonstructural solutions to achieve the desired objectives. In the long term, the nonstructural solutions will be more cost-effective and more economically, socially and environmentally viable. In this phase of the coastal zone management more attention is given to the nonstructural solutions. These include land acquisition, transfer of development rights, implementation of setback standards, regulating sand and coral mining activities and enhancement of community awareness through education.

2.3 Management Objectives, Policies and Actions

Objective 2.1 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 1 New construction may be permitted only in accordance with the setback standards set forth in Chapter 6, Table 6.2.

Actions CCD shall:

1. Enforce coastal setback standards.
2. Conduct annual permit compliance monitoring surveys.
3. Institute legal action against non compliance of stipulated setback conditions.
4. Build awareness of setback regulations.
5. Demarcate coastal segments and display sign boards indicating relevant variable setback standards.

Policy 2 Minimize adverse impacts due to construction of maritime structures such as piers, jetties, breakwaters and recreational facilities within the coastal zone.

Actions CCD shall:

1. Formulate and implement guidelines governing the location and construction standards of maritime structures within the coastal zone.

Objective 2.2 **Ensure that sand mining within the coastal zone does not contribute to unacceptable levels of coastal erosion.**

Policy 1 Sand mining shall be regulated by means of guidelines specifying quotas, time limits, setbacks, site rotation and the imposition of monitoring schemes (Table 2.7).

Actions CCD shall:

1. Enforce guidelines specified in the CZM Plan (Table 2.7).
2. Undertake periodic monitoring surveys of sand mining.

Policy 2 Research shall be conducted to define sustainable limits and site specific sand budgets, and to identify alternative sources of sand to meet the requirements of the construction industry.

Actions CCD shall:

1. Participate in a National Sand Study under the auspices of the Central Environmental Authority.
2. Implement recommendations made by the National Sand Study.

Objective 2.3 **Identify the coastal erosion trends and formulate appropriate mitigation measures that are cost effective and socially and environmentally acceptable.**

Policy 1 Carry-out the coast protection programmes consistent with the updated Master Plan for Coast Erosion Management.

Action CCD shall:

1. Update the Master Plan for Coast Erosion Management for identification of erosion-prone areas and design strategies to manage them.

Table 2.7. Guidelines for sand removal in the coastal zone*

1. Riverine Estuaries

Permitted where the downstream beaches do not indicate signs of deficient sand supply; a minimum distance to be maintained between the mining site and the river mouth specified in permit

2. Beaches, Barrier Beaches and Spits

a) Removal from non-accreting beaches, barrier beaches and spits is not permitted
b) Removal from accreting beaches may be permitted if such removal will not cause adverse environmental impact in adjacent sites

3. Multiple Dune Systems and Stable Reservoir Area

Removal from areas known to be termini of sand circulation cells may be permitted; when mining is completed, the developer must replant the dune with appropriate vegetation to prevent further sand loss from wind erosion; backfilling will be carried out by the developer as specified by CCD

4. Sand Bars 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 removed shall not be out of the littoral cell

5. Sites Containing Stone Age Artifacts

Sand removal will not be permitted from areas designated by the Director General of Archaeology as containing stone age artifacts.

6. Offshore Areas

Offshore mining will not be permitted within the 10 m depth contour or 1000 meters seaward 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 mining may be permitted in other locations if the following conditions are met:

a) Developer conducts an Initial Environmental Examination or Environmental Impact Assessment prior to commencement of any kind of offshore dredging;
b) Developer conducts, at his cost, investigations deemed necessary by the CCD and submits to CCD all required documentation for evaluation of the permit application;
c) 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;
d) Mining is restricted to a depth, determined by CCD for a particular site.

* Guidelines will be applied in the issue of permits pending the location of alternate supply sources; methods of mining, stockpiling, transfer from the mining site to storage site, and location of storage and disposal sites will be specified by CCD.

2. Conduct and support research on coastal processes relating to erosion and its control, including investigating the feasibility of using soft solutions to control erosion.

Policy 2 Shoreline protection schemes implemented by public or private entities other than the CCD may be permitted if consistent with CCD guidelines.

Action CCD shall:

1. Formulate guidelines and criteria to allow for the construction of private coast protection works in compliance with Master Plan for Coast Erosion Management.
2. Prepare monitoring plans with the project proponent to determine impacts of such measures.

Policy 3 Support action to minimize the social and economic impacts caused by the prohibition of coral mining.

Actions CCD shall:

1. Coordinate inter-agency efforts to provide alternative employment to displaced coral miners.

Policy 4 Carry out a land acquisition and development rights purchase programme as a soft solution for managing vulnerable coastal stretches where necessary.

Actions CCD shall:

1. Conduct a survey to identify potential sites for acquisition or purchase of development rights;
2. Develop financial mechanisms for a land acquisition and development rights purchase programme.

Policy 5 Promote the collection of scientific information on coastal erosion rates and trends.

Actions CCD shall:

1. Collaborate with universities and other concerned agencies to assess erosion trends and patterns.
2. Establish fixed locations to monitor erosion trends.

Policy 6 Encourage the collection and use of scientific and socio-economic information required to update the CZM plan.

Actions CCD shall:

1. Establish and develop a comprehensive database on coastal processes and socio-economic characteristics.
2. Collect, store, disseminate and exchange data with public and private agencies for research and planning purposes.

Objective 2.4 **Minimize the negative impacts of coastal erosion and possible sea level rise by reclaiming suitable coastal frontages to ensure additional buffers.**

Policy 1 Promote measures to expand the existing coastal front, thereby providing additional buffers against sea erosion and possible sea level rise.

Actions CCD shall:

1. Prepare guidelines on coastal reclamation.
2. Identify potential reclamation sites, prioritize the most vulnerable places, and prepare reclamation plans.

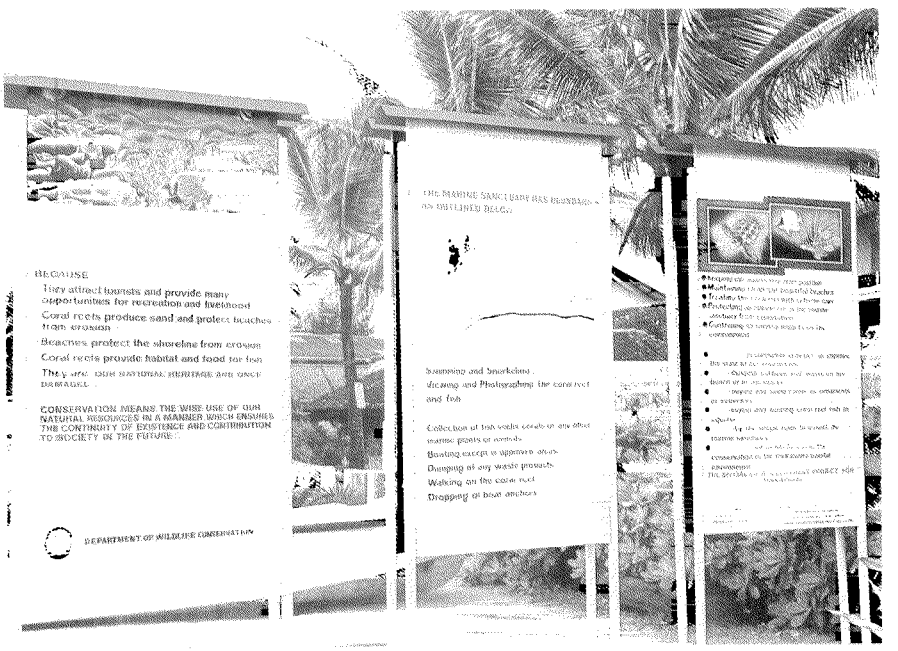
Objective 2.5 **Enhance economic potential of coastal frontages and their capacity to withstand erosion, by implementing development schemes based on coastal reclamation, at sites where such reclamation will not have adverse environmental consequences.**

Policy 1 Enhance the economic potential and ability to withstand erosion of selected coastal reaches by implementing environmentally acceptable reclamation schemes.

Actions CCD shall:

1.Encourage development consistent with this objective.

2.Implement reclamation schemes at sites where protection costs can be recovered through developments consistent with this objective.



Public education encourages stewardship of coastal habitats

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

Chapter 3

COASTAL HABITAT MANAGEMENT

3.1 Findings

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. Sri Lanka's important coastal habitats are small and highly vulnerable to degradation. The areal extent of biologically productive mangrove systems, estuaries, coral reefs and seagrasses is decreasing. Mangroves estimated to cover about 12,000 ha in 1986 were reduced to 8,687 ha by 1993 and are predicted to cover only 6000 ha by the year 2000.[4,5,6]

The number of people attempting to make a livelihood in the coastal region will increase by at least 37 percent over the 1981 census numbers by the year 2000, and by fifty percent towards the middle of the twenty first century.[27] Population density in the coastal region is projected to be 446 person per km^2 by the year 2000 and more than 1000 per km^2 in 27 of 67 coastal AGA divisions. The resource management problems associated with increasing population pressures, the need for expanding settlements, the need for industrial development and increasing exploitation of resources will intensify. The challenge is to manage the development and use of natural habitats in a manner that will provide sustainable yields.[14]

Activities that occur outside the legally defined Coastal Zone often create impacts on coastal habitats. In addition, a number of governmental agencies share responsibility for aspects of coastal habitat management. Hence, wise management of coastal habitats requires inter-agency cooperation, participation of resource uses and careful analysis of long-term impacts of patterns of resource use.

Management of natural habitats is being carried out by the CCD under the implementation of Coast Conservation Act of 1981 and the Coastal Zone Management Plan of 1990. In 1983, CCD embarked on a process of developing integrated management strategies for Sri Lanka's coastal habitats. The process included compilation of information on the coastal habitats, preparation of maps, and preliminary identification of management issues and

priorities for management and research. Policies and management strategies were developed and incorporated into the first generation CZM Plan (1990). In the implementation of the CZM Plan (1990) the following management strategies were adopted:

- **Regulatory** (banning of extraction, possession, processing, and transportation of corals and operation of lime kilns within the coastal zone by the Coast Conservation Act of 1981 as amended in 1988 and permit requirements for all development activities in the coastal zone);
- **Education and awareness** (published and distributed materials on habitats, inclusion of issues affecting coastal habitats into the secondary school curriculum);
- **Planning and policy development** (conservation of coastal habitats through Special Area Management Plans at Hikkaduwa and Rekawa);
- **Monitoring** (implemented monitoring program on coral mining);
- **Research** (supported research on coral reefs and mangroves); and,
- **Coordination** (established habitat management and research priorities with other agencies).

However, implementation of the first CZM Plan fell short of the desired objectives. Experience revealed that more participatory approaches are necessary for the management of Sri Lanka's coastal habitats. The success of participatory approaches will largely depend on the continued cooperation and involvement of governmental and non-governmental agencies who are concerned with the protection of coastal habitats and their uses, as well as the people who exploit these habitats for their livelihood.

Identification of Sri Lanka's 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 areal extent of each habitat type are shown in Table 3.1. Other coastal habitats such as sandstone reefs are not specifically addressed because of a lack of information. Also, the relationship between coastal habitats and fish populations and their dynamics are not discussed. The Department of Fisheries and Aquatic Resources Development exists specifically for fisheries management. However, fishery productivity depends largely upon the proper management of the coastal habitats discussed in this chapter.[25]

Table 3.1. Extent (ha) of coastal habitats by district [4,5,17]

District	Mangroves	Salt Marshes	Dunes	Beaches, Barrier Beaches, Spits	Lagoons, Basin Estuaries	Other Water Bodies	Marshes
Colombo	-	-	-	112	-	412	15
Gampaha	122	497	-	207	3442	205	1604
Puttalam	2264	3461	2689	2772	39119	3428	2515
Mannar	1261	5179	1458	912	3828	2371	308
Kilinochchi	312	4975	509	420	11917	1256	1046
Jaffna	260	4963	2145	1103	45525	1862	149
Mullativu	463	517	-	864	9233	570	194
Trincomalee	1491	1401	-	671	18317	2180	1129
Batticaloa	1421	2196	-	1489	13682	2365	968
Ampara	292	127	357	1398	7235	1171	894
Hambantota	539	318	444	1099	4488	1526	200
Matara	6	-	-	191	-	234	80
Galle	187	185	-	485	1144	783	561
Kalutara	70	-	4	77	87	476	91
Total Extent	8687	23819	7606	11800	158017	18839	9754

Note: Includes an area of approximately 2 km inland from the coastline; information was taken from existing maps of the Survey Department and air photographs for some areas; the maps were not ground checked.

While the six coastal habitats are discussed separately, this does not imply they are independent units. Natural coastal habitats are linked together by a complex web of direct and indirect interactions. Disruption of any one of these interactions affects the others as shown in Figure 3.1.[43]

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

Managing the Coastal Habitats

Coastal habitat management is most successful when it is geographically specific and based on well understood linkages among human activities and changes within a natural system. In the discussion of individual habitat types that follow, the known uses of the six coastal habitats are classified under each habitat type as non-extractive, extractive and transformative to facilitate discussion and public awareness with respect to conflicts among them. Non-extractive uses refer to activities such as recreation, research and education which do not involve removal of material from the habitats or result in serious impacts. Extractive uses involve removal

of renewable materials such as fish or mangrove wood. Transformative uses result in negative changes in habitat characteristics and function. 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.

The following section defines each coastal habitat and its associated uses. In turn, specific management issues are identified and the actions to address these issues. CCD's management policies for coastal habitats rely on regulatory and non-regulatory initiatives including more site-specific management plans.

3.2 Coastal Habitats in Sri Lanka

Coral Reefs

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 reef building corals and coralline algae. The corals constitute the more important component since they give vivid color and varied three dimensional form to the reef.

Coral reefs in Sri Lanka can be found along 2 to 3 percent of the nation's total shoreline (Figure 3.2). 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. Barrier reefs, which are ridges of corals lying some distance from shore and running parallel with it, are rare in Sri Lanka.[37] 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 Chapter 2). Coral reefs occur in shallow coastal waters that are clear and free from excessive freshwater and nutrients. Growth of corals depends on the presence of microscopic symbiotic plants in their body walls. These plants require sunlight that passes through the clear, shallow water.

Surveys have recorded 171 species of reef building corals in Sri Lanka waters.[37] The staghorn coral (*Acropora* spp.) is the dominant genera. 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. 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 massive brain coral and 10 cm per year for branching corals.

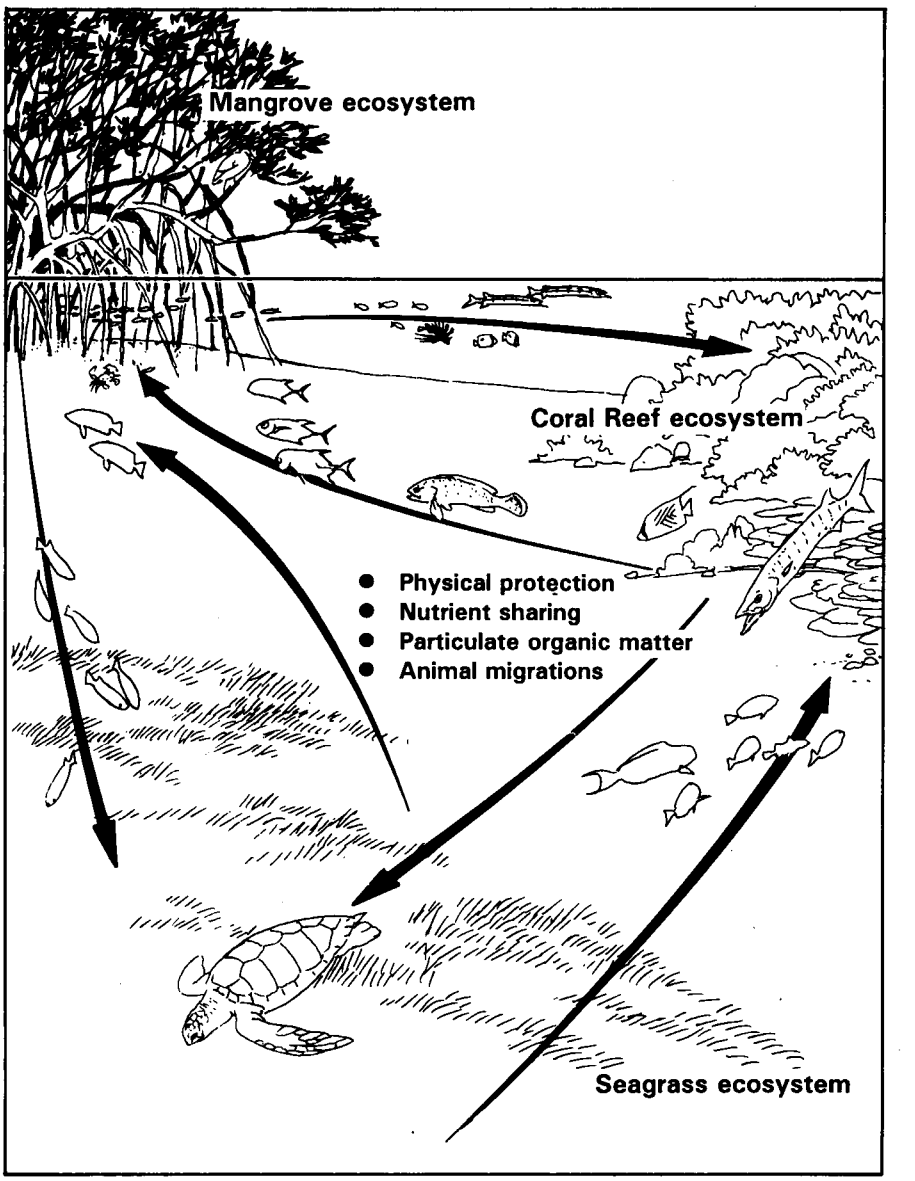


Figure 3.1 Mutual contributions of tropical coastal habitats

When physical damage occurs, its consequences are rapid and obvious. Coral reefs can become masses of rubble encrusted by algae without the color and productivity that characterizes living 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 correspond to areas where corals have died. In Polhena, rotting of coconut husks in the intertidal region has led to the destruction of coral reefs.

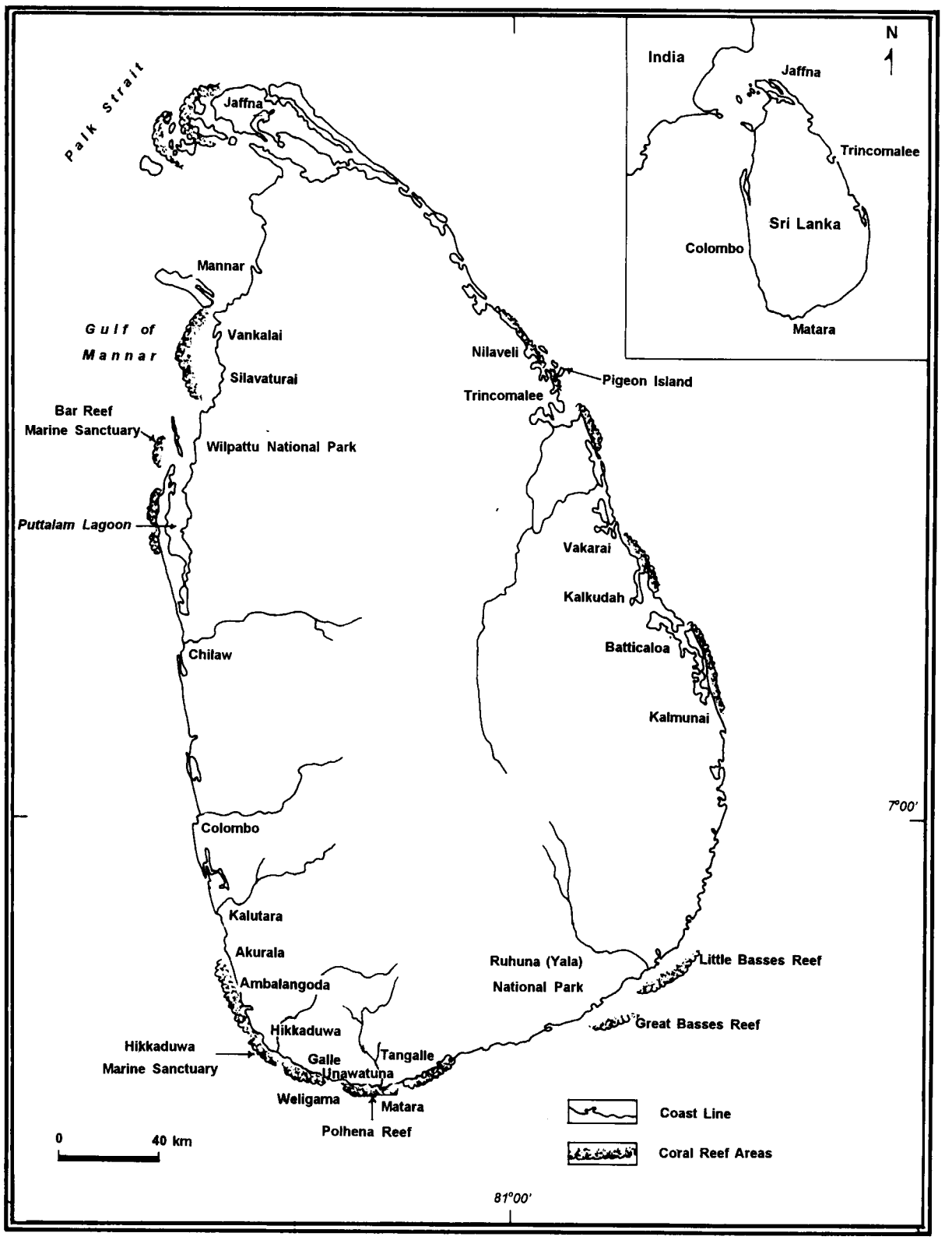


Figure 3.2 Distribution of coral reefs in coastal waters of Sri Lanka (NARA)

Table 3.2 Typical uses of coral reefs

Type of Use	Specific Use/Benefit
Non-Extractive	a. **Tourist** viewing generates employment b. **Scientific/educational** research on coral reefs is being conducted by NARA, University of Colombo and University of Kelaniya
Extractive	a. **Coral mining** for coral based lime b. **Ornamental fish and reef products** primarily for exports; amounts unknown c. **Fishing** by hook and line, with spear guns, with gill nets and explosives
Transformative	**Anchorages**, fisherman sometimes blast channels through reefs to create anchorages

Coral reefs in Sri Lanka support a variety of uses, which are briefly summarized in Table 3.2.

