ශ්‍රී ලංකා ප්‍රජාතාන්ත්‍රික සමාජවාදී ජනරජයේ ගැසට් පත්‍රය

අති විශෙෂ

The Gazette of the Democratic Socialist Republic of Sri Lanka

EXTRAORDINARY

අංක 1,429/11 – 2006 ජනවාරි 24 වැනි අඟහරුවාදා – 2006.01.24

No. 1,429/11 – TUESDAY, JANUARY 24, 2006

(Published by Authority)

PART I : SECTION (I) — GENERAL

Government Notification

SRI LANKA COASTAL ZONE MANAGEMENT PLAN — 2004

Amended under the Section 12(5) of the Coast Conservation Act No. 57 of 1981

THE public are hereby informed that the amended Sri Lanka Coastal Zone Management Plan – 2004 was approved by the Cabinet of Ministers on 20th July, 2005 and the plan is implemented with effect from the date of Gazette notification.

FELIX PERERA,
Minister of Fisheries and Aquatic Resources.

Ministry of Fisheries and Aquatic Resources,
New Secretariat,
Maligawatta,
Colombo 10,
10th January, 2006.

1. INTRODUCTION

1.1THE SCOPE FOR COASTAL ZONE MANAGEMENT

1.1.1 Context and setting

The need for integrated management to conserve, develop and sustainably use Sri Lanka's dynamic and resource rich Coastal Zone has long been recognized. The Costal Zone Management Plan (CZMP) is the plan of action adopted by the Coast Conservation Department (CCD) for management of the Coastal Zone during a five year period. It is designed to ensure sustainable use of the coastal environment and its resources in the long-term, while satisfying current national development goals. It outlines the management objectives of the CCD for the period under consideration, the policies to be adopted, and the strategies and actions required for effective management of the Coastal Zone in the face of competing resource uses. So far, coastal resource management planning has been based on the recognition that (a) CCD is only one of many institutions that have jurisdiction over management of coastal resources, (b) proposed management measures have to be socially and politically acceptable, and (c) planning has to be based on a realistic assessment of the CCD's capacity to directly manage the development activities affecting coastal resources and its ability to influence coastal management activities of other organizations.

The use of coastal resources and combating coastal erosion dates back to many centuries. However, coastal zone management in its current sense began in the early 1960s when coastal issues received greater attention of the government. In 1963, a Coast Protection Unit was established in the Colombo Port Commission, and in 1978, a Coast Conservation Division was set up under the Ministry dealing with the subject of fisheries[1]. Although a programme of work for coast conservation was thus in place, the first attempts at systematic coastal resource management in Sri Lanka began in 1981 after the setting up of the Coast Conservation Department in 1984[+]. The Coast Conservation Act No. 57 of 1981 (CCA of 1981) vested the administration, control and custody of the Coastal Zone in the Republic of Sri Lanka and appointed a Director of Coast Conservation who is responsible for administration and implementation of the provisions of the Act, including the survey and inventorization of coastal resources. The Coast Conservation Department is thus the prime agency responsible for coastal issues in Sri Lanka. The requisite regulations for the CCD to commence operations under the CCA were gazetted in 1983[1]. The CCA of 1981 also conferred the legal responsibility upon the Director, Coast Conservation to prepare a national Coastal Zone Management Plan (CZMP) that should be revised and updated periodically. The Coastal Zone Management Plan of 2004 constitutes the 2nd revision of the CZMP.

+ The Coast Conservation Division was upgraded to form the Coast Conservation Department

Landmarks in coastal zone management planning

* The first national Coastal Zone Management Plan (CZMP) of 1990 dealt with the critical coastal problems that were economically and socially significant at the time. Accordingly, initial management efforts in the Coastal Zone focused largely on erosion control - including addressing the problems of sea coral and sand mining - and the loss and degradation of critical habitats and sites of historical, cultural, scenic or recreational value.

* The preparation of "Coastal 2000: Recommendations for a Resource Management Strategy for Sri Lanka's Coastal Region" spearheaded the trend towards integrated coastal resource management. This important policy paper produced by the CCD and endorsed by the Coast Conservation Advisory Council and, approved by the Cabinet of Ministers in 1994, provided policy guidance for future coastal zone management and underlined the need to consider the relevant social and economic factors.

* The CZMP update of 1997 (based on the principles elucidated in Coastal 2000) which addressed issues connected with coastal erosion, conservation of coastal habitats and sites of scenic, historical and archaeological value, covered new aspects such as coastal pollution and devolution of responsibility for coastal resource management through Special Area Management.

* Special Area Management (SAM) Plans of 1996 prepared for, and implemented at, two sites (i.e. Rekawa and Hikkaduwa) to pilot test the concept of SAM as a management tool for critical coastal sites beset by complex issues.

* The legal boundaries

The mandate of the CCD for conservation and management of the coastal environment lies within the Coastal Zone, defined in the CCA of 1981 as the area lying within a limit of 300 m landward of the Mean High Water Line (MHWL) and a limit of 2 km seaward of the Mean Low Water Line (MLWL); in the case of rivers, streams, lagoons, or any other body of water connected to the sea either permanently or periodically, the landward boundary extends to a limit of 2 km measured perpendicular to the straight base line drawn between the natural entrance points thereof and includes the waters of such rivers, streams and lagoons or any other body of water so connected to the sea (**Figure 1.1**). All beaches in Sri Lanka are public property in accordance with the Coast Conservation Act

+ 1 mile = approximately 1.15 nautical miles

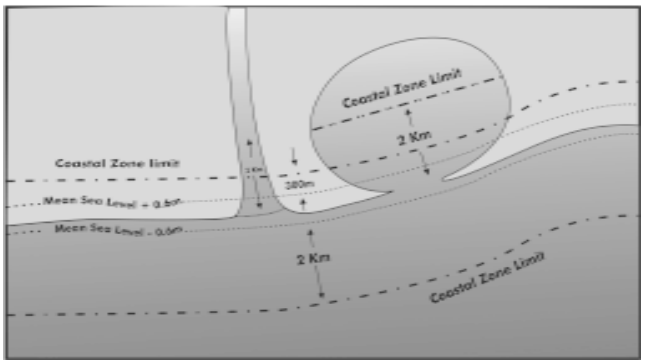


Figure 1.1 Illustration of the legal boundary of the Coastal Zone of Sri Lanka

The amendment of this definition is currently under consideration and the definition in the proposed amendment to the CCA will prevail once it becomes law.

The issues addressed by the CZMP are, however, not restricted to the Coastal Zone. They often extend well into, or even beyond, the coastal region - defined here as the Divisional Secretaries' Divisions (DSD) with a coastal boundary (Annex 1.1). Similarly, activities in marine areas outside the Coastal Zone have definite impacts and implications for Coastal Zone management. This has necessitated that the CCD adopts an integrated resource management perspective through collaborative efforts with local communities and with state agencies having jurisdiction over coastal resources, or are engaged in activities that affect the Coastal Zone.

The territorial sea of Sri Lanka extends seaward to a distance of 12 nautical miles+ from the low-water line along the coast as decreed by the provisions of the Maritime Zones Law No. 22 of 1976 and the Presidential Proclamation thereunder of 15th January 1977 and UN Convention of the Law of The Sea. This comprises the area in which the country has sovereignty over all living and non-living resources lying in the water column, seabed and subsoil as well as the air space over the territorial sea.

The Exclusive Economic Zone (EEZ), (which coincides with Sri Lanka's Pollution Prevention Zone) surrounds the island. It extend upto up to the Maritime Boundary between Sri Lanka and India, in the Gulf of Mannar, Palk Strait and Palk Bay and to a distance of 200 nautical miles at other points. Outside the territorial sea, but within the EEZ the country has sovereign rights to all living and non-living resources lying in the water column, seabed and the subsoil. It also exercises exclusive rights and jurisdiction to authorize, regulate and control marine scientific research, and other rights recognized by International law.

+ The entire country including the Coastal Zone came under British rule from 1815 until the country gained independence in 1948.

The extent of the territorial sea and the EEZ is 21,500 km^2 and 517,000 km2 respectively; the latter amounting to 7.8 times the total area of the country.[8]

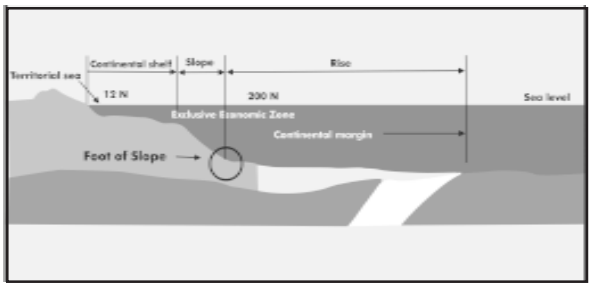


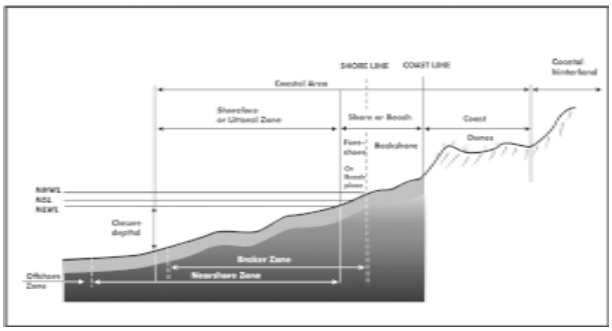
Figure 1.3 Illustrated definitions of the territorial sea, EEZ,+ etc.