Estuaries and Lagoons

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. For management, 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 basins which in turn connect with the sea (Negombo and Puttalam Lagoons). Numerous coastal bodies of water that are named as lagoons (Puttalam, Negombo, Chilaw, Jaffna and Batticaloa Lagoons) are actually basin estuaries.

Riverine estuaries are formed by rivers discharging directly into the sea by way of relatively narrow channels (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 to the sea only during part of the year.

Sri Lanka's estuaries and lagoons are shown in Figure 3.3. 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, will be required to support a widening range of human activities.

Sri Lanka's estuaries support many commercially important organisms that contribute both to estuarine and nearshore fisheries. 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. 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. This process occurs through the stabilization of shoals by vegetation, barrier formation by longshore drift or opening up to an estuary mouth by erosion to form a bay. The pace of extinction depends primarily upon geomorphology and can be increased by human activities.

Table 3.3 Typical uses of estuaries and lagoons

Type of use	Specific use/benefit
Non-extractive	a. **Anchorages** for trading and fishing vessels b. **Tourist recreation** (Negombo, Bentota) c. **Research and education** d. **Raft culture** of mussels and oysters (Trincomalee Bay, Puttalam Lagoon, Ratgama Lake and Mirissa Harbour)
Extractive	a. **Fishing**, full or part-time, employment of 30,000 in 1993 b. **Sandmining**, direct employment for about 2,900 in 1991 c. **Seedfish/shrimp collection**, demand is increasing with more aquaculture d. **Ornamental fish collection** (Negombo Lagoon, Bolgoda Lake, Trincomalee Bay)
Transformative	a. **Desalination experiments** (Thondaimannar Lagoon) b. **Landfill** (Negombo Lagoon) c. **Pond aquaculture** (Puttalam and Negombo Lagoons, Bolgoda Lake) d. **Sewage disposal**

Sri Lanka's estuaries and lagoons have economic significance because of their fisheries which provide employment to some coastal communities. Additional uses are shown in Table 3.3.

Mangroves

Mangroves are salt-tolerant, woody, seed-bearing plants ranging in size from small shrubs to tall trees. They occur along sheltered intertidal coastlines, and in association with estuaries and lagoons. Although mangroves occur on saline soils they have the usual plant requirements of freshwater, nutrients and oxygen.[7]

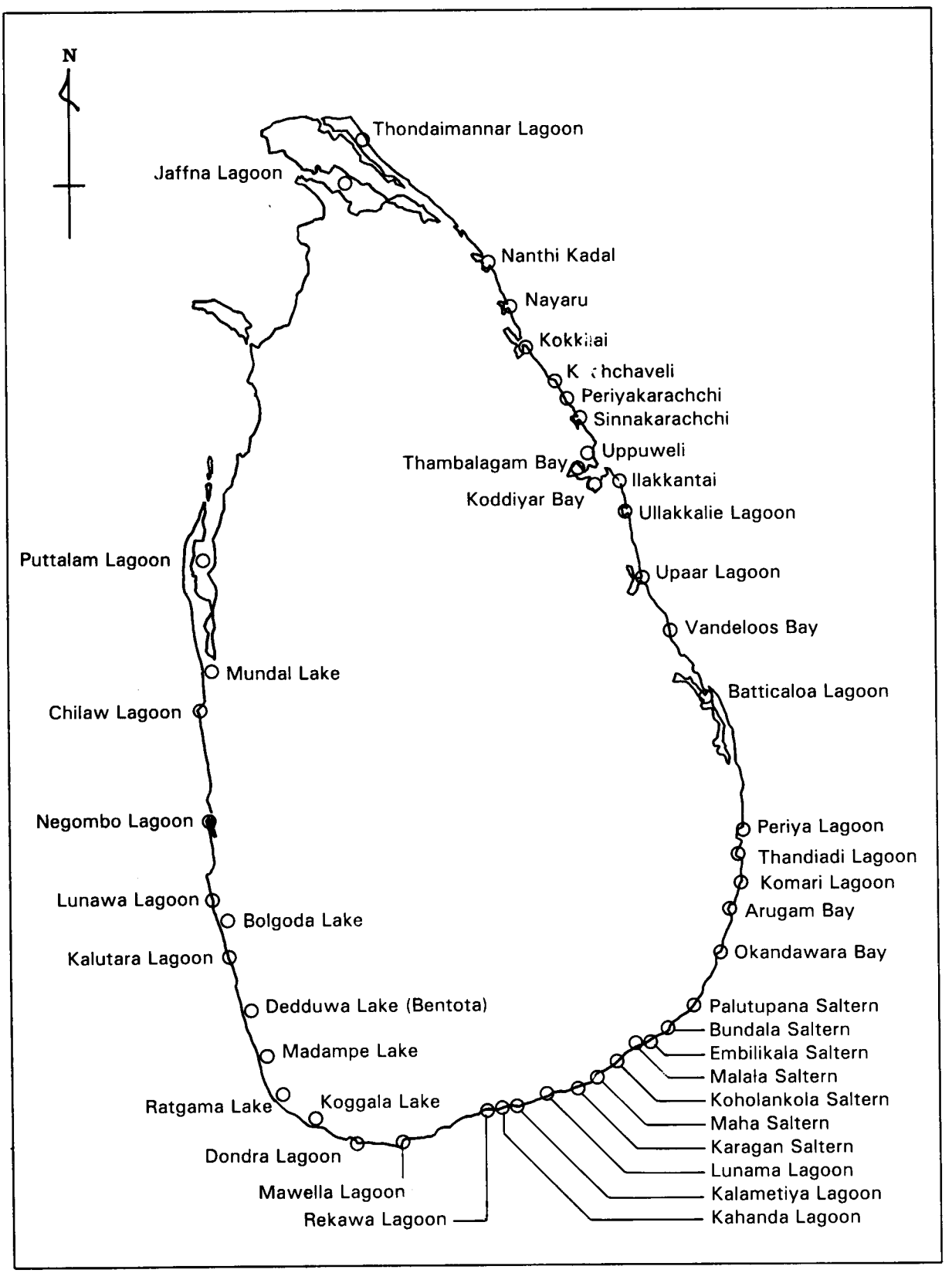


Figure 3.3 Location of well known basin estuaries and lagoons in Sri Lanka

Mangrove cover was 8687 hectares in 1993.[17] This area represents a small percent of Sri Lanka's total low energy coastal habitat (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 one kilometer landward from the mean low water tidal level. There are 14 species of true mangroves and 12 species of mangrove associates in Sri Lanka.

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 northeastern coastal sectors. Some dense localized stands occur in association with lagoons at Koggala and Kalametiya which are more or less separated from tidal influence. The mangrove ecosystem can be a major source of food and nutrients to estuarine, lagoon 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.

Mangroves support a number of subsistence and commercial uses critical to the welfare of some coastal communities. Permits are being issued for cutting mangroves in certain areas by District and Divisional Secretaries under the provisions of the Forest Ordinance. Major activities supported by mangroves are summarized in Table 3.4.

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

Table 3.4 Typical uses of mangroves

Type of Use	Specific Use/Benefit
Non-extractive	**Science and education** for research and tourism; Universities of Colombo, Kelaniya and Peradeniya, as well as NARA and the Forest Department are engaged in mangrove related research
Extractive	**Mangrove harvest** for subsistence and commercial uses; domestic use includes house construction and firewood (bakeries, kilns and illicit distilleries)
Transformative	**Mangrove conversion** for aquaculture, coconut, paddy, housing and urban expansion

Seagrass Beds

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 many commercially important organisms.

Seagrass beds are abundant along Sri Lanka's coast although their locations and extent have not been precisely mapped and estimated. They form dense underwater meadows, the edges of which may be glimpsed during low tide. They often occur in association with coral reef ecosystems. Seagrasses allow epiphytic organisms to obtain sites for attachment and provide nesting habitat and food for a number of species of fish. They also provide habitats and food for the endangered Dugong and Sea turtles. Some herbivorous fish consume the leaves, some juvenile fish feed upon epiphyses and several 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, coral reefs and fisheries production is direct and critical, but not usually quantified nor always recognized.

Sri Lanka's seagrass heads are subject to various uses as shown in Table 3.5.

Table 3.5 Typical uses of seagrasses

Type of Use	Specific Use/Benefit
Non-extractive	a. **Sediment stabilization**, seagrass foliage decreases water current speed and prevents sediment displacement
	b. **Research** on seagrass ecology and chemical uses
Extractive uses	a. **Polychaete harvests** are used as broodstock feed in commercial shrimp hatcheries, harvested from selected seagrass beds
	b. **Fishing** along northwestern and northeastern coasts
	c. **Fodder** at some locations

Salt Marshes

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 temperate climates and they are generally replaced in the tropics by mangroves. Nevertheless, tropical versions of salt marshes occur.

In Sri Lanka salt marshes occur mainly 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 growth 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 and mangrove associations. This type of salt marsh mangrove association is created by changes that occur in mangrove stands when the canopy is removed causing the soil to become dehydrated and hypersaline, allowing salt marsh vegetation to develop.

The major natural functions of salt marshes are to provide nutrients to nearshore coastal waters, provision of bird habitat, supply of seed fish for coastal aquaculture and as a discharge area that can absorb storm water runoff. Salt marshes are not heavily utilized in Sri Lanka at the present. However, in the future they are likely to be the focus for activities which require habitat conversion (Table 3.6).

Table 3.6 Typical uses of salt marshes

Type of Use	Specific Use/Benefit
Non-Extractive	a. **Tourism and bird watching** on tidal flats that serve as a habitat for migratory birds
Extractive Uses	a. **Grazing** on a small scale b. **Hunting** of waterfowl c. **Collection of milk fish** from tidal pools
Transformative Uses	a. **Construction of salt pans** b. **Shrimp aquaculture** in some areas

Barrier Beaches, Spits and Dunes

Barrier beaches and spits. Barrier beaches are accumulations of unconsolidated sediment transported ashore by waves and molded into a form that lies across a body of water and isolates it from the sea (Rekawa beach). Spits are essentially incipient barrier beaches that project from the 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 are wind blown accumulations of sand which are distinctive from adjacent land forms 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.

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 (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 position from a previous location 5 km south. Spits that protrude into estuaries are especially unstable (the spit at the Kalu Ganga estuary).

Coast protection and sand supply are the major natural functions of barrier beaches and spits (see Chapter 2). In addition, some segments of beaches serve as nesting areas for sea turtles (Kosgoda). The dynamic spits that form seasonally at estuarine inlets obstruct natural water flow patterns, often resulting in the flooding of low-lying lands (Kalu Ganga and Maha Oya estuaries), and in decreased fishery productivity. For example, fishery yields

Table 3.7 Typical uses of barrier beaches and dunes

Type of Use		Specific Use/Benefit
Non-Extractive	a.	**Beach landing** of fishing boats, drying of gear on barrier beaches
Extractive	a.	**Mining of beach sand** on barrier beaches and some dunes (Point Pedro and Hambantota)
Transformative	a.	**Construction of housing** on dunes (Hambantota, Ambakandawila); houses and temples at Point Pedro
	b.	**Grazing** on some dunes

at Koggala Lagoon declined sharply after a spit expanded into a barrier beach and sealed off the inlet.

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 (Uswetakeiyawa).

Barrier beaches and dunes are subject to a number of uses as shown in Table 3.7.

Table 3.8 Impacts on coastal habitats of particular concern to the Coast Conservation Department

Coastal Habitat	Potential Impacts
Coral Reefs	Physical damage to coral reefs and over collection of reef organisms Increase in fresh water runoff and sediments Introduction of waterborne pollutants
Estuaries/Lagoon	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
Mangroves	Changes in fresh water runoff, salinity regime and tidal flow patterns Excessive siltation Introduction of pollutants Conversion of mangrove habitat and over harvesting of resources
Seagrass Beds	Physical alterations Excessive sedimentation or siltation Introduction of excessive nutrients or pesticides
Salt Marshes (Tidal Flats)	Degradation of bird habitat or seed fish collection sites Obstruction of storm water runoff
Barrier beaches, Dunes and Spits	Sand mining Erosion Dune migration

Impacts on Coastal Habitats of Management Concern

The typical uses of coastal habitats and ecosystems are many as noted above. Not all uses can be controlled but those which cause destruction or a decrease in the natural productivity of the ecosystem should be minimized. Those impacts of particular concern of the CCD are shown in Table 3.8.

3.3 Management Objectives, Policies and Actions

Objective 3.1 **As possible, preserve and enrich the coastal habitats and natural features of exceptional value including protected areas.**

Policy 1 Prohibit or require modification of development activities where there is a reasonable probability that significant degradation will occur in designated protected areas (National Reserves, Sanctuaries and Fisheries Conservation Areas) in the coastal zone.

Actions CCD shall:

1. Periodically update the list of designated sites as areas of exceptional value with a view to protect them by having them declared as conservation areas under the Fauna and Flora Protection Ordinance and the Fisheries and Aquatic Resources Act.
2. Regulate all development activities through coastal development permit and EIA procedures.

Policy 2 Ensure sustainability of the coastal habitats including protected and designated natural areas of exceptional value.

Actions CCD shall:

1. Cooperate with other relevant governmental and non-governmental agencies to develop protection and management plans for protected areas and natural areas of exceptional value.
2. Participate directly and indirectly in the identification, prioritization and implementation of management plans for Special Area Management sites and identified Areas of Particular Concern (Chapter 7).

Objective 3.2 **Promote sustainable development of resources found within coastal habitats.**

Policy 1 Promote inter-agency cooperation in development planning to minimize adverse impacts on coastal habitats.

Policy 2 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.

Policy 3 Encourage and directly sponsor scientific research on coastal habitats as it relates to CCD management objectives.

Policy 4 CCD will promote awareness of the nature and significance of coastal habitats.

Objective 3.3 (Coral Reefs) **Seek to prevent the degradation or depletion of coral reefs and maintain reefs as a scientific, educational and tourist resource.**

Policy 1 Breaking of reefs, collecting of offshore coral debris and mining of coral is prohibited in the Coastal Zone.

Actions CCD shall:

1. Strictly enforce the Coast Conservation Act jointly with concerned authorities.
2. Conduct annual surveys to determine the level of illegal mining activities in the coastal zone.
3. Amend the existing legislation pertaining to coral mining activities.
4. Conduct awareness programmes for identified target groups and initiate community actions.

Policy 2 Promote introduction of alternative sources of lime to meet the requirements of the construction industry and agriculture.

Actions CCD shall:

1. Prepare policy paper on alternative sources of lime.
2. Coordinate with concerned agencies which promote the use of alternative sources of lime.

Policy 3 Identify areas where reef restoration will impede erosion and provide additional habitat.

Actions CCD shall:

1. Initiate and/or assist community based reef restoration and preservation at identified locations.
2. Assist other agencies undertaking action programmes on restoration and preservation of reefs.

Policy 4 In considering proposed development in the vicinity of coral reefs, ensure that adverse impacts of increases in fresh water runoff and sediments and the introduction of waterborne pollutants will be minimized.

Action CCD shall:

1. Initiate research and awareness programmes with NARA and CEA to mitigate the adverse impacts of runoff and sedimentation on coral reefs at identified locations.

Policy 5

Collection of small and limited coral specimens may be permitted by the CCD if it is for valid scientific research purposes.

Action

CCD shall:

1. Issue permits for collection of corals only for the purpose of scientific research provided that the proposed research is in compliance with specified guidelines.

Policy 6

Protect and preserve coral reefs as an important coastal habitat to ensure a sustainable marine environment

Action

CCD shall:

1. Cooperate with other government and non-government agencies to develop appropriate coral reef management plans for identified vulnerable areas.

Policy 7

Ensure that removal of reef organisms, such as aquarium fish, does not exceed sustainable levels.

Objective 3.4 (Estuaries and Lagoons)

Maintain fishery habitat and water quality, protect recreational values, and regulate sand mining at levels that do not have an adverse impact on beach replenishment.

Policy 1

Ensure that impacts due to encroachment, sedimentation, desalination and pollution are minimized in considering proposed development within and adjacent to estuaries or lagoons.

Policy 2

Cooperate with other governmental and non-governmental agencies to develop special area management plans for selected estuaries and lagoons.

Objective 3.5 (Mangroves)

Preserve the mangroves as an important habitat for wildlife, a nursery for fish, a nutrient trap, and to enable extraction at a sustainable level.

Policy 1

CCD will work to prevent further depletion of mangroves or degradation due to excessive fresh water or pollutants.

Action

CCD shall:

1. Ensure that impacts of fresh water runoff, excessive siltation, oil pollution, and conversion of mangrove habitats are minimized when reviewing proposed developments in the coastal zone.
2. Participate in the Sri Lanka National Mangrove Committee.
3. As part of management responsibilities for development activities within or adjacent to mangrove habitats in the Coastal Zone, the CCD will consider the guidelines developed by relevant national agencies.

Objective 3.6 (Seagrass Beds) — **Preserve seagrass beds as fisheries habitat and a habitat for Dugong and sea turtles.**

Policy 1 — In considering proposed development in the vicinity of seagrass beds, will ensure that physical alterations are prohibited, and excessive sedimentation or siltation, and introduction of nutrients or pesticides are minimized.

Actions — CCD shall:

1. Identify a zoning scheme for utilization of seagrass beds that will enable fishing to co-exist with movements of the Dugong and the Sea turtles.

Objective 3.7 (Salt Marshes) — **Ensure the sustainable use of salt marshes as an important waterfowl habitat, as a buffer which protects coastal settlements from flooding (by storm water runoff and tidal surges) and to protect an estuary or lagoon from chemical pollution in runoff from land.**

Policy 1 — Ensure that coastal development will not significantly degrade important bird habitats, seed fish collection sites, or significantly obstruct storm water runoff.

Policy 2 — Support activities to map distribution and extent of salt marshes, 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 3 — Support research that will assist in identification and rehabilitation of particular sites by mangrove reforestation.

Objective 3.8 (Barrier Beaches, Spits and Dunes) — **Conserve barrier beaches, spits and dunes.**

Policy 1 — Ensure that alteration of particular barrier beaches, spits and dunes will not be permitted without due regard for their particular ecological function.

Chapter 4

COASTAL POLLUTION CONTROL

4.1 Definition of Pollution

The National Environmental Act of 1980 defines pollution as:

> "Any direct or indirect alteration of the physical, thermal, chemical, biological, or radioactive properties of any part of the environment by the discharge, emission, or the deposit of wastes so as to affect any beneficial use adversely or to cause a condition which is hazardous to public health, safety or welfare, or to animals, birds, wildlife, aquatic life, or to plants of every description".

Nature of the Problem

Sri Lanka's efforts to achieve economic development are accelerating urbanization and industrialization in coastal areas. This is leading to substantial increases in the aggregate amount of wastes produced. The larger waste stream has increased strains on the capacity of natural systems to absorb these wastes and on institutions to manage wastes effectively. The trend of increasing concentrations of urban wastes and inadequate waste management will extend into the 21st century.[13]

Waste management and coastal water pollution control are of increasing concern. Urban pollutants of heavy metals, petro-chemicals, sediments and fecal matter degrade marshes, estuaries, lagoons, coral reefs and other coastal habitats and directly threaten the sustainability of nearshore fisheries. A lack of access to uncontaminated water for drinking, cooking and bathing increases exposure to water-borne pathogens and to gastroenteritis, hepatitis, dysentery and other illnesses.

Since pollution mitigation activities are generally cheaper than pollution clean-up strategies, waste management is essential. Urban sewage treatment plants, community-based sewage disposal systems, pollution mitigation plans for industrial estates and even small scale campaigns to prevent people from dumping oil and other wastes into streams and canals are generally far more cost-effective than after-the-fact clean up strategies. Also since increased levels of pollution degrade coastal environments and threaten coastal tourism, Sri Lanka's second largest foreign exchange earner is vulnerable.[32]

The health, environmental and economic benefits associated with pollution management are substantial. When the full costs and benefits of pollution control are analyzed as has been done for Hikkaduwa, a more aggressive approach to coastal pollution control is seen to support rather than detract from economic development objectives. The challenge is to understand the singular and cumulative impacts of pollutants, identify activities causing adverse pollution loads, and to design and support pollution control strategies that are both fairly distributed and cost-effective.