MORE ON HISTORICAL SETTING TO COASTAL ZONE MANAGEMENT IN SRI LANKA

Sri Lanka's coastal zone has played an important role in the social, cultural and economic development of the country even before Vijaya, the first King of Lanka, landed on the copper coloured beaches off Puttalam in 550 B.C.[2, 3] Sri Lanka's position as the hub of major shipping routes from different parts of the world as far back as the 1st Century A.D.[3] resulted in considerable 'outside' trading influences and cultural exchanges [4,5,6]. It also led to the advent of the seafaring Portuguese, Dutch and British who successively colonized the island's Coastal Zone for about four hundred years.+ Consequently, this region reveals fascinating layers of the country's rich cultural heritage, ranging from pre-historic sites and artifacts of monarchical rule to elegant colonial architecture. Not surprisingly, the varied external influences on the Coastal Zone have had social, cultural and economic implications, as well as undeniable environmental impacts. Notably, human settlement patterns during the colonial period have resulted in a high population density in some coastal areas, and a consequential concentration of development activities and urban growth, as well as a varied and cosmopolitan society engaged in diverse economic pursuits that use or have an impact on coastal resources.

History also provides ample evidence of earthquakes, tidal waves, and submersions by the sea that had momentous impacts on the political and social life of the country. The *Mahawamsa* documents an incursion of the sea at Kelaniya - which was then seven *gauvas* (28 miles) distant from the sea - during 200 B.C., while the *Rajavaliya* records that eleven-twelfths of the island was once submerged due to sea encroachment. According to the 13th century traveler Marco Polo, the circumference of Sri Lanka had reduced from 3,500 miles to 2,400 miles, because of "the north wind that blows so strongly in these parts that it has submerged a great part of the island under the sea"[7]. Thus, sea erosion has existed through the ages, shaping and sizing Sri Lanka to make the island what it is today - the 'pearl drop' of the Indian ocean.

1.2 THE CHARACTERISTICS OF THE COASTAL ZONE



* BEACH or SHORE*: comprises unconsolidated material and extends from the Mean Low Water Line (MLWL) to the place where there is a marked change in material or physiographic form, or the line of permanent vegetation (i.e. the coastline).*

* SHORELINE*: The intersection between the Mean High Water Line (MHWL) and the shore.*

* COASTLINE: *Technically the boundary between the COAST and the SHORE; it is also the foot of the dune, or the line of permanent vegetation, or the effective limit of storm waves and storm surges.* The coastline is the reference for setback lines.

* COAST*: The strip of land that extends from the coastline inland to the first major change in terrain features, which are not influenced by coastal processes.*

* COASTAL HINTERLAND*: The land that extends landward of the coast and is not influenced by coastal processes. There is no agreed landward limit of the coastal hinterland.*

* THE COASTAL WATERS *of Sri Lanka extend from the shore to the edge of the continental shelf.*

* THE OFFSHORE WATERS *of Sri Lanka extend from the continental shelf to the outer limits of the EEZ.*

* The MEAN HIGH WATER LEVEL *is defined as 0.6 m above Mean Sea Level.*

* The MEAN LOW WATER LEVEL *is defined as 0.6 m below Mean Sea Level.* (source: addendum to Mangor 2002, MOFOR, 2002)

1.2.1 The biophysical features

Sri Lanka's coastal environment is greatly influenced by the island's location[10] in the northern part of the Indian Ocean, between 5^0 54' and 9^0 52' North Latitude and 79^0 39' and 81^0 53' East Longitude. The coastal area is positioned in the lowest of the three peneplains forming the island, and generally consists of flat coastal plains averaging an elevation of less than 100 ft (30 m)[10]**.** The lowest peneplain containing the coastal plains extends outward from the island and under the sea as the continental shelf for a width of 5-25 miles (about 8-40 km) in most parts, and at an average depth of 216 ft (about 65 m) below sea level. The continental shelf is narrow around the southern part of the island, but widens considerably towards the north where it merges with the shelf around India[10].

Sri Lanka has a coastline of approximately 1,620 km including the shoreline of bays and inlets, but excluding lagoons (*Chapter 3*). The transverse type coastline in the southwest and northeast is characterized by a series of picturesque sandy bays protected on either side by rocky headlands; the southwestern coastline also has many complex systems of lakes and lagoons with sinuous shapes[10]. The bay of Trincomalee on the northeastern coast described as "the most perfect natural harbour of the Indian seas"[4] is of particular significance. The northwestern and southeastern coastlines exhibit lagoons, sand bars, banks and spits that sometimes extend over many kilometres. The presence around the island of the continental shelf with shallow waters has permitted the formation of coral reefs along the coastline amidst well-developed reefs of sandstone and rock. Large deposits of coral are also found inland in the coastal region, particularly between Ambalangoda and Matara, chief among which are the Akurala deposits[10]. Some segments along the southwest coastline are retreating due to natural erosive action of the sea compounded by anthropogenic activities such as river sand mining and destruction of protective coral reefs (*Chapter 2*). In contrast, some areas of the northwestern and southeastern coastlines are advancing due to accretion[10].