4.2. Water Regimes: The Conduit of Pollution

The water regimes which are relevant to coastal pollution include rivers, streams, estuaries, lagoons, ground water sources and the ocean. The main water pollutants are urban, domestic and industrial waste plus solid and toxic agricultural waste including agro-chemicals, sediments and runoff. Oil spills, direct discharge of oil, solid and other wastes from the fishing vessels and ships pollute the ocean waters and the beaches.

Rivers and Streams

Over 100 rivers radiate to the sea through the Coastal Zone in Sri Lanka. Rivers and streams in the urban areas are highly polluted as a result of direct discharge of effluent, garbage, sewage and oil.

The Kelani River, the second largest and most polluted river in the country, drains an area of 2,278 km^2 in the wet zone. This drainage area includes the Colombo Metropolitan Region. A greater part of the 487 km^2 Colombo catchment area drains into the Kelani river. The sea outfalls at Wellawatta and Galle Face and the different canals opening into the Kelani river constitute the main outlets of the city's storm water and canal systems.

Significant sources of the Kelani River pollution are sewage, industrial effluent and agricultural runoff. Heavy metals and pesticide levels in the Kelani river have not been studied in detail, but cadmium and copper have been found at levels in excess of tolerance limits. Most of the organic pollutants enter the river in the 50 km before the river mouth.

Pollution levels in the Mahaweli River are less than those of the Kelani. Heavy use of pesticides and fertilizers in upland agriculture pollute this river. The Walawe River has been polluted by black liquor effluent from the Embilipitiya paper mill and from sugar processing effluent from the Sevanagala Sugar Mill.

Estuaries and Lagoons

Brackish water bodies include about 158,000 ha of estuaries and lagoons many of which are highly vulnerable to pollution, particularly those located near urban areas such as the Kelani and Mahaweli river estuaries. A number of lagoons and basin estuaries are exposed to considerable discharges of sewage and waste water (Negombo lagoon, Bentota estuary, Valachchanai estuary and Bolgoda-Panadura estuary).[1] Analysis of water from a number of lagoons and estuaries shows evidence of pesticides at various locations, including the Chilaw and Mundel lagoon, Kala Oya, Deduru Oya and Dandugam Oya.[2] Studies conducted on the Negombo Lagoon indicate that coliform (total and fecal) bacteria counts were unacceptably high at some locations.[2] Disposal of industrial waste at a few spots causes a high concentration of heavy metals. Lunawa lagoon in the southern periphery of the city of Colombo receives an average of 81 tons chemical oxygen demand and 43 tons suspended solids annually from surrounding residential housing and industry. This water body has thus lost its value for recreation and aquaculture.

Ground Water

Ground water is increasingly used for drinking, especially in small urban centers and rural areas. The estimated ground water potential for the country is 780,000 ha/meters per annum.[1] For this water to remain safe, the rate of water extraction must not exceed the aquifer's replenishment capacity. High rates of extraction will cause the wells to run dry or result in brackish water intrusion. This has occurred in northern and northwestern coastal areas where ground water is used to irrigate rice and cash crops.

The most serious threats to ground water come from nitrate and bacterial (fecal) contamination. Nitrate pollution is due to excessive use of nitrogenous agrochemicals. Sewage effluent from pit latrine soakways and septic tanks causes bacterial contamination of ground water. River and canal pollution also affect ground water. Leaching of pesticides into ground water may occur in agricultural areas. In peripheral areas of the Colombo Municipal Region, fecal contamination of ground water is very high. The nitrogen levels of the ground water in some places has reached intolerable levels. The ground water has also been contaminated with fecal material at tourist resort centers such as Beruwala, Ahungalla and Hikkaduwa. The cost of ground water treatment will increase significantly unless proper treatment and disposal facilities are provided in these areas.[1, 40, 46]

Ocean

The ocean, sometimes viewed as having an unlimited capacity to receive wastes, is limited in its assimilative capacity. In Sri Lanka the direct

ocean disposal of waste materials is limited to sewage waste, dredged materials, and industrial and domestic wastes. These effluents can still contain substantial quantities of suspended solids, toxic metals, synthetic organic compounds, fecal coliform, and other potentially pathogenic micro-organisms. The main sources of ocean pollution are industry (textile, tanning, paint, pulp and paper, metal finishing, dyeing, printing, chemicals, food and beverages and petrochemicals), agriculture (pesticides, fertilizers), housing and tourism (sewage, waste water and solid wastes).

4.3 Pollution Sources and Levels

The major sources of coastal water pollution along the west and southwest coasts are domestic sewage, industrial wastes, solid wastes and agricultural chemicals (Table 4.1).

Table 4.1. Major sources of coastal pollution in Sri Lanka [42]

Source	Pollutants
Domestic Sewage	Organic Compounds Metals (Na, Ca, Cu) Nutrients (N, P) Gases (CO_2, CH_4)
Industry	Organic Compounds Heavy Metals (Cr, Zn, Cd) Gases (CO_2, SO_2, NO_2)
Agriculture (Pesticides & Fertilizer)	Organic Compounds Metals (Cu, Hg, Cd) Nutrients (N, P)
Vehicles and ships	Heavy Metals (Zn, Pb, Fe) Gases (CO, CO_2, SO_2) Particulate (Pb) Oil

Na	Sodium
Ca	Calcium
Cu	Copper
N	Nitrogen
P	Potassium
CO_2	Carbon Dioxide
CH_4	Methane
Cr	Chromium
Zn	Zinc
Cd	Cadmium
SO_2	Sulfur Dioxide
NO_2	Nitrogen Dioxide
Hg	Mercury
Pb	Lead
Fe	Iron
CO	Carbon Monoxide

Domestic Sewage

Growing urban population densities coupled with inadequate housing and lack of urban infrastructure, such as water and sewage disposal facilities, has led to fecal contamination of surface and ground water. More than 40 percent of the Sri Lanka population is affected by typhoid, amoebic and bacillary dysentery, infectious hepatitis, gastroenteritis, colitis and worm infections.[1]

The Colombo Municipal Area has a population of 625,000 million, but only 60 percent live in households served by the city's sewage collection system. Between 67,500 and 90,000 cubic meters of Colombo's untreated sewage is

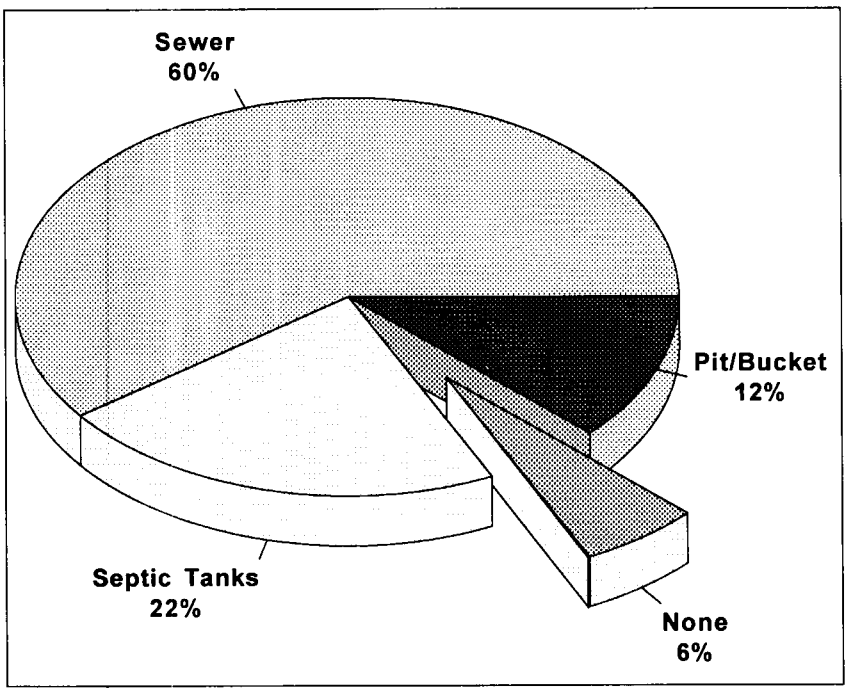


Figure 4.1 Percent of Colombo population served by different sewage disposal methods[45]

dumped daily into the Kelani River.[1] The different disposal methods in Colombo are shown in Figure 4.1.

The problem of sewage disposal in Colombo is compounded by the inadequacy of urban infrastructure for the city's poor residents. About half of the population lives in slums and squatter settlements of which 75 percent of the residents live along streams and canals. The waste, along with storm water and some industrial effluent, is discharged directly into canals. Organic pollution from sewage accounts for 50-60 percent of the total waste load (10,000 kg BOD_5/day) discharged into the canal network in Colombo.[1] This pattern of turning canals and water ways into sewers is replicated in urban areas throughout the country.

Pollution from untreated sewage, kitchen wastes, swimming pool and laundry wastewater is causing water quality problems in all the major tourist centers along the south and southwest coast. Hikkaduwa and Beruwala are of particular concern. Only several of the tourist resorts along the southwest coast have effective sewage disposal systems or treatment plants. Water quality problems along the southwest coast are compounded by the proliferation of squatter settlements. Such settlements near Chilaw, Negombo (Porutota, Duwa, Kamachchode), Dehiwela, Panadura, Ambalangoda, and Galle (between Fort and Dewata) have resulted in fecal pollution and solid waste on the beaches and in nearshore waters.

Industrial Pollution

About two-thirds of Sri Lanka's industrial plants are located within the coastal region, primarily in the Greater Colombo Metropolitan Region. Two of the three Investment Promotion Zones (IPZ) and two primary industrial estates are located in coastal areas near Colombo. The third IPZ is at Kogalla near Galle.

Surface waters, ground water and coastal waters are polluted by direct discharge of wastes from these industrial facilities as well as by leakage and seepage. The industries contributing most to water pollution are textiles, paper, tanning, metal preparation, finishing and engineering, paints, chemicals, cement, food and beverages and distilleries. The main pollutants of those industries are untreated wastewater, solid waste, heavy metals, and gases. In 1994, 366 industrial facilities were identified in coastal areas with "high" or "medium" pollution potential.[16] The types of facilities and their estimated daily pollution loads are shown in Table 4.2.

Of the industrial pollutants discharged into canals and streams, toxic wastes are of particular concern. Inorganic compounds, including metals such as arsenic, cadmium, chromium, nickel, copper, mercury, tin, lead and zinc are discharged into coastal areas by both natural processes and human activities. Toxic waste production by the metal preparation finishing, engineering and chemical industries are shown in Table 4.2. Production processes for food and beverages, footwear and leather, wood and wood products, paper and painting and petroleum and service utilities are the primary sources of organic compounds. These wastes include: pesticides, phthalate esters, polynuclear aromatic hydrocarbons, metal organic compounds, alkyl-benzine, plasticisers, polychlorinated biphenyls (PCBs) and halogenated hydrocarbon compounds.

Table 4.2. Number of industrial facilities in coastal areas with high or medium pollution potential and their waste loads[16]

Type of industry and process	No. of units	Total waste water load m^3 per day	Estimated pollution and kg/day	
			BOD	COD
Textile	41	7100	4970	11360
Food & Beverage	47	4111	6166	12333
Rubber Processing	154	4840	9670	29040
Tanning of hides	151	614	3229	8070
Metal Preparation Finishing and Engineering	76	6692	669*	
Paints and Chemicals	33	928	92.2*	

* Measured in Toxic kg/day

Waste Oil

Waste oil is of increasing importance as a source of coastal water pollution. It sometimes forms tar balls that wash ashore on beaches used by tourists and wildlife. Oil pollution comes from washing oil tanker holds, the discharge of oil in bilge water and discharges from mechanized boats. Sri Lanka's proximity to major oil shipping lanes makes the coast vulnerable to a major tanker spill. Oil waste also results from careless handling of oil products by more than 100 service stations and automobile service facilities. Waste oil is often dumped directly into canals.

The magnitude of oil wastes in coastal waters is not known but oil slicks are visible in ditches, marshes, lagoons and the sea. A slick with a silvery surface is equivalent to 0.25 ppm oil in the top 30 cm layer of water. The accepted maximum of oil in water for fish culture is 0.1 ppm, but even 0.01-0.02 ppm of crude oil, petrol and diesel oil can taint the flavor of fish and shellfish, damage fish larvae, and clog gills of fish.[46]

Solid Wastes

Solid wastes include garbage, refuse and other discarded materials resulting from industrial, commercial and household activities. More than 470 tons of solid waste is generated daily within the Colombo Municipal Region.[1] Waste collection and disposal systems have been established in Colombo and other urban centers, but many households are outside this collection system. In some areas solid waste is dumped indiscriminately in low-lying wetlands or thrown in canals or streams. Some industrial processing facilities lie outside the collection network. Textile, wood processing, paper manufacturing and plastic and metal plants are the industrial plants generating most of the solid waste. Solid waste collection and disposal problems are particularly acute in and around Negombo, Colombo, Ratmalana, Moratuwa, Panadura, Galle, Koggala, Trincomalee, and within tourism beach areas.

Agriculture and Aquaculture Wastes

The heavy use of chemical fertilizers and pesticides degrades the soil and contributes to the pollution of water in marshes, lagoons and nearshore coastal water. As soil humus is leached out reducing the soil's ability to retain essential nutrients, more fertilizers have to be applied per unit area to maintain production levels. With the depletion of soil humus, the fertile topsoil is also more susceptible to erosion.

The increasing use of agrochemicals, some of which are persistent and accumulate in dangerous concentrations, is a growing problem. The annual level of chemical fertilizer use in Sri Lanka is estimated to be 77 kg/ha which

is two to eight times more than in other Asian countries.[1] The annual average use of pesticides in Sri Lanka is between 1,200 and 1,600 grams per hectare. Over half of the farmers use at least twice the recommended dosage.

Aquaculture activities also contribute to coastal pollution. The discharge of untreated pond effluent is a problem. Aquaculture can lead to increased saltwater intrusion and increasing eutrophication in water sources caused by leaching of acidic substances during pond construction.[32]

Table 4.3 Agencies responsible for coastal pollution control in Sri Lanka

Agency	Function	Management Mechanism
Central Environmental Authority National Environmental Act No. 47 of 1980 amended by Act No. 56 of 1988	• Investigate the cause, nature, extent and prevention of pollution • Promote research • Set standards, norms and criteria to maintain the quality of the environment • Coordinate all regulatory activities for the discharge of waste and pollutants • Recommendations, directives to Local authorities	• Implement environmental standards • Environmental Impact Assessments (EIA) and Initial Environmental Examination (IEE) • Prohibitions • Issue of Environmental Protection Licenses (EPL) • Research • Coordination • Appointment of committees
Coast Conservation Department Coast Conservation Act No. 57 of 1981 amended by Act No. 64 of 1988	• Control development activities which may create pollution in the Coastal Zone	• Permits for development activities • Guidelines • IEE and EIA • Public education • Coordination
Local Government Institutions (Local Government by-laws)	• Control pollution	• Removing solid waste • Cleaning • Providing facilities
Sri Lanka Land Reclamation and Development Corporation	• Management of inland waterways	• Rehabilitating existing canals and outlets
Water Supply and Drainage Board	• Management of sewage outfalls	• Providing new facilities • Managing existing sewage outfalls
Marine Pollution Prevention Authority Marine Pollution Prevention Act No. 59 of 1981	• Prevention, reduction and control of pollution in Sri Lanka waters • Effect international conventions for the prevention of pollution of the sea	• Prevention of marine pollution from land-base sources • Oil spill contingency plan and prevention • Port operation and shipping control

4.4 Coastal Pollution Management

Coastal pollution mitigation and control is a shared responsibility of several government agencies and the private sector. Although this plan focuses on the role of the Coast Conservation Department in pollution prevention, Table 4.3 lists all the agencies with prime responsibility for coastal pollution control. Table 4.4 shows the tolerance limits for industrial and domestic effluents discharged into marine coastal areas as set by the National Environmental Act No. 47 of 1980.

Table. 4.4 Tolerance limits for industrial and domestic effluents discharged into marine coastal areas*

Determinant	Tolerance Limit
Total Suspended Solids, mg/l, max	
(a) For process waste waters	150
(b) For cooling water effluents	total suspended matter content of influent cooling water plus 10%
Particle size of	
(a) Floatable solids, max	3 mm
(b) Settlable solids, max	850 micro m.
pH range at ambient temperature	6.0-8.5
Biochemical Oxygen Demand (BOD_5) in 5 days at 20°C, mg/1, max	100
Temperature, max	45°C at the point of discharge
Oils and grease, mg/l, max	20
Residual Chlorine, mg/l, max	1.0
Ammoniacal Nitrogen mg/l, max	50.0
Chemical Oxygen Demand (COD) mg/l, max	250
Phenolic compounds (as phenolic OH) mg/l, max	5.0
Cyanides mg/l, max	0.2
Sulfides mg/l, max	5.0
Fluorides mg/l, max	15
Arsenic mg/l, max	0.2
Cadmium total, mg/l, max	2.0
Chromium total, mg/l, max	1.0
Copper total, mg/l, max	3.0
Lead total, mg/l, max	1.0
Mercury total, mg/l, max	0.01
Nickel total, mg/1, max	5.0
Selenium total, mg/l, max	0.05
Zinc total, mg/l, max	5.0
Radio active material	
(a) Alpha emitters, micro curie/ml, max	10^{-8}
(b) Beta emitters, micro curie/ml, max	10^{-7}
Organo-Phosphorus compounds, mg/l	1.0
Chlorinated hydrocarbons, mg/l max.	0.02

Every effort should be made to remove colour and odour from effluents. These values are based on dilution of effluents by at least 8 volumes of clean receiving water. If the dilution is below 8 times, the permissible limits are multiplied by 1/8 of the actual dilution. The limits have been prescribed by regulations published in Gazette Extraordinary No. 595/16 of 02.02.1992 under the National Environmental Act No. 47 of 1990 as amended by Act No. 56 of 1988.

4.5 Management Objectives, Policies and Actions

Objective 4.1 **Minimize effluent discharges and impacts in the coastal zone to prevent further degradation of coastal water quality and coastal habitats.**

Policy 1 Require that all development activities in the coastal zone comply with the Central Environmental Authority's standards for stipulated coastal and marine waters.

Actions CCD shall:

1. Impose CEA standards for discharges on all new development activities in the coastal zone subject to permits under provisions of the Coast Conservation Act.
2. Impose a compliance programme in collaboration with CEA against existing developers violating the stipulated standards.
3. Implement the guidelines stipulated by the Inter-ministerial Committee on Aquaculture Development for all aquaculture projects.
4. Initiate an awareness programme in collaboration with the Department of Fisheries and Aquatic Resources Development for fishing communities to encourage proper disposal of oil waste.
5. Initiate studies on water quality in collaboration with other concerned agencies on water quality and publicize the results.

Policy 2 Cooperate with other agencies in developing strategies for providing economic incentives to developers to minimize untreated discharges into the coastal waterways.

Action CCD shall:

1. Collaborate with other agencies to develop a programme of tax incentives, expedited permit approval processes or other incentives to encourage the private development of waste water treatment systems.

Policy 3 Encourage the relocation of high and medium polluting industries in industrial zones and encourage more efficient provision of pollution abatement technology.

Policy 4 Assist relevant agencies in establishing a single pollution abatement fund.

Policy 5 Actively participate in efforts to obtain technical and financial assistance to establish central sewage treatment systems at appropriate locations within the coastal zone.

Objective 4.2 **Improve the coastal environment by reducing the types and volume of solid waste disposed in the coastal zone.**

Policy 1 Assist in preparing solid waste management plans for identified coastal urban centers, coastal tourist centers and fishing harbors.

Action CCD shall:

1. Identify those urban centers, coastal tourist centers and fishing harbors for which solid waste plans are most urgently needed.

Policy 2 Discourage local authorities to disposal solid waste in the coastal zone.

Actions CCD shall:

1. Assist local authorities in identifying dump sites in environmentally less vulnerable locations outside the coastal zone.
2. Assist the local authorities to relocate dumping sites out of the coastal zone.

Policy 3 Collaborate in public education and awareness programs and join with other agencies in promoting public participation in solid waste management.

Actions CCD shall:

1. Facilitate the active public participation in preparation, implementation and monitoring solid waste management programmes.
2. Update the ongoing public education programme addressing the issues of discharges and solid wastes in regard to coastal pollution management.
3. Initiate a programme to involve the communities in designing local community pollution abatement programs adopting the Special Area Management and Areas of Particular Concern management approaches.