Shoreline Types		Coastal Profile Type	
A	Bay & Headland	a	Sandy Beach
B	Straight Sandy Shoreline	b	Sandy Beach & Low Dunes
C	Deltas & Saline Flats	b	Sandy Beach & High Dunes
D	Limestone Coasts	c	Sandy Beach & Beach Rock
		d	Sandy Beach & Reef
		e	Spits & Barriers
		f	Reefs/Coral reefs

Table 1.1 Typical shoreline types and coastal profile types around Sri Lanka[9]

* The Bay and Headland Shorelines (Type A) are mainly concentrated along the coasts of the southern part of the Western Province, coasts of the Southern Province, and coasts in the northern part of the Eastern Province.
* The Straight Sandy Shorelines (Type B) in combination with dunes, spits, barriers, beach rock and reefs are found along the coasts of the northern part of the Western Province, along the Northwestern Province, along the southern part of the Eastern Province and along the east coast of the Northern Province.
* Saline Flats and Limestone coasts (Types C and D) are found in the northern and western part of the Northern Province.

Much of the island is dominated by rocks of Precambrian origin, but they reach the Coastal Zone mainly from Maggona (south of Colombo) along the west, south and southeast coasts up to Sangamankanda Point (north of Komari); Kalkudah Bay (25 km north of Batticaloa); and Pulmoddai (35 km northeast of Trincomalee) along the east coast[9]. Coastal areas contain several types of Quarternary deposits among which are sands, sandstone (including beach rock), quartz, gravels, red earth and inland coral deposits[10]. Among the important minerals in coastal areas are heavy mineral sands (Kokilai to Pulmoddai, Kudremalai, Trincomalee, Beruwala and Hambantota), silica sands (Madampe-Nattandiya), salt (Puttalam, Palavi, Mannar, Elephant Pass and Hambantota), Miocene limestone (Puttalam, Mullaitivu, Jaffna Peninsula), iron ore (Ratgama), and moonstones (Ambalangoda)[8]. Low grade peat is found at Muthurajawela[8].

The coastal landscape contains a very dynamic transition zone between the sea, land and atmosphere, and is formed as a result of sea and atmospheric forces on the landmass and the supply of sediments to the coast[9]. Sri Lanka has around 103 rivers most of which radiate from the hill country and flow down to the sea forming estuaries that are important features of the coastal landscape and provide vital habitats for species of commercial and subsistence use (*Chapter 3*). These rivers transport large amounts of sand, silt and clay essential for beach nourishment (*Chapter 2*); but they are also carriers of pollutants that degrade the quality of coastal waters and habitats (*Chapters 3 and 4*). Throughout its length, the Coastal Zone contains a variety of terrestrial habitats that include sandy beaches, barrier beaches, sand spits and dunes, rocky shores, mangrove stands and salt marshes. Equally important are the coral reefs, lagoons, estuaries, and sea grass beds in the coastal waters. These systems help maintain vital physical processes, fulfill ecosystem services and functions, and provide land, goods and services (C*hapter 3*).

Climatic conditions

Almost all major climatic divisions of the country are represented in the Coastal Zone. The western and southwestern coasts are within the Wet Zone, which is characterized by an annual rainfall of 2,500 mm to over 5,000 mm, and a temperature of around 27^0C. Most other areas of the Coastal Zone fall within the Dry Zone, which averages an annual rainfall between 1,250-1,900 mm and a temperature of around 30^0 C. The two extra dry coastal strips in the northwest and southeast form the 'Arid Zone', which receives less than 1,250 mm of rain annually[11].

The wave climate around the island can be characterized as seasonal with moderate wave heights. The tide is micro tidal, mixed to semi-diurnal, with generally weak tidal currents. The wind climate is influenced by the shifting monsoons with light to moderate wind speeds[9]. During May to September, the coastal areas of the southwestern quarter of the island are exposed to heavy rains from the southwest monsoon. The east coast receives its highest rainfall from December to February from the northeast monsoon, which also provides rain to the rest of the island. The coastal areas also receive inter-monsoon rains from April-May, and again from October-November when tropical cyclonic activity may occur[12].

Storm surges accompany cyclones. The coastal sandbars are the first lines of defense against cyclones and the accompanying storm surges. Typically, cyclones have wind velocities ranging from 20-30 mph (32-48 kph) near the periphery to 70-100 mph (113-161 kph) near the centre, though occasionally the latter may reach 120-150 mph (193-241 kph). Cyclones have major impacts on water surfaces, especially near the shoreline and in lagoons.

Cyclones are not frequent phenomena in Sri Lanka (*Chapter 2*), although the island is located at the fringe of the northern Indian Ocean cyclone belt. Most cyclones have traversed the northern part of the island moving from southeast to northwest, with the northeast coast experiencing the highest impact. The mean annual occurrence of storms affecting the northern areas of the island is 0.2 indicating a return frequency of a storm in every five years [13,14]. This situation can vary, however, in the future with climate change, particularly as cyclone patterns in the equatorial zone have shown increasing frequency and intensity during the past two decades. Changes in the type and number of storms can vary the littoral drift budget that greatly influences coastline development[9].

1.3 COASTAL ZONE MANAGEMENT: SIGNIFICANCE FOR NATIONAL DEVELOPMENT

The coastal region is made up of DS divisions with a coastal boundary, which currently number 74. They lie within 14 of the 25 administrative districts and cover approximately 23% of the total land area of the country.

Due to historic reasons, population density is weighted heavily towards the coastal region, particularly along the southern, western and northwestern coastal areas. The coastal region accommodates about 4.6 million people, which is about 25% [+] of the total population. The coastal areas under Municipal and Urban Councils cover 285 km^2 [*] and comprise nearly half of such lands in the island. This has resulted in the concentration of a large share of urban growth and development activities within this region, as reflected by a high rate of construction activity - particularly in the Western Province. This in turn leads to a high level of river sand mining that contributes to coastal erosion (*Chapter 2*).

Sri Lanka's diverse coastal resources serve to maintain a range of economic activities within the Coastal Zone, chief among which is the marine and brackish water fishery (*Chapter 5*). The fishery sector had contributed about 2.7 % of the GNP at Current Factor Cost Prices in 2000[15] and continues to be an important source of foreign exchange. Estimates show that the marine fishery provided approximately 91 % of the total fish production in Sri Lanka in 2003, with the coastal fishery[#] contributing 64 % of this share[15]. The fisheries sector - including coastal aquaculture, which consists mainly of shrimp farming in the Northwestern Province - provides direct employment to about 150,000 people, and sustenance to at least a million (*Chapter 5*). Fish also constitutes the main source of animal protein for Sri Lankans[16].

Sri Lanka follows a highly liberalized industrial policy, and the rate of industrial output, measured as the output of factory industries, is growing[17]. The coastal region is the hub of industrial production and contains 61.6% of all industrial units.[++] There are over 30 coastal DS divisions with industrial units; most of these units are clustered in Colombo, Gampaha, Kalutara, Galle, Matara and Puttalam Districts.* On the other hand, there are serious economic implications from the release of untreated industrial effluents and other wastes which affect the quality of coastal waters (*Chapter 4*) and the status of coastal habitats and the resources they contain (*Chapter 3*).

Tourism is the fifth largest income earner in Sri Lanka, and had netted in SLRs 18,863.3 million (US$ 211.1million) in foreign exchange during 2001.[**] It also provided direct and indirect employment to over 85,000 persons[18]. At the commencement of tourism growth in Sri Lanka in the 1980s, the influx of tourists attracted to the island's wide sandy beaches which caused a

concentration of tourist infrastructure along the southwestern coastal belt. The coastal region continues to have around 70 % (159 hotels) of all hotels registered with the Tourist Board.[##] This region holds ample potential to support the government's current tourism related policy aimed at maximizing Sri Lanka's potential for nature-based and cultural tourism. Even so, several coastal areas continue to be beleaguered by unplanned tourism development in the past causing pollution of coastal waters and habitats (*Chapters 3 and 4*), degradation of scenic sites (*Chapter 7*), coastal erosion (*Chapter 2*) and user conflicts with the traditional fishery (*Chapter 5*). As tourism depends on the quality of the environment, and tourists are increasingly sensitive to environmental degradation at their travel destinations[19], planned management of the Coastal Zone is required to sustain the coastal tourist industry.

Agriculture is less important than fishery and industry in the Coastal Zone, and agricultural lands only amount to about 17% of land area in the Coastal Zone. Coastal planning will be instrumental in ensuring that climate change or developmental activities in the Coastal Zone do not degrade coastal agricultural lands. Conversely the release of agrochemicals from farmlands constitutes a source of coastal water pollution that is difficult to control (*Chapter 4*). Many other economic activities in the Coastal Zone such as river and beach sand mining, and sea coral mining for production of lime, have serious implications on managing coastal erosion (*Chapter 2*). The Coastal Zone also assumes high importance in trade and transportation. There are four major sea ports located in Colombo, Galle, Trincomalee and Kankesanturai[20]. About 4,200 vessels called over at these ports in 2000, and sea traffic is increasing[21]. In addition, there are 12 fishery harbours in operation under the Ministry of Fisheries and Aquatic Resources[8]. Waste oil released from ships and motorized fishing vessels contribute to costal water pollution, and this necessitates remedial action (*Chapter 4*). Presently, Sri Lanka has one International Airport at Katunayake, which is located in the coastal region. The proximity to seaports and the airport are key incentives for the continued concentration of industry in the Coastal Zone.

[+] Calculation made using (a) 2001 census data for most DS Divisions (DSD); (b) 1997, 1999 and 2000 data for DSDs in the Northern and Eastern Provinces for which 2001 data were not available; and (c) 1981 census data for five DSDs that had no other recent data.

[*] UDA data (2003).