Objective 4.3 **Share and disseminate information on coastal pollution management.**

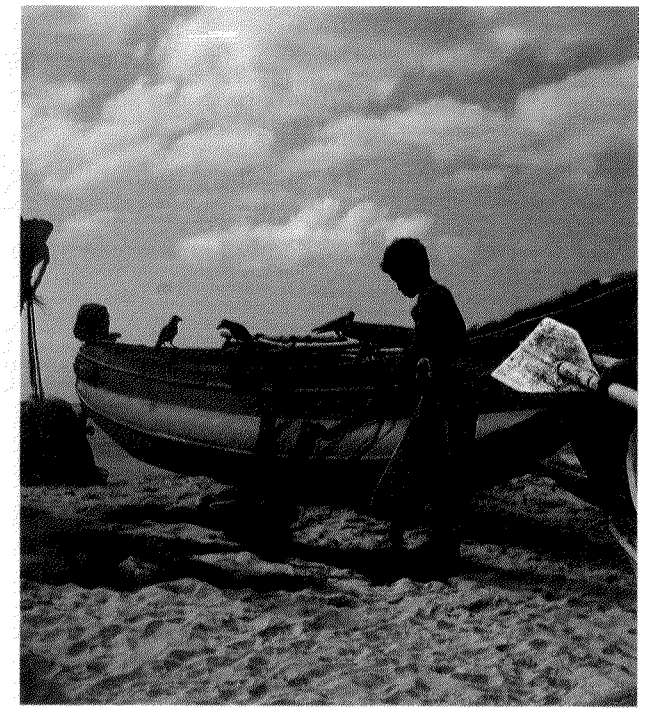
Policy 1 Collaborate with CEA, NARA and other agencies in formulating a research agenda for coastal pollution management.

Actions CCD shall:

1. Develop a research agenda for coastal pollution management for the next four years.

Policy 2 Support similar research programs conducted by other agencies or organizations on oil waste discharge and solid waste management.

Historical and archaeological sites are protected from development within their immediate vicinity



Traditional fishermen add to the scenic value of coastal areas

Chapter 5

PROTECTION OF SITES OF SPECIAL SIGNIFICANCE

5.1 Findings

Nature of the Problem

Sri Lanka's Coastal Zone contains many diverse sites of archaeological, historical, religious and cultural significance and sites of natural value. These sites provide evidence of the pattern and progress of Sri Lankan culture and represent part of Sri Lanka's heritage. Sri Lanka's Coastal Zone is also a place of great scenic beauty. Picturesque bays, lagoons and coral reefs, wide sandy beaches, rocky terrain tumbling down to the beach, water-trapped rock fissures functioning as seasonal blowholes, and wide salterns and lagoons rich in birdlife can be found along the shoreline.[47]

The cultural and scenic resources of Sri Lanka's Coastal Zone make it a focus of people's cultural and recreational activities. These same resources support the nation's economically important tourism industry which generated over Rs. 11,000 million and directly employed over 35,000 individuals in 1994.[10]

Today, many of Sri Lanka's important cultural and natural sites are threatened with inappropriate development. When archeological 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 address the preservation of important archeological, historical, religious and cultural sites, as well as the Coastal Zone's scenic beauty and important recreational areas. The Coastal Zone Management Plan of 1990 has addressed this requirement. However, the 1990 Plan fell short of achieving desired objectives in full due to the following constraints:

1. In managing identified archaeological, historical, religious, cultural, and recreational and scenic areas the CZM plan relied heavily on regulation. The main tool was the adoption of a permit procedure to control development activities in the vicinity of the designated sites.

2. The adoption of development and conservation approaches in managing the designated sites in the first generation CZM Plan has been overlooked.

3. Management limitations in some of the designated sites have not been properly addressed in the first generation CZM plan.

Identification and Characterization of Sites

In 1985, the CCD commissioned two inventories of places of religious and cultural significance and areas of scenic and recreational value. The first survey was from Kalpitiya to Kirinda and the second for the north and east coasts.[36] The following types of sites were inventoried within the coastal zone:

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

Archaeological, historical and cultural sites were categorized 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.

Sites of Archeological Significance

a) Definition

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

b) Nature and Significance

The inventory identifies a large number of sites with archeological, historical, religious and/or cultural significance. Of these sites, those considered more important from the point of view of age or current public focus and popularity value and their locations are listed in Table 5.1. Of these 93 sites, only 11 have been declared by the Department of Archaeology. However, the department has agreed in principle to adopt the list published in this plan.

The sites and monuments of pure archaeological value include pre-historic sites (Ussangoda, Bundala), and protohistoric sites (Pomparippu). In the second category, broadly classified as historic sites, such as forts (Kalpitiya, Negombo and Mannar), ports (Kalpitiya, Negombo and Mannar), most of the Buddhist monastic sites (Kirinda and Muhudu Maha Viharaya) and some churches (Galle Fort Dutch Church).

Prehistoric sites such as that of Ussangoda are undisturbed sites with much archaeological potential. Test excavations at the Bundala site have revealed valuable data on prehistoric man in Sri Lanka, dating back about 27,000 years. The protohistoric (Megalithic) sites which have yielded black and redware pottery and burials 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 future findings will be significant for the study of this formative phase in Sri Lankan history.

Historical Sites and Monuments

a) Definition

Historical sites and monuments are those 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 are still functional.

b) Nature and Significance

The inventory identifies historical sites and monuments in the Coastal Zone.[36] These include such edifices as Buddhist Temples (Vehera-Navaya, Samudratheera viharaya), Hindu Kovils, (Sri Mariamman Kovil; Vishnu Kovil, Udappuwa), Devales (Sinigama), Christian and Catholic Churches (Dutch Church, Kalpitiya; St. Anne's Church, Talawila), forts (Kalpitiya, Galle), harbours (Colombo, Galle, Godaways), shipwrecks (Akurala, Galle, Trincomalee), esplanades and parks (Gordon Gardens, Galle Face), Lakes (Beira Lake), air bases (Koggala) and resthouses (Tangalle). The more important sites are indicated in Table 5.1.

Each site or edifice possesses its own intrinsic qualities and values, and requires recognition in planning development activities in its vicinity. 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, 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.

Table 5.1 High priority archaeological, historical, religious and cultural sites within the coastal zone[36] The GN division names & numbers are as designated in 1986

No.	Place	Type	GN Division	GN Division Number
Puttalam District				
1	Kudiramalai	A/H/C	Pukulam	634
2	Kollan Kanatta	A/H/C	Pukulam	634
3	Dutch Church*	H/C	Sinnakudirippu	631
4	Dutch Fort*	H/C	Sinnakudirippu	631
5	St. Anne's Church	H/C/R	Mudalaipali	625/626
6	Mohideen Jumma Mosque	H/C/R	Udappuwa	594
7	St. Xavier's Church	H/C/R	Udappuwa	594
8	Vishnu Devale	H/C/R	Udappuwa	594
9	Ayanar Kovil	H/C/R	Karukkapona	582
Gampaha District				
10	Negombo Fort	A/H	Munnakkare	156
11	Our Lady of Sindrathri	H/C/R	Duwa	162A
12	St. Mary Maddalena Church	H/C/R	Talahena	163
Colombo District				
13	Siva Devalaya	H/C/R	Modera	02
14	St. Anthony's Church	H/C/R	Kochchikade (N)	09
15	Gordon Gardens	H/C	Fort	20
16	Galle Face Hotel/Green	H/C	Slave Island	21
Kalutara District				
17	Rankoth Viharaya	H/C/R	Pattiya North	685
18	Kechchimale Mosque	H/C/R	Paranakade	753/757
19	Duwa Viharaya	H/C/R	Moragalla	760/761
20	Pulinathalaramaya		Kalutara (N)	717
Galle District				
21	Dutch Church School	A/H	Maha Ambalangoda	82
22	Modera Devalaya	H/C/R	Maha Ambalangoda	82
23	Sinigama Devalaya	H/C/R	Sinigama	64
24	Galle Fort*	A/H	Galle Fort	96D
25	Wella Devalaya	H/C/R	Unawatuna South	137
Matara District				
26	Samudragiri Viharaya	H/C/R	Mirissa South	406
27	Samudratheera Viharaya	A/H/C/R	Kamburugamuwa	408
28	Fortress of Matara	A/H	Ginigasmulla	416
29	Sinhasana Kovil	H/R	Devinuwara South	433
30	Talgashena	A/H/C/R	Gandara East/Gandara West	473/473A
31	Gurukanda Viharaya	H/C/R	Bathigama	451
Hambantota District				
32	Fort of Tangalle	A/H	Kotuwegoda	458
33	Vehera-Navaya	H/C/R	Bata-Ata	562
34	Ussangoda	A	Lunama	555
35	Godawaya	A	Walawa	586
36	Bundala	A	Bundala	604
37	Telulla*	A/H	Bundala	604
38	Kirinda Vihare*	A/H/C/R	Kirinda	601
39	Patanangala	A/H/C	Magama	601
40	Palatupana Fort*	A/H/C	Kirinda	601
Ampara District				
41	Megalithic site	A/C	Kumana	1
42	Samuddha Vihara (Kumana)	A/C/R	Kumana	1

No.	Place	Type	GN Division	GN Division Number
43	Megalithic site(Panama)	A/C	Panama	2
44	Okandamalai	A/H/C/R	Panama	2
45	Velayutha Swamy Kovil	H/C/R	Panama	2
46	Muhudu-Maha-Vihara*	A/H/C/R	Potuvil Div.1	3
47	Arugam Bay Port	A/C	Potuvil Div.1	3
48	Sagamankanda	A/H/C	Komari	9
49	Chitra Velayutha Kandaswamy Kovil	H/C/R	Thirukkovil	10
Batticaloa District				
50	Dutch Fort*	A/H/C	Koddaikallar Div.1,2	113
51	Kannaki Amman Kovil	H/C/R	Eruvil	115
52	Jamiul Lafireen Mosque	C/R	Katankuddi Div.1	167
53	Batticaloa Fort	A/H	Puliyantivu	179
54	Sittandi	A/H/C	Valaichchena Tamil Div.	205
55	Periya Kaduveikarai	H/C	Valaichchena Tamil Div	205
56	Panichchenkerni Historical Site	H/C	Mankerni	211
Trincomalee District				
57	Ilangaturai Port	A/C	Ichchilampattai	214
58	Monastic Site	A/H/C/R	Nawathkanikadu	215B
59	Tampalakamam	A/H/C	Tampalakamam South	228A
60	Tirukoneswaram Kovil	A/H/C/R	Trincomalee Town	244B
61	Fort Frederick	A/H/C	Trincomalee Town	244B
62	Gokanna Viharaya	A/C/H/R	Trincomalee Town	244B
63	Fort Ostenberg	A/H	Trincomalee Town	244B
64	Kuchchaveli	A/H/C/R	Kuchchaveli	239
Mullaitivu District				
65	Mullaitivu Fort	A/H/C	Mullaitivu Town	233
66	Monastic Site Kurundanmalai*	A/H/C	Mullaitivu Town	233
Jaffna District				
67	Pas Pyl Fort	A/H/C	Mulliyan	149
68	Vallipuram Burial	A/H/C	Thunalai North	131
69	Kankesanthurai Fort	A/H/C	Kankesenthurai	67
70	Sambilturai Port	A/H/C/R	Keerimalai	64 A
71	Keerimalai	H/C	Keerimalai	64 A
72	Naguleswaram Sivan Kovil	H/C/R	Keerimalai	64 A
73	Vishnu Kovil	H/C/R	Keerimalai	64 A
74	Monastic Site-Keerimalai	A/H/C/R	Keerimalai	64 A
75	Megalithic Site-Anaicottai	A/C	Anaicottai	40
76	Jaffna Fort*	A/H/C	Columbuturai	8
77	Hammenheil Fort	A/H/C	Karainagar North	10 A
78	Port of Kayts	A/H/C	Allaippiddi	19
79	Fort Eyrie	A/H/C	Allaippiddi	19
80	Allaippiddi	A/H/C	Allaippiddi	19
81	Portuguese Fort (Urindi Kottai)	A/H/C	Allaippiddi	19
82	Naga Pooshani Amman Kovil	H/C/R	Nainativu	04
83	Portuguese Fort	A/H/C	Delft West	01
84	Dutch Fort*	A/H/C	Delft Central	02
85	Monastic Site-Vadiresan Koddai	A/H/C	Delft Central	02
86	Nagadipa Vihara	A/C/H/R	Nainativu	04
87	Nolans Bungalow	A/H/C	Delft Central	02
88	Elephant Pass Fort	A/H/C	Mukavil	153

No.	Place	Type	GN Division	GN Division Number
Mannar District				
89	Mannar Fort	A/H/C	Thoddaveli	194
90	Tambapanni Port	A/H/C	Arippu	198
91	Arippu Dutch Fort	A/H/C	Arippu	198
92	Uruvela	A/H/C	Kokkupadayan	202
93	Megalithic Site	A/H/C	Marichchukaddi	203

* Protected Monument

Type A Archaeological Value
H Historical Value
R Religious Value
C Cultural Value

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, such as the President's House and the old colonial Parliament building are significant vestiges of Colombo architecture. The Dutch hospital in Colombo Fort is a unique piece of architecture and is the finest and only example of its kind in the world. Shipwrecks, though not very old, are of significant historical value.

Sites of Religious Significance

a) Definition

Monuments and sites with religious associations belonging to Buddhism, Hindu, Muslim and Christian denominations, dating upto the present.

b) Nature and Significance

Sites of religious significance have been identified in the inventory under cultural sites also. Some religious sites have been selected due to significance for coexistance with other religions. In rare cases due to regional significance and popularity even "B" type monuments are included in the list (St Xavier's Church). In the case of certain monuments and sites, their status has been reevaluated and consequently the status as appearing in the inventory is altered[36]. Certain monuments bearing status "A" have been exluded from the list as in the present context, no management interventions could be made at these sites (Closenberg; St. Mary's Church, Kepungoda; Church of Our Lady of Mount Carmel).

Some coastal features such as the "blowhole" should be left unobstructed by development

Kechchimale mosque at Beruwala

Sites and Monuments of Cultural Significance

a) Definition

All archaeological and historical sites and monuments 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

Of the identified sites and monuments of cultural significance, some are categorized as high priority sites.[36] 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

The numerous statues (Suruwam) of Christian saints and Buddhist devales dedicated to folk deities 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 highseas. All Catholic churches, ancient and modern, hold annual feasts. St. Anne's Talawila, Our Lady of Sindratri-Duwa (Passion Play), St. Sebastian's Negombo, are famous seaside centers of worship. 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 at locations such as, Udappuwa (Sri Mariamman and Vishnu Kovils).

Scenic, Recreation and Protected Areas

a) Definition

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

Protected Areas include all areas partially or fully located within the coastal zone which are designated as a National Reserve, Sanctuary or proposed protected area by the Department of Wildlife Conservation.

b) Nature and Significance

The inventory records 100 recreational and scenic sites situated within the Coastal Zone. Most of these are located along the western, southwestern, southern and the eastern coast (Table 5.2). Sri Lanka has many fine beaches suitable for recreation which provide uninterrupted vistas. These scenic vistas still remain in good stead except for a few places where over development has occurred. Sri Lanka's tourism industry is centered around its scenic recreational beaches with nearly 70 percent of Sri Lanka's graded hotels and 80 percent of hotel rooms located along the coast (Table 5.3).[10]

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 are littered with garbage, and sewer pipes empty directly on the beach. In Mawella Lagoon and along the Tangalle coasts, coconut husk-ratting pits pollute the water. In some instances, the very quality of the resources which made them significant has been degraded by incompatible uses and over exploitation. Coral mining is an example.

Table 5.2 High priority recreational, scenic and protected sites within the coastal zone[36]

The GN division names and numbers are as designated in 1986

	Place	Type	GN Division	GN Division Number
ZONE 1 (Kalpitiya-Chilaw)				
1.	Kandakuliya	S/R	Kuringanpitti	629
2.	Talawila Beach	S/R	Mudalaipali	625/620
3.	Udappuwa Sand Spit	S	Udappuwa	694
4.	Karukkapone Beach	S/R	Karukkapone	582
5.	Bar Reef Sanctuary	P/S/R	--	--
ZONE 2 (Chilaw-Negombo)				
6.	Chilaw Beach	R	Sea Beach (Chilaw)	577
7.	Teppanpola Beach	S/R	Marawila	512
8.	Wennappuwa Beach	R	Ulhitiyawa	492
9.	Maha Oya Sand Spit	S/R	Sindathriya	481
10.	Lewis Place	S/R	Ettukala/Wellaweediya	73/158
11.	Negombo Duwa	R	Munnakkara	156
ZONE 3 (Negombo - Colombo)				
12.	Talahena Beach	R	Talahena	163
13.	Kepungoda	S/R	Kepungoda	163A
14.	Uswetakeiyawa	R	Uswetakeiyawa	167
ZONE 4 (Colombo - Panadura)				
15.	Galle Face Green	S/R	Slave Island	21
16.	Wellawatta - Mt.Lavinia Beach	R	Wellawatta (South)	47
			Dehiwela	540
			Mt. Lavinia	541
ZONE 5 (Panadura - Bentota)				
17.	Panadura Beach	R	Pattiya (Northwest)	685/686
18.	Wadduwa - Talpitiya Beach	S/R	Talpitiya	697
			Wadduwa(West)	699
19.	Tangerine Beach	R	Kalutara (North)	717
20.	Kalutara Sand Spit	S/R	Kalutara (North)	717
21.	Maggona Bay	S	Maggona (West)	742
22.	Polkotuwa Beach	S	Polkotuwa	748
23.	Kechchimalai Mosque Area	S/R	Paranakade	753/757
24.	Moragalla Beach	R	Moragalla	760/761
ZONE 6 (Bentota - Galle)				
25.	Bentota Spit & Estuary	S/R	Pahurumulla	1
26.	Godagala - Induruwa Beach	S/R	Angagoda	2
			Yalegama	8
27.	Athuruwella Beach	S/R	Yalegama	8
28.	Kaikawala - Naya-Handugala Beach	S/R	Kaikawala	9
29.	Babungala - Arangala Beach	S/R	Induruwa	10

	Place	Type	GN Division	GN Division Number
30.	Kosgoda Sand Spit	S/R	Nape	16
31.	Oruwella Ambalangoda	S/R	Maha Ambalangoda	82
32.	Ambalangoda Hikkaduwa Rocky Islets Sanctuary	P/S	Maha Ambalangoda	82
33.	Akurala Beach	R	Akurala	76
34.	Hikkaduwa Marine Sanctuary	P/S/R	Wewala	57
			Waulagoda	58
35.	Patuwata - Narigama Beach	R	Narigama	56
			Thiranagama	54
			Patuwata	53
ZONE 7 (Galle - Dondra)				
36.	Galle Fort	S/R	Galle Fort	96 D
37.	Closenberg	S	Magalla	99
38.	Rumassala	S	Unawatuna(West)	137
39.	Unawatuna Bay Proposed Sanctuary	P/S/R	Unawatuna (East)	138
			Unawatuna (West)	132
			Talpe(South)	138
40.	Koggala Beach	S/R	Koggala	144 A
41.	Devala Kanda	S	Ahangama (East)	156
42.	Yakkinige Duwa	S	Ahangama (East)	156
43.	Kapparatota	S/R	Kapparatota	386
44.	Weligama Bay	S/R	Galbokka	385
			Mahaweediya	382
45.	Polwatumodara Beach	S/R	Polwatumodara	308
46.	Mirissa Bay	S/R	Mirissa (South)	406
47.	Polhena Beach	S/R	Polhena	412
48.	Beach Park Matara	S/R	Ginigasmulla	416
49.	Wellamadama	S		
ZONE 8 (Dondra - Kirinda)				
50.	Dondra Light House Area	S	Devinuwara (South)	433
51.	Talalla Beach	R	Talalla (South)	438
52.	Naigalkanda-	R	Bathigama	451
	Dickwella Beach			452
53.	Kudawella Blow Hole	S	Kudawella (West)	466 A
54.	Seenimodara (Mawella Bay)	S/R	Seenimodara	468
55.	Pallikudawa Beach	S/R	Unakuruwa	469
56.	Paravi Wella Beach	R	Kotuwegoda	458
57.	Medaketiya Beach	S/R		
58.	Rekawa Lagoon & Bay	S/R	Rekawa	463
59.	Kalametiya Lagoon & Bay (Kalamatiya Sanctuary)	P/S/R	Hathagala	563
60.	Lunama Lagoon (Kalamatiya Sanctuary)	P/S/R	Lunama	555
61.	Ussangoda	S	Lunama	555
62.	Karagam Lewaya	S	Walawa	586
63.	Hambantota Beach	S/R	Hambantota	584
64.	Bundala National Park	P/S/R	Bundala	604
ZONE 9 (Kirinda - Batticaloa)				
65.	Kirinda Headland	S	Kirinda	601
66.	Nimalawa Sanctuary	S	Kirinda	
67.	Yala National Park/Strict Nature Reserve/	P/S/R	Kirinda	601
	Yala East National Park		Kumana	1
68.	Kudumbigala Sanctuary	P/S/R	--	--
69	Panama Beach	R	Panama	2
70	Arugam Bay Beach	S/R	Potuvil	3
71	Kalmunai Beach	R	Kalmunai T.C.	61

	Place	Type	GN Division	GN Division Number
ZONE 10 (Batticaloa-Foul Point)				
72	Kalladi Beach	S/R		
73	Punnaikudah Bay	R	Eravur	192 Div 3
74	Palaiyadithona Beach	R	Chanthiveli	200
75	Kiran Beach	R	Kiran	203
76	Kalkudah Bay	S/R	Kalkudah	204
77	Pasikudah Bay	S/R	Kalkudah	204
78	Valachchenai Estuary	S	Valachchenai (Tamil Div)	205
79	Thenadi Bay-Elephant Point	S	Valachchenai (Tamil Div.)	205
80	Irichchal Island	S	Mankerni	211
81	Sallativu Island	S	Mankerni	211
82	Vakarai Sand Spit & Lagoon	S/R	Vakarai	212
ZONE 11 (Foul Point-Chempionpattu)				
83.	Seruvil-Allai Sanctuary	P/S/R	--	--
84.	Clapenberg Hill	S	Vellaimanal	229
85.	Trincomalee-Marbel Bay	S/R	Trincomalee Town	244/244A/2
86.	Trincomalee Beach Road	R	Trincomalee Town	244B
87.	Nilaveli Beach	R	Kumpurupiddi, Nilaveli, Sampaltivu	240/241/242
88.	Pigeon Island Sanctuary	P/S/R	--	--
89.	Red Rock Beach	S/R	Kumpurupiddi	239/237
90.	Pirates Cove	R	Kuchchaveli	239/237/2
91.	Kokilai Lagoon Sanctuary	P/S	Kokilai	225
ZONE 12 (Chemionpattu-Mannar)				
92.	Chundikulam Sanctuary	P/S/R	Chundikulam Mulliyan	141/149
93.	Manalkadu Sand Dunes	S	Kudattanai-Karaiyur	142
94.	Senthankulam Beach	S/R	Myliddy Coast	72 A
95.	Casuarina Beach	S/R	Karainagar North	10 A
96.	Castle Beach	S/R	Delft Central	2
97.	Kalmunai Point	S/R	Kavutharimunai	172
98.	Paraitivu Island Sanctuary	P/S/R	Thoddakadu	189 A
99.	Toddakkadu (Mannar Beach)	S/R	Marichchukaddi	203
100.	Wilpattu National Park	P/S/R	--	2

S Scenic Value R Recreational Value P Protected Area

Table 5.3. Graded hotel accommodations in 1996

Region	Number of Hotels	Number of Rooms
Colombo City	20	3,099
Greater Colombo	29	1,952
South Coast	53	4,145
East Coast	1	101
Total in Coastal Zone	103	9,297
Other Regions	41	2,509
Grand Total	144	11,806
Percent in Coastal Areas	71.5	78.7

Source: Ceylon Tourist Board

5.2 Management Objectives, Policies and Actions

Objective 5.1 **Conserve and protect Sri Lanka's significant cultural, historical and archaeological sites including ship wrecks within the coastal zone.**

Policy 1 Promote compliance with the existing laws and regulations so as to limit the adverse impacts of development activities on designated sites within the coastal zone.