[#] Defined as the coastal fishery conducted primarily by day boats over the continental shelf.[8]

[++] Source: Management Information Systems, Ministry of Industrial Development, December 2002

[**] CTB, November 2002. Tourism is usually ranked as the fourth foreign exchange earner in Sri Lanka, but the industry received a set back in 2001 due to the attack on the International Airport (also personal communication. P. Hettiarachchi, CTB)[a]

[##] Percentage of the number of hotels registered with the CTB in 2002.

1.4 THE ROLE OF THE CCD IN COASTAL ZONE MANAGEMENT

Sustaining the multiplicity of coastal ecosystem services and functions, and benefits derived from the coastal environment requires planned management. Of particular concern is ensuring that conflicting resource uses do not preclude the provision of basic needs for coastal communities and improving the quality of life of Sri Lankans. For instance, mining of river and beach sand and sea coral, and construction of dams inland, reduce sand for beach nourishment and expose beaches to erosion. This in turn causes the loss of coastal lands and infrastructure with significant economic and social repercussions. Erosion is compounded by intense development in densely populated coastal areas for housing, hotels and harbours that alter the geomorphological balance of the coast. Thus, planning is required to ensure the correct prerequisites for development initiatives that may otherwise require "enormous economic efforts to minimize adverse impacts of uncontrolled and unexpected events"[22].

What the CCD aims to accomplish

Mission of the CCD:

"The sustainable development of coastal resources and the management of coastal processes to optimise social, economic and environmental status of Sri Lanka."

Objective of the CCD:

To fulfil the Mission, the four objectives that drive the CCD are:

* To improve status of the coastal environment.
* To develop and manage the coastline.
* To improve the living standards of coastal communities and resource users.
* To promote and facilitate economic development based upon coastal resources

Results to be achieved:

* Quality of coastal lands and waters improved.
* Conservation and sustainable use of biodiversity ensured
* Optimal economic potential of coastal lands realized.
* Development of the Coastal Zone regulated.
* New economic opportunities created.
* Quality of life of coastal communities improved.
* Facilities for recreation use provided.
* Scientific/scenic/historical/archaeological and cultural sites conserved.

The CCD has a distinct role for "sustainable development of coastal resources and the management of coastal processes." In recent years, the CCD has increasingly recognized the need to strengthen its capacity for policy planning and regulation as well as facilitating integrated management of coastal resources. The management efforts undertaken so far reflect these needs.

1.4.1 Key achievements

The notable achievements of the CCD during the past two and a half decades are given below:

* Mitigating impacts of coastal erosion.
* Considerably reducing coral mining and beach sand mining.
* Ensuring environmental impact assessments for coastal development.
* Ensuring permit compliance.
* Facilitating coastal access.
* Enhancing awareness of coastal issues, including curriculum development for schools.
* Promoting community participation in coastal resource management.
* Introducing Special Area Management at Rekawa and Hikkaduwa.

External Technical Assistance

The CCD has been successful in receiving external technical assistance in the past to counter or mitigate the consequences of coastal issues that threaten the long-term stability of the Coastal Zone. Chief among these are the Coastal Erosion Management Programme consisting of two DANIDA funded projects (1987-1989 and 1990 -1992), the USAID funded Coastal Resources Management Programme - Phases I and II (1985 – 1991, 1991-1997), and the CCD/GTZ funded Coast Conservation Project (1988-1996).

Capacity Building for Management

Although much has been achieved, fiscal and institutional constraints as well as the multiplicity of agencies active in the coastal region have made the CCD to adopt a more reactive than a proactive approach[22]. This issue is being addressed through the current Coastal Resources Management Project (CRMP) spanning 2000-2005 (see box below), which includes a component for institutional strengthening and staff capacity building for management. Chief among these are enhancing capability for GIS applications and data base development. The latter is designed to hold information that will help decision making (i.e. for SAM planning, conservation of coastal habitats and sites of archaeological, historical and scenic value, erosion management and controlling coastal water pollution) and identification of coastal land use patterns and sites for future development. Separate but related actions supported by the CRMP are updating of the CZMP and capacity building within the CCD to carry out its coastal zone management programme more effectively[22]. This includes providing assistance for institutional reform of the CCD and for amending the CCA. It is envisaged that the resultant institutional strengthening will help the CCD to shift from emergency interventions to giving greater emphasis to policy driven and planned management initiatives[22].

The Coastal Resources Management Project (2000-2005)

The Coastal Resources Management Project (CRMP) is a major initiative of the Ministry of Fisheries and Aquatic Resources (MFAR) implemented with founds with funds amounting to US$ 80 million from the ADB, the Netherlands Government and the Government of Sri Lanka. This project has four major components, namely (a) Coastal stabilization which addresses the problem of coastal erosion by construction of coast stabilization structures and development of proactive or preventive erosion management schemes as relevant, (b) Fisheries Resource Management and Quality Improvement which seeks to achieve sustainable coastal fishery management supported by the construction of fisheries harbours, anchorages and ancillary facilities that allow the improvement of fish quality and the reduction of handling losses, (c) Coastal Environmental Resources Management which addresses the problem of coastal resource depletion and degradation, and promote activities that will reduce pollution in lagoons and estuaries and relieve pressure on coastal resources, and (d) Institutional Strengthening to enhance the institutional capabilities of the MFOR and its agencies including the CCD. The 2004 revision of the CZMP was carried out under this component.

Controlling coastal erosion

The CCD bears direct responsibility for controlling coastal erosion, which, though longstanding, has been aggravated in recent times due to human interference with the natural processes. Considerable advancement has been made by the CCD to stem coastal erosion at critical sites, saving public and private property and infrastructure and reducing social costs. **Table 1.2** shows the expenditure for coast protection by the CCD from 1985 – 1999.

Since the early part of the last century, the primary means of combating coastal erosion has been through construction of coastal protection structures. By the 1970's however, the trend was for erosion control to be regarded as a part of a broader programme of coastal resources management requiring long, medium and short-term solutions. This led to the preparation of a Master Plan for Coast Erosion Management (MPCEM) in 1986 by the CCD to identify medium and long-term measures. While the MPCEM recommended structural solutions where required, it recognized that coastal erosion management should:

* be undertaken as a part of a holistic exercise of managing the Coastal Zone,
* be based on adequate planning and a good understanding of the underlying causes, and
* ensure that structural solutions are applied only when it is the best option over others such as control of the root causes of erosion, relocation, establishment of buffer zones, dune management, etc [23].

Table 1.2: Annual expenditure for controlling coastal erosion (1985-1999)

Year	Expenditure GoSL (SLRs million)
1985	3.7
1986	14.4
1987	121.4
1988	121.4
1989	164.3
1990	230.3
1991	230.3
1992	226.9
1993	56.9
1994	63.3
1995	34.5
1996	32.0
1997	45.5
1998	79.0
1999	96.0

Source : Byrne and Nanayakkara 2002[24]

Recent Coastal Zone management policy of the CCD acknowledges that mechanical and structural erosion control interventions which, though often inevitable given the circumstances, are at best palliative and solve the immediate problem only by moving it elsewhere along the coast[22]. There is increasing emphasis now on non-structural soft solutions, such as controlling sand mining and coral mining, controlling developmental activities in the Coastal Zone, precluding development in hazardous areas, identification of coastal erosion trends and formulating appropriate measures that are cost effective and socially acceptable[25]. In this regard, assistance is provided to the CCD via the CRMP 2000 for coastal stabilization through a mix of structural and soft solutions (*Chapter 2*). Equally important has been the capacity enhancement of the CCD to tackle the predominant cause of coastal erosion viz. river sand mining, by identifying alternatives to river sand, and pilot testing the use of offshore sand for construction to promote its use (*Chapter 2*).

Facilitating integrated management of coastal resources

Coastal resources are subject to a range of extractive, non-extractive and transformative uses, many of which have adverse impacts. Extractive uses involve removal of renewable materials; non-extractive uses refer to activities such as education, recreation and research, which do not involve removal of material from the habitats or result in serious impacts. Transformative uses cause negative changes in habitat characteristics[25+]. Although initial efforts for coastal zone management were weighted heavily towards regulation of development activities in the Coastal Zone, this has changed over the years. The need for a more holistic and participatory approach for management of coastal resources to ensure sustainable development is now widely appreciated. Consequently, the failure to give due recognition in the CZMP of 1990 to the participatory role of local stakeholders in the management of coastal resources was rectified in the revised CZMP of 1997 by promoting Special Area Management (SAM) for selected coastal sites. This approach is further advanced in the CZMP of 2004 through more effective identification of (a) Special Area Management (SAM) sites with multiple resource use conflicts, and (b) Level II SAM sites which are geographically smaller and have fewer user conflicts (*Chapter 6*). Capacity building within the CCD to use GIS application is also expected to assist Special Area Management planning in the future.

Regulation

Coastal policies decree that regulation continues to play an important role in coastal zone management (*Chapter 8*). This involves the operation of a permit system and setback standards, both of which are effectively carried out by the CCD. Accordingly, 762 permits have been issued by the CCD during the period 1996-2001, apart from minor permits issued by the Divisional Secretariats. In addition, guidelines have also been formulated and applied in respect of setback standards and sand mining. According to the provisions of the CCA, Director Coast Conservation has the discretion to call for an Environment Impact Assesiment (EIA) from private or state agencies, for any development activity that falls within the Coastal Zone. However for projects listed in the National Environment Act (NEA) of 1988, he is required to call for an EIA. Although IEEs are not a requirement of the CCA, the Director may call for an Initial Environment Examination (IEE) if the development activity is deemed to have no major adverse impact. Director CCD is, however, not authorized to issue a permit for a proposed development activity which is inconsistent with the CZMP. New guidelines are presented in the CZMP of 2004 for more realistic setback standards ***(Annex 8.1),*** for sand mining within the Coastal Zone ***(Annex 8.2)*** and for reclaiming coastal frontages ***(Annex 8.3).***

Monitoring coastal water quality

Sri Lanka requires identification of realistic coastal water quality standards for designated uses. The CCD has strengthened its capacity to address the problem of coastal water pollution (*Chapter 4*) through a study of ambient water quality* in coastal areas, both during and outside the monsoons. This information is expected to provide a benchmark for the CCD to establish suitable coastal water quality standards and to develop a continuous coastal water quality monitoring programme. This will be assisted by GIS application and database establishment.