Action CCD shall:

1. Permit development in the vicinity of designated sites (see Table 5.1) only in accordance with guidelines for the preservation of archaeological sites (Section 6.4) which prohibit development within a limit of 200m of the boundary of the designated sites and CCD actions given in Table 8.1.
2. Collaborate with the Department of Archaeology to enforce Environmental Impact Assessment or Initial Environmental Examination procedures to avoid potential negative impacts on the site.
3. Collaborate with other concerned agencies to develop a guide book on permitting development activities in and around the designated sites within the Coastal Zone.
4. Coordinate the following development and conservation initiatives for appropriate sites with the participation of Department of Archaeology and other relevant agencies to:
   - Display of sign boards at sites
   - Demarcate boundaries of the sites
   - Formulate and implement management and conservation plans
5. Cooperate with the Department of Archaeology to demarcate and prepare site plans of sites listed in Table 5.1.
6. Incorporate high priority archaeological, historical and cultural sites in the coastal zone as part of CCD's ongoing awareness programmes.

Policy 2 Protect and conserve Sri Lanka's marine archaeological sites including ship wrecks in the coastal zone.

Actions CCD shall:

1. Comply with the guidelines recommended by the Inter-Ministerial Committee on Ship Wrecks when issuing development permits.

Policy 3 Maintain and enhance the quality of the scenic areas and natural resources within the coastal zone.

Actions CCD shall:

1. Require EIA or IEE procedures for development activities which may adversely affect natural resources and scenic areas in the coastal zone.

2. Identify, demarcate and, where possible, acquire areas with high scenic and recreational value.
3. Formulate development and conservation guidelines for development activities in the vicinity of high priority scenic and recreational areas within the Coastal Zone.
4. Formulate and implement plans for coastal and marine parks with the collaboration of private and public sector institutions.

Policy 4

Develop with the Department of Wildlife Conservation, Forest Department, Ceylon Tourist Board, UDA, CEA, and local authorities and other relevant governmental, non-governmental organization and private sector agencies appropriate management plans for scenic sites in the coastal zone consistent with other traditional coastal activities.

Policy 5

Ensure continued public access, consistent with conservation of natural resources along shoreline.

Actions

CCD shall:

1. Sponsor a study to identify significant public access points to and along the shoreline.
2. Formulate and implement an effective public access protection programme with other agencies.

Policy 6

Ensure that new developments are compatible with their visual environment by requiring locating such developments in ways that minimize the alteration of natural landforms and existing public views to and along the shoreline.

Action

CCD shall:

1. Encourage design and location of development that minimize alteration of land forms or loss of visual access.

Policy 7

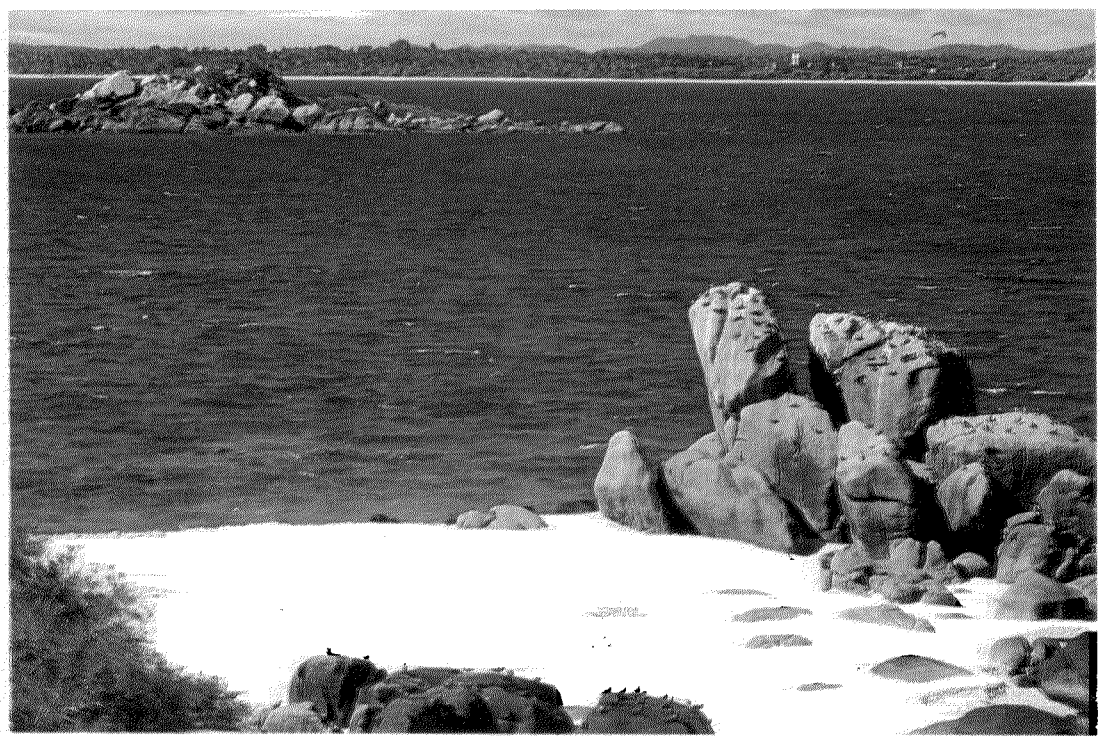
Preserve, maintain and, where desirable, improve and restore shoreline open space.

Action

CCD shall:

1. Initiate a study to assess visual open space and access in the coastal zone.
2. Implement a programme to purchase/acquire development rights to establish open space and or to enhance the environmental quality in identified locations within the coastal zone.

Coral mining still presents a management problems



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

Chapter 6

REGULATORY SYSTEM

6.1 The Coastal Zone Permit System

The primary mechanism for managing activities in the Coastal Zone is a permit system. The Coast Conservation Act (CCA) requires any person proposing to engage in a "development activity" to obtain a permit from the Coast Conservation Department. The CCA defines "development activity" as "any activity likely to alter the physical nature of the coastal zone in any way". The permit system allows the department to ensure that proposed activities are consistent with the Act and the Coastal Zone Management Plan or with some modifications, can be made consistent. The Coastal Zone is defined in Figure 1.1. Some activities for which a permit is required are listed below.

Construction and other activities in the Coastal Zone for which a permit is required from the Director of CCD, include:

- Dwelling houses and related structures of total floor area 1000 sq.ft (93 sq.m) or more
- Tourism, commercial and industrial structures
- Recreational and/or sports structures
- Harbor structures and navigation channels
- Roads, bridges and railway lines
- Public and religious structures
- Shoreline protection works
- Sewage treatment facilities and ocean outfalls
- Aquaculture facilities
- Waste water discharge facilities
- Disposal of solid waste
- Dredging
- Filling
- Grading
- Landscaping
- Mining
- Removal of sand or sea shells
- Removal of vegetation
- Removal of coral for research
- Breaching of sand bars
- Reclamation
- Conveyance lines

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

- Fishing;
- Cultivation of crops that do not destabilise the coast;
- 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 procedure as outlined in Chapter 2.

6.2 Types of Permits and Criteria of Evaluation

Two types of permits are issued for activities within the Coastal Zone.

Major Permit

A permit issued by the Director of Coast Conservation (DCC) will be referred to as a Major Permit.

The following criteria shall be used by the Director of Coast Conservation in evaluating major permit applications:

a) The activity is consistent with the management policies stated in Chapters 2-5 of this plan;

b) The activity is not prohibited by this plan;

c) The activity should comply with the stipulated set back standards;

d) 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 Central Environmental Authority are met;

e) The activity will ensure public access to and along the coast;

e) The activity allows for continuation of existing fishing activities; and,

f) The activity is consistent with the intent of agency zoning schemes and/or guidelines recognized by CCD.

Minor Permit

A permit issued by the Divisional Secretary will be referred to as a Minor Permit. The procedure and the guidelines for issuing or denying minor permits are described below. Activities in the Coastal Zone for which a minor permit is required from the Divisional Secretary of an area are:

- Dwelling houses and related structures of total floor area less than 1000 sq feet (93 square meters);

- In case of an extension to an existing unit the total floor area of the existing unit and the proposed extension together shall not exceed 1000 sq. feet (93 square meters);
- Small scale commercial structures of total floor area less than 350 sq feet (32.5 square meters);
- Removal of sand bars to prevent floods; and,
- Removal of sand up to two cubes from the locations specified by the CCD.

6.3 Procedures and Guidelines for Issuing Minor Permits by the Divisional Secretaries

The Coastal Zone Management Plan of 1990 emphasized the necessity for CCD to decentralize some of its functions to the regional level administrative authorities with a view to ensuring adequate regional and local level participation in Coastal Zone Management. The CZM Plan of 1990 stipulated that the CCD must accomplish the task of training and awareness creation among the regional level administrative authorities before delegating Coastal Zone Management functions to them. Further complying with Government Public Administration Circular No. 21/92, of 21 May 1992, the CCD delegated the function of issuing Minor permits to the Divisional Secretaries (DS) in conformity with Section Five (5) of the Coast Conservation Act No. 57 of 1981 and its amendment Act No. 64 of 1988. A summary of responsibilities between the Director CCD and the Divisional Secretaries is provided in Table 6.1.

Table 6.1 Distribution of responsibilities between Director Coast Conservation Department and Divisional Secretaries in permitting dwelling houses, commercial and other structures

Location*	Activity	Director CCD	Divisional Secretary
Coastal zone (Landward of setback line)	Dwelling Houses	Over 1000 sq. feet (93m²)	Below 1000 sq. feet (93m²)
Coastal zone (Landward of setback line)	Commercial Structures	Over 350 sq. feet (32.5m²)	Below 350 sq. feet (32.5m²)
Coastal zone (Landward of setback line)	Other Structures	------Director CCD only------	
Within Setback restricted area	Dwelling Houses	Below 750 sq. feet (69.7m²)	
Within setback reservation area	Temporary structures for fishing	------Director CCD only------	

Setback areas are defined in Section 6.5

Procedures and Guidelines for Issuing Minor Permits by the Divisional Secretary for Dwelling Houses and Commercial Structures

The Divisional Secretary may issue a minor permit for construction of dwelling houses within the coastal zone if the following criteria are met:

1. The proposed dwelling house will be located outside the setback area as specified in Section 6.5 and Tables 6.1 and 6.2 and protected areas as specified in Table 6.3

2. The proposed structure will comply with other guidelines for residential dwellings stipulated in this plan;

3. The proposed structure will not be located within a radius of 200 m of the periphery of a designated high priority archaeological, historic or cultural site designated in the CZM Plan (Table 5.1);

4. The development will not involve significant removal of coastal vegetation eg. Maharawana (*Spinifex littoreus*), Wetakeiya (*Pandanus Spp.*) or other native beach species;

5. The proposed structure will not be located in an environmentally sensitive area such as a mangroves, salt marshes, estuaries or lagoons;

6. The proposed structure must meet all minimum lot size and other requirements stipulated by the Urban Development Authority;

7. The proposed structure will not unduly interfere with the access to or use of the beach;

8. The proposed structure will not involve the construction of parapet walls, coast protection structures such as groins, revetments or seawalls, piers or jetties on the beach;

9. The proposed structure will not disturb the sand dunes or dune vegetation in the area;

10. Traditional access to the beach that has been longstanding and of open and continuous public use will not be eliminated or restricted by the proposed structure;

11. The proposed structure will not be located in the area of significant recreational activity or scenic areas specified in the CZM plan;

12. All permits will be issued in triplicate and one copy will be forwarded to the Director of Coast Conservation for information; and,

13. All permits will be issued in a prescribed format.

Criteria for Issuing Minor Permits for Sand Removal

Sand removal shall be permitted only from the locations which are recommended or specified by the Coast Conservation Department. These specified locations are subject to change from time to time. The Divisional Secretary will therefore follow the latest directive of the Director, CCD.

The following criteria shall apply:

- Permits for sand removal will be issued only for non-commercial use;
- Mechanical extraction of sand will not be permitted;
- Removal of sand from the non-accreting beaches, barrier beaches and sand spits will not be permitted;
- Permits should not be issued even for a specified location if erosion has occurred within the past twelve months;
- A permit for sand removal will be issued subject to a maximum of two cubes to each applicant;
- The Divisional Secretary will seek approval from the Director of Coast Conservation in the event applications are received for removal of large quantities of sand from the Coastal Zone for a public purpose;
- Sand removal will be carried out in a manner that causes minimal damage to the existing vegetation cover adjacent to the sand removal site; and,
- Sand removal will be carried out in a manner that causes minimal damage to river banks and estuaries.

6.4 Summary of Prohibited Activities

Activities prohibited by the CCD within the Coastal Zone are:

- Development within designated protected areas;
- Removal of corals. In case of removal for research purposes a permit may be issued by the Director/Coast Conservation specifying type, quantity, location and period for removal.
- Removal of sand except in areas identified by CCD;
- Development within a radius of 200 meters of archaeological, historical and cultural sites designated by the Department of Archaeology and this Plan; and,
- Any development activity that will significantly degrade the quality of any area designated as being of exceptional value.

6.5 Setback Definition and Requirements

A setback is an area within the coastal zone wherein certain development activities are prohibited or significantly restricted. Setbacks are a means of accomplishing a number of objectives including:

a) Protecting life and property against erosion and storm surge;

b) Minimizing public investment in coast protection works;

c) Protecting and enhancing the scenic value of coastal environments, protecting vulnerable coastal habitats, and unique natural sites;

d) Providing buffer zones around coastal archeological, historical and cultural sites within the coastal zone;

e) Minimizing use conflicts among different activities taking place in the Coastal Zone;

f) Ensuring public access to and along the coast;

g) Maintaining consistency among national and regional laws and plans; and

h) Ensuring consistency between national development goals and environmental objectives.

Definitions

Setback Area. A setback Area is a geographical strip or band within the Coastal Zone or within which certain development activities are prohibited or significantly restricted. It is comprised of the Reservation Area and the Restricted Area lying between the Seaward Reference Line and the Landward Reference Line of the particular coastal segment (Figure 6.1).

a) **The Seaward Reference Line** will generally be the plus 0.6 meter line from the mean sea level. However the CCD reserves the right to demarcate setbacks from the permanent vegetation line on the beach front where Coconut *(cocos nucifera)* , Maharawana *(Spinifex littoreus)*, Wetakeiya *(Pandanus spp)*, or Mudilla *(Barringtonia speciosa)* are present, or in the absence of a permanent vegetation line, the Mean High Water Line, an appropriate contour line above MSL, the landward toe of the dunes or the seaward edge of a cliff will be considered to be the Seaward Reference Line.

b) **Landward Reference Line** will generally be the landward boundary line of the Setback Area, if not stated otherwise.

The Landward Reference Line is of a variable distance from the shoreline. The criteria for establishing the Landward Reference Line for each segment of the coastline and the minimum actual landward reference lines for each coastal segment are set forth in Table 6.2. The segments have been rated to convey coastal vulnerability to erosion: "low" indicates least vulnerable; "medium" represents moderate vulnerability; and "high" indicates greatest vulnerability (and therefore greater setbacks). Protected areas have setbacks as far landward as 300 m.

The criteria used for demarcation of setbacks by the CCD are as follows:

a) Coastal erosion rate;
b) Exposure to extreme natural events such as cyclones, storm surges;
c) Geomorphological characteristics;
d) Vulnerability of coastal habitats;
e) Significance of other natural components;
f) Level of development;
g) Significance of cultural and natural sites;
h) Level of user conflict;
i) Legal status; and,
j) Special Area Management sites.

Areas not specified in Table 6.2, such as offshore islands, shall assume setbacks of at least 60 m or be determined by Director/Coast Conservation based on site specific parameters.

Reservation and Restricted (soft) Area of Setback

The entire setback band is divided into segments varying in length from 1 to 30 km. Each segment has been given a number from 1-70 (Table 6.2). Each setback segment is further subdivided into two areas: Reservation and Restricted (Figure 6.1). Because it is nearest the shoreline, the reservation area corresponds to a no-build zone in which only uses which are absolutely

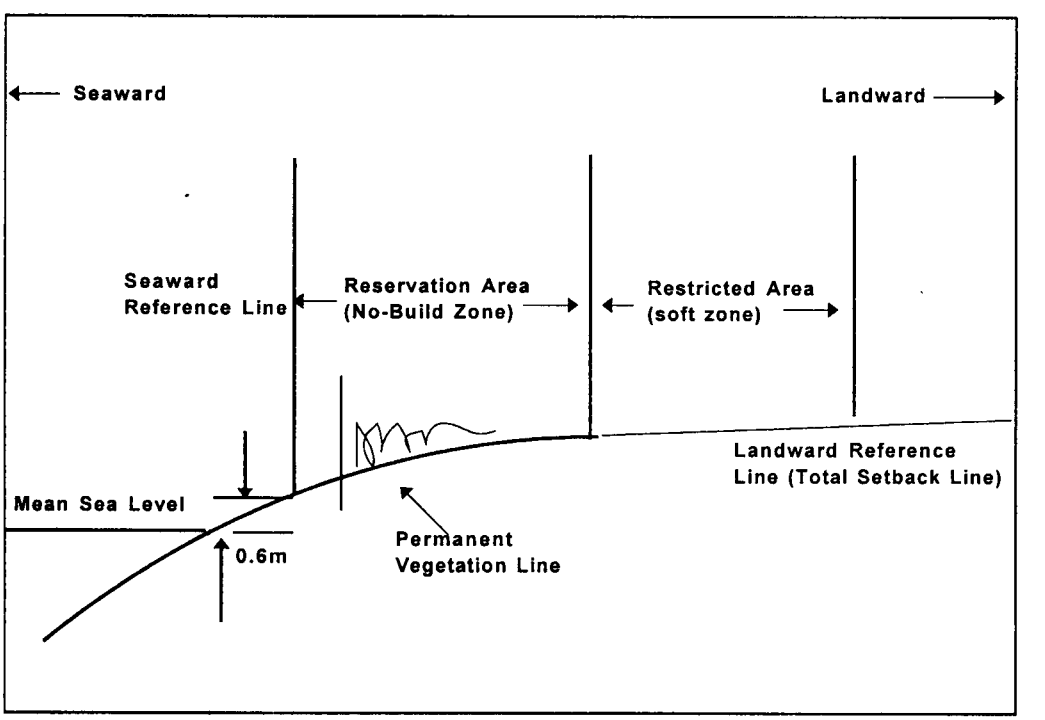


Figure 6.1 Relative locations of setback areas within the coastal zone

essential are allowed. The Restricted Area (soft zone) can be used for a few low-impact activities such as small dwelling units. The width of the Reservation Area and the Restricted Area will vary in accordance with the vulnerability to erosion of the coastal segment in which it is located (Table 6.2). In determining vulnerability, the current density of development, availability of free space, exposure to extreme natural events etc. have been taken into consideration. Accordingly in the segments 1 to 40 (Table 6.2) a lesser set back distance has been assigned whereas in the segments 41 to 70 a broader setback has been assigned.

Permissible Uses in the Reservation Area

The Director of Coast Conservation may issue permits to persons engaged in the following activities if it can be demonstrated that the activity will not have any significant adverse impacts on the particular coastal segment or on the adjacent segments and shall not obstruct access to and along the beach:

a) Coast protection structures which comply with the Master Plan for Coast Erosion Management;

b) Jetties, piers, sea water intakes, tube-wells and related structures;

c) Removal of navigational hazards;

d) Communication, navigational, waste disposal, power generation and other public facilities in the nearshore;

e) Conservation activities approved by the CCD;

f) Temporary structures for a period not exceeding six (6) months, exclusively for fisheries activities in the gazetted Madal Padu locations as identified in the Gazette Notification No.337/48 of February 21, 1985 if the following criteria are met:

- Roof--cadjan, Illuk, canvas, cloth, tar sheets;
- Walls--cadjan, planks, plant leaves, bamboo, canvas, plastic or paper materials;
- Floor--sand, mud, clay (non processed) or wood; and
- Foundation--no permanent foundation (piles, concrete or brick).

g) Leases of the ocean or lagoon bottom by Government Agent or Director, CCD;

h) Reclamation to provide additional buffers.

Permissible Uses in the Restricted (Soft) Area

It is good management practice to leave the restricted area free from any development activity. However given prevailing land use patterns, small land

parcel sizes and socioeconomic considerations involving some coastal residents a less rigid management strategy may be required. Thus, construction of dwellings only will be permitted in the restricted area, but not commercial structures of any kind. Such dwellings shall however, not restrict access to and along the beach.

The Director of Coast Conservation may issue a permit for construction of dwelling houses if the following criteria are met:

- The proposed structure will have a floor area of less than 750 Sq. feet ($69.7m^2$) and will have a roof of tile, asbestos or cadjan. Concrete slabs are not permitted; and
- The proposed dwelling house will be used solely for residential purposes and not for any form of commercial activity.

6.6 Criteria for Granting Setback Exemptions and Variances

Setback Exemptions

An exemption implies a significant deviation from the intent of the setback guidelines stipulated in this plan. Exemption will only be granted if public interest (not private) requires it. Exemptions may be granted to engage in restricted activities within the setback area 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; or,
    - An activity that provides better public access to the shore.

2. All reasonable steps will be taken to minimize adverse environmental impacts and/or use conflicts; and

3. There are no reasonable alternative locations for serving the compelling public purpose stated.

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 granting it.

Table 6.2 Setback standards for development activities in the coastal zone by segment and vulnerability

Segment No.	Area	Source Map (one inch)	Geographical Coordinates		Level of Vulnerability	Setback Distance in (m)		Total Setback Area (m)
			Latitude (N)	Longitude (E)		Reservation Area	Restricted Area	
1	Kala Oya River mouth to Kandakuliya	Kalpitiya	8°17'56" 8°12'36"	79°55'00" 79°41'55"	Medium(-)	15	30	45
2	Kandakuliya to Uddappu South	Puttalam Battulu Oya	8°12'36" 7°44'30"	79°41'55" 79°47'16"	Medium(+)	20	30	50
3	Udappu South to Sinna Karukkapone	Battulu Oya Chilaw	7°44'30" 7°37'30"	79°47'16" 79°47'50"	Medium(-)	15	30	45
4	Sinna Karukkapone to Toduwawa North	Chilaw	7°37'30 7°29'35"	79°47'50" 79°47'40"	High	20	35	55
5	Toduwawa North to Mudukatuwa	Chilaw Kochchikade	7°29'35" 7°24'05"	79°47'40" 79°49'05"	Low(+)	15	25	40
6	Mudukatuwa to Porutota	Kochchikade	7°24'05" 7°15'36"	79°49'05" 79°50'22"	Medium(+)	20	30	50
7	Porutota to Kamachchode	Kochchikade Negombo	7°15'36" 7°12'52"	79°50'22" 79°49'55	Low(+)	15	25	40
8	Kamachchode to Duwa	Negombo	7°12'52" 7°12'28"	79°49'55" 79°49'07"	High(+)	25	35	60
9	Duwa to Uswatekeiyawa	Negombo	7°12'28" 7°02'40'	79°49'07" 79°51'15	Medium(-)	15	30	45
10	Uswetakeiyawa to Mount Lavinia Hotel	Negombo Colombo	7°02'40" 6°50'06"	79°51'15" 79°51'35"	High(-)	20	35	55
11	Mount Lavinia Hotel to Pinwatta Railway Station	Colombo Kalutara	6°50'06" 6°41'17"	79°51'35" 79°54'35"	Medium(-)	15	30	45
12	Pinwatta Railway Station to Tangerine Hotel	Kalutara	6°41'17" 6°36'23"	79°54'35" 79°56'46"	Low(-)	10	25	35
13	Tangerine Hotel to Sinbad Hotel	Kalutara	6°36'23" 6°33'54"	79°56'46" 79°57'32"	High(+)	25	35	60
14	Sinbad Hotel to Payagala South	Kalutara Aluthgama	6°33'54" 6°31'13"	79°57'32" 79°58'37"	Medium(+)	20	30	50
15	Payagala South to Maggona Bridge	Aluthgama	6°31'13" 6°29'54"	79°58'37" 79° 58'42"	Low(+)	15	25	40

16	Maggona Bridge to Confifi Hotel	Aluthgama	6°29'54" 6°27'17"	79°58'42" 79°58'31"	High(+)	25	35	60
17	Confifi Hotel to Yakgahagala to Induruwa	Aluthgama	6°27'17" 6°23'55"	79°58'31" 80°00'16"	Low(+)	15	25	40
18	Yakgahagala to Kosgoda River Mouth	Aluthgama	6°23'55" 6°20'25'-	80°00'16" 80°01'24"	Medium(+)	20	30	50
19	Kosgoda River Mouth to Wellawatte Balapitiya	Aluthgama Balapitiya	6°20'25" 6°16'00"	80°01'24" 80°01'53"	Low(-)	10	25	35
20	Wellawatta Balapitiya to Coral Gardens Hotel, Hikkaduwa	Balapitiya Ambalangoda	6°16'00" 6°08'55"	80°01'53" 80°03' 52"	Medium(-)	15	30	45
21	Coral Gardens Hotel, Hikkaduwa to Devapatiraja Maha Vidyalaya, Ratgama	Ambalangoda Galle	6°08'55" 6°04'57"	80°03'52" 80°08'46"	Low(-)	10	25	35
22	Devapatiraja Maha Vidyalaya to Gintota River	Galle	6°04'57" 6°03'25"	80°08'46 80°10'32"	Medium(+)	20	30	50
23	Gintota River to Maha Modara	Galle	6°03'25" 6°02'25"	80°10'32" 80°11'30"	Medium(-)	15	30	45
24	Maha Modara to Cement Factory, Galle	Galle	6°02'25" 6°01'40"	80°11'30" 80°14'25°	High(-)	20	35	55
25	Cement Factory, Galle to Welle Dewalaya	Galle	6°01'40" 6°00'20"	80°14'25" 80°14'25"	Low(+)	15	25	40
26	Welle Dewalaya to Koggala Housing Scheme (129 km)	Galle	6°00'20" 6°00'25"	80°14'25" 80°15'03"	Low(-)	10	25	35
27	Koggala Housing Scheme (129 km.) to Kataluwa Bridge	Galle	6°00'25" 5°58'55"	80°15'03" 80°20'00"	Medium(-)	15	30	45
28	Kataluwa Bridge to Midigama	Galle Matara	5°58'55" 5°57'30"	80°20'00" 80°23'55"	High(-)	20	35	55
29	Midigama to Walliwala East (140km.)	Matra	5°57'30" - 5°57'45"	80°23'55" 80°25'08"	Low(-)	10	25	35
30	Walliwala East (140 km) to Palana	Matara	5°57'45" 5°58'17"	80°25'08" 80°26'06"	High(+)	25	35	60
31	Palana to Madiha East	Matara	5°58'17" 5°56'17"	80°26'06" 80°30'05"	Low(+)	10	25	35
32	Madiha East to Devinuwara	Matara	5°56'17" 5°55'30"	80°30'05" 80°35'35"	High(-)	20	35	55

Segment No	Area	Source Map (one inch)	Geographical Coordinates		Level of Vulnerability	Setback Distance in (m)		Total Setback Area (m)
			Latitude(N)	Longitude(E)		Reservation Area	Restricted Area	
33	Devinuwara to Goyambokka Peace Haven Hotel	Matara Tangalle	5°55'30" 6°00"55"	80°35'35" 80°47'02"	Low(-)	10	25	35
34	Goyambokka to Kapuhena	Tangalle	6°00'55" 6°02'30'-	80°47'02" 80°49'08"	High(+)	25	35	60
35	Kapuhena to Henagahapugala	Tangalle	6°02'30" 6°04'42"	80°49'08" 80°56'07"	Low(+)	15	25	40
36	Henagahapugala to Lunama	Tangalle	6°04'42" 6°05'07"	80°56'07" 80°57'43"	High(+)	25	35	60
37	Lunama to Wanduruppa	Tangalle	6°05'07" 6°06'22"	80°57'43" 81°01'06"	Low(+)	15	25	40
38	Wanduruppa to Godawaya	Hambantota	6°06'22" 6°06'28"	81°01'06" 81°03'01"	High(+)	25	35	60
39	Godawaya to Mirijjawila	Hambantota	6°06'28" 6°06'55"	81°03'01" 81°05'30"	Low(+)	15	25	40
40	Mirijjawila to Koholankala	Hambantota	6°06'55" 6°08'20"	81°05'30" 81°08'46"	High(+)	25	35	60
41	Koholankala to Parawamodaragala (Yala National Park)	Hambantota Tissamaharama	6°08'20" 6°46'05"	81°08'46" 81°49'25"	High (+)	45	80	125
42	Parawamodaragala to Murugatena Lagoon	Yala, Panama Potuvil	6°46'05" 6°57'23"	81°49'25" 81°51'30"	Low(-)	20	30	50
43	Murugatena Lagoon to Kandaraj	Potuvil	6°57'23" 7°04'08"	81°51'30" 81°51'46"	Medium(-)	30	50	80
44	Kandaraj to Tambiluvil	Potuvil, Tirukkovil	7°04'08" 7°07'58"	81°51'46" 81°51'21"	Low(+)	25	40	65
45	Tambiluvil to 228 Mile Post, Cemetery	Tirukkovil	7°07'58" 7°12'30"	81°51'21" 81°51'40"	High(+)	45	80	125
46	228 Mile Post to Periya Kallar	Tirukkovil Kalmunai	7°12'30" 7°27'45"	81°51'40" 81°48'58"	Low(+)	25	40	65
47	Periya Kallar to Ondachchimunai	Kalmunai	7°27'45" 7°29'59"	81°48'58" 81°48'11"	High(+)	45	80	125
48	Ondachchimunai to Kallady	Kalmunai Batticaloa	7°29'59" 7°43'03"	81°48'11" 81°43'00"	Low(-)	20	30	50

49	Kallady to Bar Light House, Batticaloa	Batticaloa	7°43'03" 7°45'38"	81°43'00" 81°41'01"	High(+)	45	80	125
50	Bar Light House, Batticaloa to Kalkudah	Batticaloa Kalkudah	7°45'38" 7°55'08"	81°41'01" 81°34'48"	Medium(+)	30	50	80
51	Kalkudah to Pulsri Point	Kalkudah	7°55'08" 7°59'36"	81°34'48" 81°32'37"	Low(+)	25	40	65
52	Pulsri Point to Foul Point, Kevuliya	Kalkudah, Vakaneri, Kathiramalai	7°59'36" 8°31'30"	81°32'37" 81°19'00"	High(+)	45	80	125
53	Foul Point, Kevuliya to Fort Frederick	Trincomalee	8°31'30" 8°35'00"	81°19'00" 81°14'37"	Low(-)	20	30	50
54	Fort Frederick to Alles Garden	Trincomalee	8°35'00" 8°36'45"	81°14'37" 81°13'06"	High(-)	40	70	110
55	Alles Garden to Thavikallu	Nilaweli	8°36'45" 8°46'11"	81°13'06" 81°08'40"	Low(-)	20	30	50
56	Thavikallu to Kokulaikanni	Nilaweli Padaviya	8°46'11" 8°59'00"	81°08'40" 80°58'06"	Medium(-)	30	50	80
57	Kokilaikanni to Thumpalai	Kokilai, Mulathivu Eranamadu Elephant Pass Point Pedro	8°59'00" 9°49'20"	80°58'06" 80°15'09"	High(+)	45	80	125
58	Thumpalai to Thiruvadiniaya	Jaffna Point Pedro	9°49'20" 9°46'42'-	80°15'09" 79°55'34"	Low(-)	20	30	50
59	Thiruvadeniya to Mandathivu	Jaffna, Delft	9°46'42" 9°36'53"	79°55'34" 80°00'15"	Medium(-)	30	50	80
60	Delft Islands to Nayinativu, Karaitivu and other Islands	Jaffna, Delft	All island		Medium(+)	35	60	95
61	Kalmunai to Devil Point	Pooneryn	9°35'56" 9°23'45"	80°02'58" 80°03'12"	Low(-)	20	30	50
62	Devil Point to Weeravandinmunai	Thunakkai	9°23'45" 9°21'08"	80°03'12" 80°03'30"	Medium(-)	30	50	80
63	Weeramandimunai to Sinnativu	Thunakkai	9°21'08" 9°19'45"	80°03'30" 80°05'04"	High(-)	40	70	110

Segment No.	Area	Source Map (one inch)	Geographical Coordinates		Level of Vulnerability	Setback Distance in (m)		Total Setback Area (m)
			Latitude	Longitude		Reservation Area	Restricted Area	
64	Sinnathivu to Periya Aru	Thunakkai	9°19'45" 9°09'04"	80°05'04" 80°05'15"	Low(+)	25	40	65
65	Periya Aru to Padaviturai	Manthai	9°09'04" 9°05'29"	80°05'15" 80°04'15"	High(-)	40	70	110
66	Padavithurai to Nayatumunai	Manthai	9°05'29" 9°00"53"	80°04'15" 80°01'40"	High(+)	45	80	125
67	Nayatumunai to Manthai	Manthai	9°00'53" 8°57'04"	80°01'40" 79°57'10"	High(-)	40	70	110
68	Mannar Island	Murukkan Talaimannar	Entire Island		Medium(+)	30	50	80
69	Manthai to Aruvi Aru River Mouth	Murukkan	8°57'04" 8°17'56"	79°57'10" 79°55'00"	High(+)	45	80	125
70	Aruvi Aru River Mouth to Kala Oya River Mouth (Wilpattu National Park)	Murukkan	8°17'56" 8°12'36"	79°55'00" 79°41'55"	High (+)	45	80	125

Classification of Coastal Segments by Level of Vulnerability and Setback Distances (in meters)

Level of Vulnerability	Coastal Segment Nos 1- 40			Coastal Segment Nos. 41 -70		
	Reservation Area	Restricted Area	Total Setback	Reservation Area	Restricted Area	Total Setback
Low -	10	25	35	20	30	50
Low +	15	25	40	25	40	65
Medium -	15	30	45	30	50	80
Medium +	20	30	50	35	60	95
High -	20	35	55	40	70	110
High +	25	35	60	45	80	125
Protected Areas			300	Protected Areas		300

Setback Variances

A variance implies a relatively minor deviation from the intent of the setback guidelines stipulated in this plan. Unlike an exemption, private interests may request it. Variances from setback requirements may be granted only if the following criteria are met:

1. The proposed development activity is strictly limited to the Restricted (Soft) Area;

2. The proposed alteration will not lead to any significant adverse environmental impacts or use conflicts; to establish the degree of environmental impact the Coast Conservation Advisory Council (CCAC) shall consider the following:

- Existing erosion rates in the area in which the proposed variance is requested;
- The degree to which the activity for which the variance is proposed might reasonably be expected to accelerate erosion rates;
- The degree to which impacts associated with the activity for which the variance is proposed will adversely affect coastal habitats in the vicinity;
- The degree to which geomorphological characteristics of the site, such as rocks, vegetation, or dunes reduce, or amplify potential adverse impacts;
- The reciprocal effects of the proposed activity and existing coast protection structures; and
- The type of precedent that is set by a decision on this variance application.

3. Due to conditions at the site in question, the setback standard will cause the applicant an undue hardship.

4. The variance requested by the applicant is the minimum necessary to relieve an undue hardship.

5. The undue hardship is not the result of any prior action of the applicant.

Such a variance may be granted by the Director only if the CCAC determines that there are compelling reasons for allowing a variance and recommends the granting of same.

6.7 Application of CCD Setback Distances for the Protected Areas

In the case of protected areas the setback distances specified in the Table 6.2, shall not be applicable. Protected areas include

1. Strict Nature Reserve

Table 6.3 Protected Areas Bordering the Coastal Zone of Sri Lanka

Name of the Protected Area	Location/Geographical Coordinations**		Nearest Coastal Segment	IUCN Category***	Extent (ha)	Year of Establishment
	Latitude (N)	Longitude (E)				
1. Bar Reef Sanctuary	8°16'00"-8°32'00"	79°40'75"-79°46'70"	02, 70	-	30,670	1992
2. Honduwa Island Sanctuary	6°27'17"-6°23'55"	79°58'31"-80°00'16"	17	IV	8.44	1973
3. Telwatta Sanctuary*	6°16'00"-6°08'55"	80°01'53"-80°03'52"	20	IV	1425	1938
4. Ambalangoda-Hikkaduwa Rocky Islets Sanctuary	6°09'00"-6°08'00"	80°08'00"-80°05'00"	20, 21	IV	1.26	1940
5. Hikkaduwa Fisheries Reserve/Sanctuary*	6°09'00"-6°08'00"	80°08'00"-80°05'00"	20, 21	IV	45	1961, 1979
6. Parappaduwa and Polgasduwa Sanctuary*	Entire Island and lagoon		22	IV	190	1988
7. Kalamatiya Lagoon Sanctuary*	6°05'00"-6°06'00"	80°56'00"-80°59'00"	36,37,38	IV	712	1984
8. Bundala National Park	6°07'00"-6°14'00"	80°07'00"-81°17'00"	40,41	--	6,216	1992
9. Nimalawa Sanctuary	6°08'20"-6°46'05"	81°08'46"-81°49'25"	41	--	1,066	1993
10. Ruhuna (Yala)--1 National Park*	6°16'00"-6°42'00"	81°15'00"-81°41'30"	41	II	16,133	1938-1973
11. Ruhuna (Yala)--2 National Park*	6°16'00"-6°42'00"	81°15'00"-81°41'30"	41	II	9,931	1954
12. Yala Strict Natural Reserve*	6°16'00"-6°42'00"	81°15'00"-81°41'30"	41,42	I	28,906	1954
13. Yala East--1 National Park*	6°30'00"-6°42'00"	81°04'00"-81°45'00"	42	II	17,864	1969
14. Yala East--2 National Park*	6°30'00"-6°42'00"	81°04'00"-81°45'00"	42	II	285.2	1969
15. Kudumbigala Sanctuary*	6°46'05"-6°57'23"	81°49'25"-81°51'30"	42	IV	4,403	1973
16. Seruwawila-Ella Sanctuary*	8°20'00"-8°25'00"	81°20'00"-81°23'00"	52	IV	15,540	1970
17. Little Sober Island Sanctuary*/ Great Sober Island*	Entire Island		53	IV	73	1963
18. Pigeon Island Sanctuary*	Entire Island		53	IV	5	1974

Name of the Protected Area	Location/Geographical Coordinations**		Nearest Coastal Segment	IUCN Category***	Extent (ha)	Year of Establishment
	Latitude (N)	Longitude (E)				
19. Kokilai Lagoon Sanctuary*	8°56'00"-9°03'00"	80°52'00"-80°58'00"	56, 57	IV	2,995	1951
20. Chundikulam Sanctuary*	9°26'00"-9°32'00"	80°24'00"-80°37'00"	57	IV	11,129	1938
21. Parititivu Island Sanctuary*	Entire Island		60	IV	97	1973
22. Wilpattu North Sanctuary	8°30'00"-8°32'00"	79°52'00"-80°04'00"	70	IV	1,878	1938
23. Wilpattu West Sanctuary	8°12'00"-8°32'00"	79°52'00"-80°10'00"	70	IV	12	1938, 1941, 1973
24. Wilpattu (Block 5) National Park*	8°12'00"-8°32'00"	79°52'00"-80°10'00"	70	II	21,486	1938, 1941, 1973

Note:

* Cited in the IUCN Directory of South Asian Protected Areas

** The Geographical Coordinates of the relevant coastal segment is given in the case of absence of such specific information pertaining to the site.

*** IUCN Category as recognized in Sri Lanka

(I) Scientifc Reserve/Strict Nature Reserve

(II) National Park

(IV) Managed Nature Reserve/Wildlife Sanctuary

2. National Park
3. Nature Reserve
4. Jungle Corridor
5. Refuge
6. Marine Reserve
7. Buffer Zone
8. Sanctuary
9. Reserved Forest,
10. Conservation Forest
11. National Heritage Wilderness Area

A total 300m setback shall be applied to the protected areas if such an area falls within any segments of the coastal zone specified in table 6.3; Fisheries Management Area, Fisheries Reserve or any other designated area or site declared by the Goverment of Sri Lanka.

6.8 Monitoring of Compliance

The main objectives of monitoring activities by CCD are to:

a) Determine whether approved permits are meeting the standards of the Coastal Zone Management Plan;

b) Determine the adequacy of CZM guidelines and standards in achieving CZM goals;

c) Detect potential or existing inconsistencies between permit decisions and the goals of the CZM Plan; and,

d) Evaluate the performance of the decentralized permitting system in terms of the adequacy of training given by the CCD and sufficiency of resources at the local level.

The CCD will apply one or more of the following monitoring tools to ensure compliance with permit conditions:

1. Periodic inspection to examine key stages of the approved projects by CCD officials using a standard checklist;

2. An information network for detecting violations compiled through formal and informal complaints which will initiate enforcement action against violators;

3. Permit monitoring compliance surveys conducted annually;

4. Cumulative Impact Assessment Monitoring emphasizing impacts of numerous individual permit decisions spread over time and space in each coastal segment;

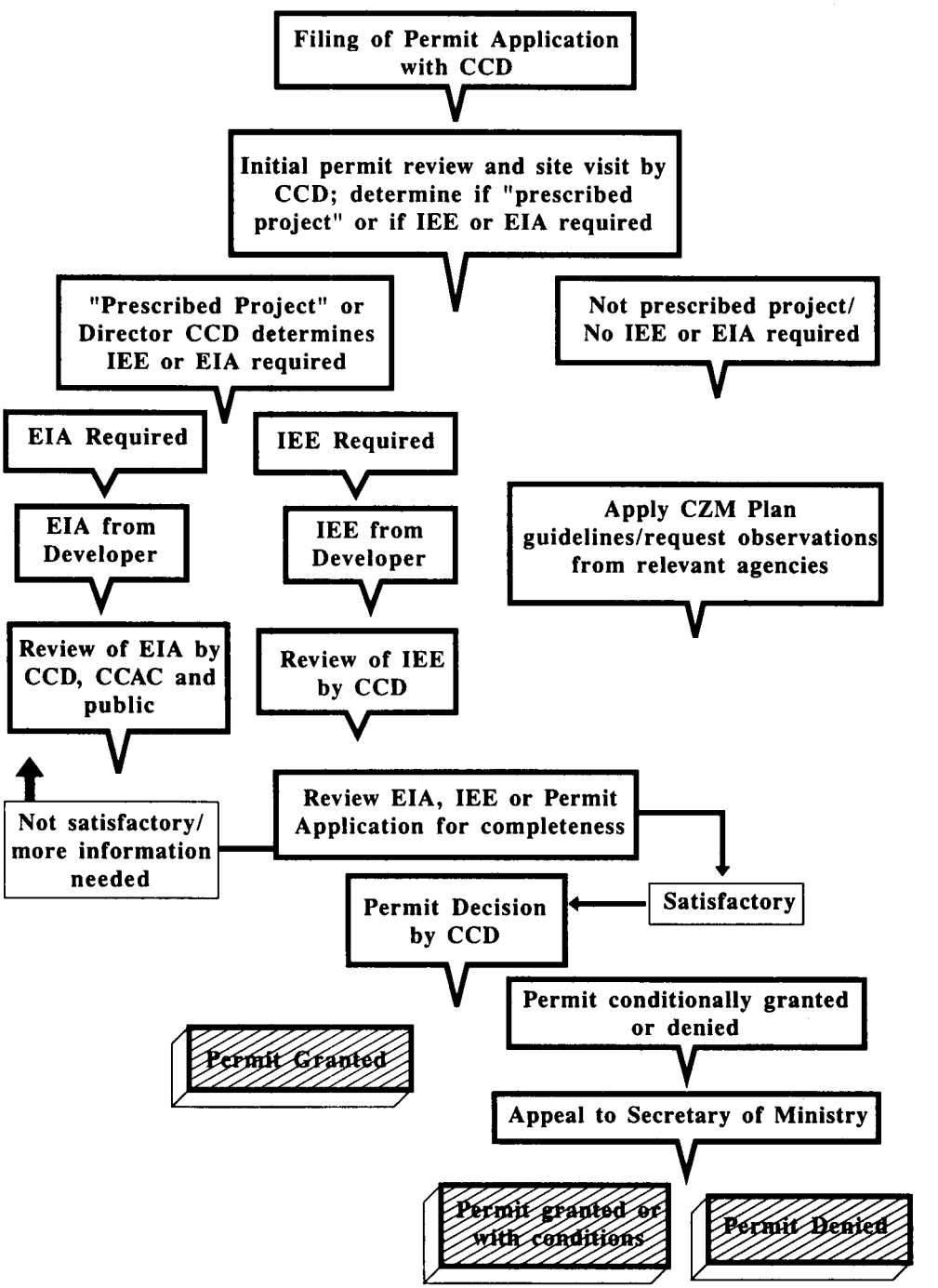


Figure 6.2 Procedure for reviewing and issuing Coast Conservation Department permits

5. Required developer reports, surveys, tests stipulated by CEA or any other agencies relevant to the development activity; and

6. Required certificates of conformity from local authority or other designated agency that the permit conditions have been adhered to.

6.9 Environmental Impact Assessment (EIA) and Initial Environmental Examination (IEE)

Upon receipt of an application for a development permit within the Coastal Zone, the CCD Director will determine whether such activity requires an EIA in accordance with the relevant section of the Coast Conservation Act. In determining the requirement of an EIA or IEE, the CCD will consult the Central Environmental Authority and due consideration will be made for the list of prescribed projects under the National Environmental Act.[9] It shall be the duty of the applicant to comply with the relevant requirements.

Initial Environmental Examination (IEE)

In issuing a permit, the Director/Coast Conservation is required to ensure that the development activity will not have an adverse effect on the environmental quality of the coastal zone. If the director so wishes he may request the developer to submit an Initial Environmental Examination report.

The Initial Environmental Examination Report (IEE) is defined in the National Environmental Act as follows:

"A written report wherein possible impacts of the proposed development activity on the environment shall be assessed with a view to determining whether such impacts are significant, and as such require the preparation of an environmental impact assessment report and such report shall contain such further details, descriptions, data, maps, designs and other information as may be prescribed."

An Initial Environmental Report will be required in the case of a "Prescribed Project" as described in *Guidance for Implementing the Environmental Impact Assessment process*[9] that is considered to have significant impacts on the coastal environment. It is the responsibility of the applicant to prepare the IEE. The general guidelines for the preparation of an IEE are given in Table 6.4. A check list and terms of reference for an IEE will be prepared by CCD in consultation with the relevant agencies and will be submitted to the developer.

On receipt of an IEE, the Coast Conservation Department will review the report and make a decision whether a permit can be issued and the conditions thereof.

Table 6.4 General guidelines for preparation of Initial Environmental Examination (IEE) and Environmental Impact Assessment (EIA)

a) **Description of Proposed Activity**

1. Description of the nature, aims and scope of proposed activity;
2. Description of the methodology to be adopted during construction operation and maintenance;
3. Description of proposed project's socioeconomic and ecological benefits/costs; and,
4. Description of the long-term monitoring program for the proposed activity.

b) **Site Description**

A description of the area within which the activity, development or operation is proposed to be sited and its environs should include:

1. Location of proposed activity marked on a 1 inch to 1 mile map or 1:50,000 metric sheet;
2. A site map at a scale suitable to show the proposed activity;
3. Delineation of coastal habitats as defined in Chapter 3 and their ecological state;
4. Proximity to water bodies;
5. Existing land use and other human activities;
6. Any high priority archaeological historic and cultural sites within the coastal zone as listed in Table 5.1 and any high priority recreational, scenic and protected sites within the coastal zone as listed in Table 5.2; and,
7. Other relevant information.

c) **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:

1 Coastal habitats described in Chapter 3;
2 Quality and quantity of coastal waters;
3 Past and present land use patterns;
4 The abundance and diversity of plant and animal life;
5 Erosion and depositional processes along the shore;
6 Water circulation, flushing, turbidity and sedimentation;
7 Freshwater runoff patterns and/or saltwater intrusion;
8 Areas of archaeological, historic, cultural, and scenic significance; and,
9 Public access to and along the shore and to coastal waters.

d) **Proposed Mitigation Measures**

A statement setting out proposed measures to minimize impacts and a statement on the effectiveness of the proposed measure should be provided. If alternative measures are considered, these should be stated and reasons for selection of the proposed mitigation measures given.

e) **Additional Requirements**

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

The procedures for obtaining a CCD permit are summarized in Figure 6.2. Application forms are available at the CCD and from Assistant Government Agents and Urban Development Authority officers. Each application must be accompanied by a fee of fifty Rupees. 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 and reading this plan and appropriate references early in the project planning stage is advised to facilitate the permit process.

Environmental Impact Assessment (EIA)

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

"A written analysis of the predicted environmental consequences of a proposed development activity, and unavoidable adverse environmental effects of the proposed development activity, a description of alternatives to the activity which might be less harmful to the environment 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 a Project that is considered by the Director/Coast Conservation to have significant impacts on the coastal environment. It is the responsibility of the applicant to prepare the EIA. General guidelines for the preparation of an EIA are given in Table 6.4. The terms of reference for the EIA will be prepared by the CCD in consultation with the related agencies and will be submitted to the proponent of the project.

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 focuses 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 (CCAC) for comments. The Director shall also publish a notice in the Gazette and one newspaper each in Sinhala, Tamil and English, 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 CCAC will submit its comments to the Director within 60 days of submission of an EIA to the CCAC. 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 make a decision whether a permit can be issued and the conditions thereof (Figure 6.2).

Chapter 7

SPECIAL AREA MANAGEMENT

7.1 The Concept

Since the adoption of the first Coastal Zone Management Plan, CCD has relied primarily on the coastal permit system, the construction of coastal protection works, inter-agency collaboration and public education as the primary means for implementing the plan. What has been missing from the management system is a mechanism to deal comprehensively with coastal resource management issues at specific sites, particularly when those resource use issues occur outside as well as within the coastal zone. At the core of site management is how best to address the hundreds of individual resource use decisions made by coastal residents that collectively can severely deplete or degrade coastal resources. How can community self-management be most effectively promoted? How can residents of an area be encouraged to collaborate with government agencies on strategies to improve their own management of resources for their own use and the use of their descendants?[51]

To deal with these questions a new "bottom-up" and collaborative management strategy, Special Area Management, has been developed to complement the existing "top-down" approaches. Special Area Management (or SAM) is a collaborative approach to planning resource management within a defined geographic area. It assumes that residents of a community and local government have both the incentives and the "local knowledge" of resources and resource-use problems to act collectively in ways that insure that resources are used sustainably.

Key aspects of Special Area Management are:

- Through the SAM process, it is possible to organize local communities to manage their natural resources, and they will in turn continue to do so if they perceive that they derive tangible benefits from better management.

- The planner, the planning agency or the organizational group plays only a catalytic role in organizing the local community providing technical and financial support for the management effort which is formulated and implemented as a local community and/or local government effort.

- The planning agency takes on the role of facilitator and collaborator rather than that of a superior authority.

- Community participation is possible in SAM planning and implementation to a degree not possible in broader area planning.

- It considers the total ecosystem including the human elements and communities and their potential role in the process of planning and implementation.

- Implementation and monitoring becomes a local responsibility and reduces the need for outside support in the long-term.

7.2 Why Special Area Management in Sri Lanka

In Sri Lanka, policies of *Coastal 2000* highlighted the need for a more integrated approach to coastal management; for local-level involvement and collaboration; and for focusing management efforts in "special areas" which have a recognized set of issues within defined and manageable boundaries. *Coastal 2000* specifically suggested using the SAM process to develop plans and to implement actions simultaneously in selected sites.

Twenty-three sites have been reviewed and ranked for SAM designation. These sites are shown in Table 7.1.

These sites were rated in terms of severity of resource management issues, biodiversity, viability, and economic significance as defined in Table 7.1. Based on the preliminary analysis using these factors, eight sites were ranked as having high priority: Arugam Bay; Batticaloa Lagoon; Bar Reef; Chilaw, Beruwala/ Bentota; Hikkaduwa Town and sanctuary; Negombo Lagoon; Rekawa Lagoon; and Unawatuna Bay. Hikkaduwa and Rekawa were chosen as pilot projects because they represented different types of management issues and solutions.

In addition to the design of comprehensive collaborative management plans for sites with multiple resource use conflicts, such as coastal lagoon areas, CCD also proposes to promote the design of single-issue collaborative plans in a few geographical areas. In general these sites will be not only geographically smaller but less complex and characterized by fewer user conflicts. There is also the prospect of more immediate results in these settings. These projects involve planning processes and principles similar to the comprehensive SAM plans. To distinguish them from the larger, more comprehensive SAM projects, CCD proposes to call these sites "Areas of Particular Concern (APC)".

Table 7.1. Potential Special Area Management sites rated by factors of concern*

		Factors rated on scale of 5 (high) to 1 (low)				
		A	B	C	D	VALUE
Potential Sites						
1	Arugam Bay	3	3	3	4	13**
2	Bar Reef	4	5	1	3	13**
3	Batticaloa	4	3	4	5	16**
4	Beruwela/Bentota	4	2	5	5	16**
5	Chilaw Lagoon	3	2	3	3	11
6	Hambantota dunes	2	1	3	1	7
7	Hikkaduwa town and Sanctuary	5	4	4	5	18**
8	Kalametiya Lagoon	2	3	3	3	11
9	Kalkudah Bay	2	4	1	3	10
10	Kosgoda Lagoon	2	3	3	4	12
11	Lunawa Lagoon	4	2	3	2	11
12	Maduganga, Balapitya	3	3	3	5	14
13	Manalkadu dunes	1	2	1	2	6
14	Mawella	2	2	3	3	10
15	Mt Lavinia Beach	4	1	2	5	12
16	Negombo Lagoon	4	3	2	4	13**
17	Panama dunes	1	2	2	2	7
18	Pirates Cove	2	2	1	2	7
19	Polhena	3	3	4	3	13
20	Puttalam Lagoon	2	4	2	4	12
21	Rekawa Lagoon	4	3	4	3	14**
22	Trincomalee Bay	2	3	1	5	11
23	Unawatuna Bay	4	4	4	4	16**

* Factors of concern are defined as follows:

- **A Severity of issues**. The relative extent and level of social, economic and environmental issues of concern at the management site.
- **B Biodiversity**. The relative richness and abundance of coastal ecosystems and their function as habitat for organisms.
- **C Viability**. The feasibility of management based size, location and legal and institutional factors which will help or hinder the management process.
- **D Economic significance**. The existing or potential value of economic development at the management site.

** Sites of high priority

7.3 Special Area Management Process

The SAM process tested in Rekawa and Hikkaduwa by the CCD/ CRMP and for Muthurajawela Marsh and Negombo Lagoon by the GCEC (now Sri Lanka Board of Investment) and the Wetlands Conservation Project of the CEA adopting different approaches confirm the necessity for the application of unique integrated methodolgy in each case. The following are the generic steps adopted by the CCD.

1. **Identification and agreement on SAM site.**
Sites are rated in terms of severity of resource use issues, biodiversity, viability and economic significance. Based on the rankings in this plan and final approval by an advisory committee or individual, one or more sites for application of the process are selected.

2. **Compile an environmental profile.**
The initial step in developing a management plan is to compile relevant existing information on the area and its resources and human communities. Profiles typically include information on climate, hydrology, geographical setting, history, natural resources, population and infrastructure, economic activities, institutional setting and management issues.

3. **Enter the community with full-time professional facilitators and community organizers.**
The primary task of the field personnel is to liaise with community stakeholders, organize education programs, facilitate the planning process with these interest groups and to organize core coastal resource management groups on a case-by-case basis. A subset of activities include:

   a. Establish management coordinating committee and determine key members; and,
   b. Organize stakeholder management associations.

4. **Conduct planning-cum-training workshops in the SAM site.**
Such workshops are ongoing as a means of involving the community and local government leaders in the planning process. A subset of activities include:

   a. Use environmental profile as basis for planning;
   b. Refine management issues;
   c. Determine overall goals and objectives for management;
   d. Develop strategies for management through discussion;
   e. Educate community and local government members; and,
   f. Build consensus on activities for implementation.

5. **Organize resource management core groups.**
Resource management core groups are defined according to their dependence on different resources such as a lagoon fishery, small-scale beach tourism, agriculture or another resource base. Such groups, in collaboration with government agencies, are the stabilizing and institutional forces which can make the SAM plan implementation sustainable.

6. **Draft management plan through community involvement and determination of indicators for monitoring.**
A draft plan reflects the management objectives of community groups, local government and key national agencies. The process of generating the plans is open and flexible so that all interested parties can have a role and express their views which would be reflected in a plan. A subset of activities includes:

a. Agreement on implementation responsibilities;
b. Small project implementation through community;
c. Linkages with national government authorities;
d. Linkages with development programs as appropriate;
e. Assistance for planned projects; and,
f. Evaluation of results.

7. **Implement pilot projects while planning continues.**
It is important that small pilot action projects be started early which provide and show real results to the participants. An example could be improved management of a small lagoon fishery which shows results within one year.

8. **Establish institutional arrangement for implementation.**
The institutional arrangements will evolve as part of the SAM process because they are tied to the local and national situation for a given place and time. The Divisional Secretariat can play a key role in the local coordination of the SAM plan along with the facilitating authority or agency. Ultimately the plan is endorsed jointly by national agencies and formally recognized community organizations for implementation. It will then be recognized by the national government as a legitimate plan.

However, depending on the level of data and knowledge and comunity commitment at each site, the procedural steps detailed above may be reduced or varied.

7.4 The Special Area Management Experience in Hikkaduwa , Rekawa and Negombo

The major events which have occurred in the SAM planning process at Hikkaduwa and Rekawa since 1992 are listed chronologically in Table 7.2. The strong emphasis on participation by the community and local government is crucial to a successful outcome. These two SAM plans were completed by the end of 1995.

The major events in the SAM planning process at Muthurajawela and Negombo Lagoon are given in Table 7.3. The difference in the approaches are evident.

7.5 Principles of the Special Area Management Process

The SAM process as followed by CCD is based on a set of principles which are evolving from the ongoing experience:[51]

Table 7.2. Major events in special area management planning at Hikkaduwa and Rekawa, 1992-1996

Year	Event
1991	* SAM concept endorsed in national workshop
	* Pilot sites selected at Hikkaduwa and Rekawa
1992	* Employ SAM coordinator for sites
	* Introduce SAM process to local level officials
	* Compile secondary information on sites
	* Collate maps on sites
	* First draft of environmental profiles
1993	* Employ project officers for field operation
	* Train project officers in SAM process and coastal management concepts and ecology
	* Setup project offices at sites
	* Map resource distribution and uses in each GN Division with community and GN participation
	* Conduct education seminars on coastal ecology among community resource user groups
	* Begin issue identification workshops for resource user groups and local level officials
	* Begin SAM Coordinating Committees for sites with DS
	* Initiate research to collect data for planning on:
	+ Hydrology, irrigation and landuse of Rekawa area
	+ Fisheries of Rekawa Lagoon
	+ Socioeconomics of Rekawa communities
	+ Feasibility of aquaculture in Rekawa area
	+ Water quality of marine sanctuary, Hikkaduwa
	+ Coral reef condition in Rekawa and Hikkaduwa
	+ Economics of tourism in Hikkaduwa
	* Monitor all studies and analyze data for planning
	* Train local government personnel in 5-day course
1994	* Publish environmental profiles on sites
	* Use profile data for education and planning with community and local level officials
	* Design educational signs with DWLC, Hikkaduwa
	* Organize community groups among fishermen, farmers, women (Rekawa) and Glass-bottom boat owners, Hoteliers and tour guides (Hikkaduwa)
	* Conduct SAM planning workshops with user groups
	* Begin drafting management plans for sites
	* Review EIAs on aquaculture and tourism proposals
	* Develop indicators of progress for SAM sites
1995	* Conduct participatory research for planning on:
	+ Coral reef users in Hikkaduwa
	+ Solid waste disposal practices, Hikkaduwa
	+ Economics of mangrove resource, Rekawa
	+ Coral growth and reef zoning, Hikkaduwa
	* Support the SAM Coordinating Committee functions
	* Use Coordinating Committee meetings to discuss management policies
	* Initiate community catalyst program, Rekawa
	* Implement community level projects on:
	+ Glass Bottom Boat Owner Association functions
	+ Lagoon Fishermen Organization functions
	+ Community leadership training, Rekawa
	+ Design floats and boundary markers, Hikkaduwa
	+ Draft Gazette notice for Sanctuary Boundaries
	+ Begin poultry livelihood project, Rekawa
	+ Initiate design for Kapuhenwela Causeway, Rekawa
	* Facilitate action on Harbor improvement through Ministry of Fisheries, Hikkaduwa
	* Finalize drafts of management plan through consensus
	* Build institutional base for SAM implementation through national plan and national education programs
1996	* Endorse management plans for implementation

Table 7.3. Major events in special area management planning and implementation for Muthurajawela Marsh and Negombo Lagoon

Year	Event
1989	* Presidential directive issued, Steering Committee convened * Donor funding acquired
1990	* Project Manager, for ecological survey appointed, Technical Assistance consultants appointed * Technical studies, problem oriented community workshops held, thematic maps completed
1991	* Environmental Profile completed, draft land use strategies identified * Consensus workshop held, Master Plan completed * Environmental Profile and Master Plan published * Approval obtained from Cabinet Sub-Committee on Foreign Investment * Master plan implementation steering committee convened * Programming and feasibility analysis begins * Wetland Conservation Project initiated
1992	* Mixed Urban Zone Sandfill funding negotiations continue
1993	* Conservation Management Plan preparation for the Conservation Zone begins by Wetland Conservation Project * Community workshop process initiated, local NGOs appointed for facilitation * Feasibility study for Mixed Urban Zone Sandfill completed * EIA for mixed Urban Zone Sandfill begins * Kerawalapitiya Urban Relocation Project formulated, funding obtained
1994	* Mixed Urban Zone Sandfill begins * Relocation and community development at Kerawalapitiya begins * Conservation Management Plan for Conservation Zone completed and published * Landuse plan for Mixed Urban Zone prepared
1995	* Mixed Urban Zone Sandfill completed * Cabinet approval obtained for continued implementation of Master Plan and Conservation Management Plan * Implementation of Conservation Management Plan commences with the Wetland Conservation Project support
1996	* Muthurajawela Marsh Conservation Zone is declared a sanctuary under the Fauna and Flora Protection Ordinance * Department of Fisheries and Aquatic Resources Development prepared the fishery management plan for Negombo Lagoon * Negombo Lagoon United Fishermen's Organization begins boundary demarcation under supervision of an inter-agency committee * Muthurajawela Visitor Centre comes into operation * Business plan prepared for the Mixed Urban Zone

- **The SAM process must be open, participatory and work towards consensus**. The government and non-government groups must work together and continue to have open dialogue during the planning and implementation process.
- **Decisions must be clear and well documented**. Any binding decisions must be very clearly communicated and abided by. Otherwise mistrust will grow and goodwill lost.
- **National government agencies must understand and accept the process**.
- **Stakeholder groups must be equally represented in the management process**.
- **Implementation results should be apparent within 3 years**. If results are not forthcoming within a reasonable time, all concerned lose interest in the process.
- **Monitoring and feedback of results makes the program tangible**. Monitoring ensures that changes over time are recorded and understood by all concerned. In this manner, positive results will reinforce participation and further change efforts.
- **In Sri Lanka, collaborative management is a more appropriate concept than community-based management** for coastal resources.
- **Community groups can make the difference in success or failure**.

To ensure successful implementation of a SAM plan, certain criteria must be met:

1. The SAM plan must conform to the national CZM plan;
2. The implementing partner agencies must adopt a memorandum of understanding to carry out their responsibilities within the SAM Plan by formal acceptance of the Plan;
3. Amendments to the SAM Plan have to be reviewed and approved by the SAM Coordinating Committee for the site; and,
4. To ensure resources for implementation, partner agencies must include relevant components within their annual budgets and workplans.

The potential for SAM Plans is for the appropriate legal and institutional framework to be forged through horizontal and vertical linkages of existing laws and agencies. Government and non-government organizations which have jurisdiction of a SAM coastal area will be crucial for the SAM plan implementation. Their roles in the planning and implementation process will vary among sites. The creation of a 'SAM Coordination Committee' is necessary at each site along with the organization of appropriate community groups with a stake in natural resources management in the area.

7.6 The future of Special Area Management Planning and Implementation

Objective 7.1 **Continue the SAM planning and implementation process to better manage coastal habitats through the development and implementation of site specific integrated resources management plans.**

Policy 1

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

CCD shall:

Actions

1. Facilitate the SAM plan implementation at Hikkaduwa and Rekawa.
2. Design two new sites with plans in the 1997-2000 planning period.
3. Identify and implement appropriate number of areas of particular concern to extend the SAM plan approach in the 1997-2000 planning period.

Policy 2

The Coast Conservation Act will be revised to accommodate a mandate for SAM Plans and interagency cooperation so that once SAM Plans have been developed and approved by all the concerned government and non-government organizations for a given site, the plan will be accepted by the Coast Conservation Advisory Council (CCAC) for national support as appropriate.

CCD shall:

Actions

1. Ensure that the CCA is revised and accepted in 1997 to reflect the incorporation of the SAM process and interagency cooperation.
2. Increase cadre to work on the SAM Planning process in designated sites.
3. Evaluate the SAM process in ongoing sites (Hikkaduwa, Negombo and Rekawa) to refine its implementation.

Chapter 8

PLAN SUMMARY AND PRIORITIES FOR ACTION

The Revised National Coastal Zone Management Plan objectives, policies and actions are summarised in Table 8.1. Priorities for action are indicated along with proposed year(s) of implementation. Priority levels have been assigned in a subjective manner which consider the gravity of the problem in relation to the capacity and resources available to CCD to implement the action. The priorities are only indicative of what needs to be accomplished first if resources and support are limited. The priority levels are determined generally as follows:

A Essential function of CCD, ongoing with GSL support.

B Important but not yet fully implemented.

C Desirable but requires additional support to CCD staff, technical assistance and/or funding

Table 8.1 Plan summary and priorities for action

Chapter 2: Coastal Erosion Management		
Objective 2.1 Regulate location of development activities in the coastal zone		
Policy	Necessary CCD Action	Priority Level
1. New construction may be permitted only in accordance with the setback standards	1. Enforce coastal setback standards 2. Conduct annual permit compliance monitoring surveys 3. Institute legal action against non compliance 4. Build awareness of setback regulations 5. Demarcate coastal segments and display sign boards indicating relevant variable setback standards	A A B A C
2. Minimize adverse impacts due to construction of maritime structures within the coastal zone	1. Formulate and implement guidelines for the location, construction standards and of maritime structures	C
Objective 2.2 Ensure that sand mining does not contribute to unacceptable levels of erosion		
1. Sand mining regulated by guidelines specifying quotas, time limits, setbacks, site rotation and monitoring	1. Enforce guidelines specified in CZM Plan 2. Undertake periodic monitoring surveys of sand mining	A B
2. Site specific research to define sustainable limits; sand budgets; identification of alternative sources of sand	1. Participate in the National Sand Study conducted by CEA 2. Implement recommendations of National Sand Study	A B
Objective 2.3 Identify erosion trends and formulate appropriate mitigation measures that are cost effective socially and environmentally acceptable		
1. Coast protection programmes consistent with updated MP-CEM	1. Update MP-CEM and design management strategies 2. Research on coastal processes relating to erosion and its control, investigating the feasibility of using soft solutions	A C
2. Permit shoreline protection schemes by other public or private entities if consistent with CCD guidelines	1. Formulate guidelines and criteria to allow construction of private coast protection works in compliance with MP-CEM 2. Prepare monitoring plans to determine impacts of such measures	C C
3. Minimize the social and economic impacts caused by the prohibition of coral mining	1. Coordinate inter-agency efforts to provide alternative employment to displaced coral miners	C
4. Land acquisition and development rights purchase programmes	1. Identify potential sites 2. Develop financial mechanisms for land acquisition and development rights purchase	B C
5. Collection of scientific information on coastal erosion rates and trends	1. Collaborate with universities/other agencies to assess erosion trends and patterns 2. Establish fixed locations to monitor erosion trends	A A
6. Collection/use of scientific and socio-economic information to update CZM plans	1. Establish comprehensive database on coastal processes and socio-economic characteristics 2. Disseminate and exchange data with public and private agencies for research and planning purposes	C C

Policy	Necessary CCD Action	Priority Level
Objective 2.4 Minimize the negative impacts of coastal erosion and possible sea level rise by reclaiming suitable coastal frontage to ensure additional buffers		
1. Promote measures to expand the existing coastal front providing additional buffers against sea erosion/sea level rise	1. Prepare guidelines on coastal reclamation 2. Identify potential reclamation sites, prioritize vulnerable places, and prepare reclamation plans	C C
Objective 2.5 Enhance economic potential of coastal frontages and the capacity to withstand erosion by implementing development schemes based on coastal reclamation		
Promote enhancement of economic potential of selected coastal frontages by implementation of acceptable reclamation schemes	1. Encourage development consistent with this objective. 2. Implement reclamation schemes at sites where protection costs can be recovered through development consistent with this objective	A B
Chapter 3: Coastal Habitat Management		
Objective 3.1 Preserve and enrich the coastal habitats and natural features of exceptional value including protected areas (marine, bird and wildlife sanctuaries)		
1. Prohibit/modify development activities if significant degradation is probable in designated protected areas (national reserves, sanctuaries and fisheries conservation areas) in the coastal zone	1. Periodically update the list of areas of exceptional value to protect them by declaring as conservation areas under the Fauna and Flora Protection Ordinance & the Fisheries and Aquatic Resources Act. 2. Regulate development activities through permit and EIAs	C A
2. Ensure sustainability of the coastal habitats including protected and designated natural areas of exceptional value	1. Cooperate with other relevant governmental/NGOs to develop protection and management plans 2. Participate in the identification, prioritization and implementation of management plans for SAM sites and identified areas of particular concern	A A
Objective 3.2 Promote sustainable development of resources found within coastal habitats		
1. Promote inter-agency cooperation in development planning to minimize adverse impacts on coastal habitats		A
2. Prohibit or require modification of development activities where there is a reasonable probability that significant degradation or destruction of the coastal habitats is likely to occur		A
3. Encourage and directly sponsor scientific research on coastal habitats as it relates to CCD management objectives		C
4. Promote awareness of the nature and significance of coastal habitats		B
Objective 3.3 Prevent the further degradation or depletion of coral reefs		
1. Breaking of reefs/collecting of off-shore coral debris and mining of coral is prohibited	1. Strictly enforce CCA of 1988 in collaboration with concerned authorities 2. Conduct annual surveys to determine the level of illegal mining activities 3. Amend legislation pertaining to coral mining activities 4. Conduct awareness programmes for target groups and initiate community actions	A B C C
2. Promote introduction of alternative sources of lime to meet the requirements of industry and agriculture	1. Prepare policy paper on alternative sources of lime 2. Coordinate with concerned agencies on the use of alternative sources of lime	C C

Policy	Necessary CCD Action	Priority Level
Objective 3.3 Prevent the further degradation or depletion of coral reefs (contd.)		
3. Identify areas where reef restoration will impede erosion and provide additional habitat	1. Initiate/assist community based reef restoration and preservation 2. Assist other agencies on reef restoration and preservation	C C
4. Minimize adverse impacts of increased fresh water runoff and waterborne pollutants by proposed development in the vicinity of coral reefs	1. Initiate research/awareness programs with NARA/CEA to mitigate these adverse impacts on reefs at identified locations	C
5. Collection of small and limited coral specimens may be permitted for valid scientific research	1. Issue permits for collection of corals for scientific research provided that the research is in compliance with specified guidelines	B
6. Protect and preserve coral reefs as an important coastal habitat for a sustainable marine environment	1. Cooperate with other agencies to develop appropriate coral reef management plans for identified areas	A
7. Ensure removal of reef organisms, such as aquarium fish, does not exceed sustainable levels		C
Objective 3.4 Estuary and Lagoons--Maintain fishery habitat and water quality, protect recreational values, and regulate sand mining at levels that do not have an adverse impact on beach replenishment		
1. Minimize impacts due to encroachment/sedimentation, desalination and pollution in development activities adjacent to estuaries/lagoons 2. Cooperate with other agencies to develop special area management plans for selected estuaries and lagoons		B A
Objective 3.5 Preserve mangroves as an important habitat for wildlife, a nursery for fish, a nutrient trap, and to enable extraction at a sustainable level		
1. Prevent further depletion of mangroves or degradation due to excessive fresh water/pollutants	1. Ensure that impacts of fresh water runoff, excessive siltation, oil pollution, and conversion of mangrove habitats are minimized when reviewing proposed developments 2. Participate in the Sri Lanka National Mangrove Committee 3. Consider guidelines developed by relevant national agencies for development activities within or adjacent to mangrove habitats	C A B
Objective 3.6 Preserve seagrass beds as fisheries habitat and a habitat for Dugong and sea turtles		
1. Prohibit physical alterations and minimize excessive sedimentation and introduction of pollutants in the vicinity of seagrass beds	1. Identify a zoning scheme for utilization of seagrass beds to enable fishing to co-exist with movements of the Dugong and the Green sea turtle	C
Objective 3.7 Ensure sustainable use of salt marshes as an waterfowl habitat as a buffer which protects coastal settlements from flooding and to prevent pollution		
1. Ensure developments do not degrade bird habitats; seed fish collection sites or obstruct storm water runoff 2. Support activities to map distribution and extent of salt marshes, clarify ownership, and identify types/scales of development on particular salt marsh areas in a manner harmonious with ecological and social needs 3. Support research in identifying and rehabilitating sites for mangrove reforestation		B C C
Objective 3.8 CCD shall conserve barrier beaches, spits and dunes		
1. Alteration of particular barrier beaches, spits and dunes will not be permitted without due regard for their particular ecological function		C

Chapter 4: Coastal Pollution Control		
Policy	Necessary CCD Action	Priority Level
Objective 4.1 Minimize effluent discharges and impacts in the coastal zone to prevent further degradation of coastal water quality and coastal habitats		
1. All development activities in the coastal zone should comply with standards stipulated by CEA for coastal and marine waters	1. Impose CEA standards on new development activities subject to provisions of the CCA 2. Impose a compliance programme with CEA against existing developers violating the stipulated standards 3. Implement the guidelines stipulated by the Inter-ministerial Committee on Aquaculture Development for all aquaculture projects 4. Initiate awareness programme with the Department of Fisheries and Aquatic Resources Development for fishing communities to encourage proper disposal of oil waste 5. Initiate studies on water quality in collaboration with other concerned agencies and publicize the results	A A C C C
2. Develop strategies in collaboration with other agencies to provide economic incentives to developers to minimize untreated discharges into coastal waterways	1. Develop tax incentives, expedited permit approval process or other incentives to encourage the private development of waste water treatment systems	C
3. Encourage the relocation of high/medium polluting industries in industrial zones and encourage more efficient provision of pollution abatement technology 4. Assist relevant agencies to establish a single pollution abatement fund 5. Participate in efforts to obtain technical and financial assistance to establish central sewage treatment systems at appropriate locations within the coastal zone		A C C
Objective 4.2 Improve the coastal environment by reducing the types and volume of solid waste disposed in the coastal zone		
1. Prepare solid waste management plans for identified urban coastal urban centers, coastal tourist centers and fishing harbors	1. Identify urban centers, coastal tourist centers and fishing harbors for which solid waste plans are most urgently needed	B
2. Discourage local authorities to dispose solid waste in the coastal zone	Assist local authorities to: 1. identify dump sites in less vulnerable locations outside the coastal zone; and 2. relocate dumping sites out of the coastal zone	B C
3. Collaborate in public education and awareness programs and join with other agencies in promoting public participation in solid waste management	1. Facilitate active public participation in implementation and monitoring of solid waste management programmes 2. Update public education programme on discharges and solid wastes in regard to coastal pollution management 3. Involve the communities in designing local community pollution abatement programs adopting the Special Area Management and Areas of Particular Concern approaches	C C C
Objective 4.3 Share and disseminate information on coastal pollution management		
1. Formulate a research agenda for coastal pollution management in collaboration with CEA, NARA and other agencies	Develop a research agenda for coastal pollution management for the next four years	B
2. Support similar research programs on oil waste discharge and solid waste management		B

Chapter 5: Historic, Archaeological and Scenic Site Protection		
Policy	Necessary CCD Action	Priority Level
Objective 5.1 Conserve and protect Sri Lanka's significant cultural, historical and archaeological sites including ship wrecks within the coastal zone		
1. Promote compliance with the existing laws and regulations to limit the adverse impacts of development activities on designated sites within the coastal zone	1. Permit development only in accordance with guidelines 2. Enforce EIA or IEE procedures to avoid potential negative impacts 3. Collaborate with other agencies to develop a guide book on permitted development activities 4. Coordinate with the Department of Archaeology and other agencies the following for appropriate sites: * Display of sign boards * Demarcate boundaries * Formulate and implement management/ conservation plans 5. Cooperate with the Department of Archaeology to demarcate and prepare site plans for sites listed in Table 5.1. 6. Incorporate high priority archaeological, historical and cultural sites as part of CCD's awareness programs	A A C B C C
2. Protect and conserve Sri Lanka's marine archaeological sites including ship wrecks	1. Comply with the guidelines recommended by the Inter-Ministerial Committee on Ship Wrecks when issuing development permits	B
3. Maintain and enhance the quality of the scenic areas and natural resources within the coastal zone	1. Require EIA or IEE for development activities which may affect natural resources and scenic areas 2. Identify, demarcate and where possible, acquire sites with high scenic and recreational value 3. Formulate development and conservation guidelines for development activities near the high priority scenic and recreational sites 4. Formulate and implement plans for coastal and marine parks with the collaboration of private and public sector institutions	A C C C
4. Develop with the DWLC, DF, CTB, UDA, CEA, and other relevant governmental/private/NGOs, appropriate management plans for scenic sites in the coastal zone consistent with other traditional coastal activities		C
5. Ensure public access, consistent with conservation of natural resources along shoreline	1. Sponsor studies to identify significant public access points to and along shoreline 2. Formulate and implement an effective public access protection programme with other agencies	B C
6. Ensure new developments are compatible with visual environment by requiring locating such developments to minimize the alteration of natural landforms and existing public views to the shoreline	1. Encourage design and location of development that minimize alteration of land forms or loss of visual access	B

Policy	Necessary CCD Action	Priority Level
7. Preserve, maintain and, where desirable, improve and restore shoreline open space	1. Initiate studies to assess visual open space and access in the coastal zone 2. Implement a programme to purchase/acquire development rights to establish open space and or to enhance the environmental quality in identified locations	C C
Chapter 7: Special Area Management		
Objective 7.1 **Continue the SAM planning and implementation process to better manage coastal habitats through the development and implementation of site specific integrated resources management plans**		
1. CZM program to proceed simultaneously at the national/ provincial/district and local levels with the collaboration required to achieve effective and participatory resource management by governmental and non-governmental agencies	1. Facilitate the SAM plan implementation at Hikkaduwa and Rekawa 2. Design two new sites with plans in the 1997-2000 planning period 3. Identify and implement appropriate number of areas of particular concern to extend the SAM plan approach in the 1997-2000 planning period	A B C
2. Revision of the Coast Conservation Act to accommodate a mandate for SAM Plans so that once SAM Plans have been developed and approved by all the concerned government and non-government organizations for a given site, the plan will be accepted by the CCAC	1. Ensure that the CCA is revised and accepted in 1997 to reflect the incorporation of the SAM process 2. Increase cadre to work on the SAM Planning process in designated sites 3. Evaluate the SAM process in ongoing sites	A A B

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Personal Communications

Amarasinghe, S.R. former Director, Coast Conservation

Deraniyagala, S., Director of Archaeology, Department of Archaeology.

Dassanayake, S. Director (Excavation), Department of Archaeology.

Deheragoda, Dr. C.K.M., Senior Lecturer, Department of Geography, University of Sri Jayawardenepura.

Ellepola, R. (Ms.) Director, Central Environmental Authority.

Hale, Lynne, Z., Associate Director, Coastal Resources Management Center, University of Rhode Island.

Jayawardene, C., Wetland Projects Officer, Department of Wildlife Conservation.

Kahawita, B.S., former Director, Coast Conservation

Lowry, Dr. Kem, Professor of Urban and Regional Planning, University of Hawaii.

Perera, N., Director, Coast Conservation Department.

Pilapitiya, Dr. Sumith, Engineer (Infrastructure, Environment and Energy), The World Bank, Colombo.

Premaratne, A. Deputy Manager (Planning), Coast Conservation Department.

Premathilaka, Dr. P.L., former Professor of Archaeology, University of Peradeniya.

Ranasinghe, I., Deputy Manager, Coast Conservation Department.

Sadacharan, Dianeetha, former Manager/Resources Development, Coast Conservation Department.

Samaranayake, R.A.D.B., Manager/Resources Development, Coast Conservation Department.

Tilakaratne, K.W.P., Assistant Manager, Coast Conservation Department.

Wijewardene, K.D.D. Chief Engineer, Coast Conservation Department.

Wickramanayake, M. (Ms.) Senior Engineer, Coast Conservation Department

Wickremeratne, H.J.M. General Manager (Operations), Lanka Hydraulic Institute

Wijayasinha, Athula, Media Consultant, Mihikatha Institute

Wijeratne, Mervyn, former Coastal Resources Management Project Administrator.

White, Dr. Alan, Coastal Resources Management Project Manager, University of Rhode Island.

Divisional Secretaries of Habaraduwa, Hikkaduwa and Tangalla.

Sri Lanka is endowed with a beautiful, diverse and resource rich coastal area. Mangroves, estuaries, coral reefs, seagrasses and beaches, common along the coastline, are among the most naturally productive ecosystems in the world. Many people depend directly on these ecological resources for their livelihood, be it fishing or tourism related. But, as for all natural systems, there are limits to tolerable impacts and extraction levels. Because these limits are not obvious to most resource users, we need a coastal zone management plan. The effective implementation of this plan depends on the efforts of many agencies and individuals from within and outside the government. The plan offers a direction of action for all concerned and provides a practical guide.