Institutional collaboration

The CCD has to draw upon many institutions and multi-sectoral activities in the Coastal Zone to help achieve the targets set out in the CZMP. This involves close liaison and collaboration with other state departments, regional and local administration and local communities. Inter-institutional coordination is currently carried out through the Coast Conservation Advisory Council and the Special Area Management Coordinating Committees. Other mechanisms are expected to be introduced through proposed amendments to the CCA.

Collaborative initiatives are required to cover fisheries (capture as well as aquaculture) and other sectors such as shipping, tourism, wildlife, forestry, urban development, irrigation and agriculture. There is also a need to work closely with the key agencies and institutions concerned with these sectors. To make such collaboration effective, the CCD requires capacity enhancement for greater emphasis on policy planning, management, monitoring and evaluation. Inter-agency coordination is also required in respect of information exchange, education and communication.

Legal framework

Coast Conservation Act No. 57 of 1981 and its 1988 amendment provide the legal foundation for activities in the Coastal Zone. Further amendments to the CCA are due to be enacted shortly. There are many other statutes that support the conservation and sustainable use of coastal and marine habitats and species through other institutional mandates (see box below). Law enforcement for conservation of coastal resources has so far not been fully effective due to deficiencies in these laws and their failure to recognize the social dimensions of problems. However, considerable success has been achieved through laws and regulations for controlling the mining of beach sand and sea coral. (*Chapter 2*).

Apart from the CCA, the CZMP is the main instrument that influences implementation of programmes and enforcement in the Coastal Zone. According to the CCA of 1981, The Minister (in charge of the subject) may on the recommendation of the Coast Conservation Advisory Council make regulations to give effect to any provisions of the CZMP, including those, which regulate use of the foreshore by the general public.

Laws affecting coastal zone management *Main statues:*

* Coast Conservation Act No. 57of 1981(CCA 1981).
* Coast Conservation (Amendment) Act No. 64. of 1988 (CCA 1988).

Other key statues:

* Marine Pollution Prevention Act No. 59 of 1981 which provides for prevention, reduction and control of pollution in Sri Lankan waters and has provision for penal action for any form of marine pollution or damage to live marine resources and wildlife;

* The Fisheries and Aquatic Resources Act No. 2 of 1996 which promotes measures for the integrated man agement, regulation, conservation and development of fisheries and aquatic resources in Sri Lanka, and enables declaration of fisheries reserves;

* The National Aquaculture Development Authority of Sri Lanka Act. No.53 of 1998 which set up the National Aquaculture Development Authority (NAQDA) to develop aquaculture and inland fisheries in Sri Lanka;

* The National Aquatic Resources Research and Development Agency Act No. 54 of 1981 which set up National Aquatic Resource Reserch and Development Agency (NARA) for research and research application work on all living and non-living aquatic resources for the development and management of the fisheries and ocean resources sector;

* The Fauna and Flora Protection Ordinance No. 2 of 1937, and subsequent amendments including Act No. 49 of 1993 which provide for six categories of Protected Areas - among which are a marine Sanctuary and a Nature Reserve. The Act also has provision to protect certain categories of animals and plants wherever they are found, including threatened species of corals, fish, turtles and all marine mammals in Sri Lankan waters;

* The National Environmental Act No. 47 of 1980, and the amended Act No. 56 of 1988 which empowers project approving agencies to obtain an EIA from any developer for prescribed development projects;

* The State Lands Ordinance No. 8 of 1947 and its two amendments.

* The Forest Ordinance No. 16 of 1907 and its subsequent amendments; and

The Urban Development Authority Law No. 37 of 1978 that provides for the development of environmental standards & schemes for environmental improvement in areas identified as UDA areas.

1.5 THE CZMP of 2004

1.5.1 The preparatory process

The CZMP of 2004 was prepared through an extensive participatory process and field investigations to ensure that coastal issues requiring management interventions were accurately and adequately identified and analyzed. Each issue related chapter was prepared by a subject specialist in close collaboration with the CCD and a working group representing stakeholder interests. These chapters were reviewed through a series of mini-workshops attended by other subject specialists and officials in related sectors. They were then edited and melded into a composite document. This was fine-tuned through a quality assurance review process and was subjected to further refining through a district level consultative process and public review prior to finalization.

1.5.2 Structure and content

The updated CZMP is divided into several chapters. Chapters 2-7 are issue related and deal with key problems to be addressed through integrated coastal zone management. The chapters on Managing coastal erosion (*Chapter 2*), Conserving coastal habitats (*Chapter 3*), Controlling coastal water pollution (*Chapter 4*), Special area management (*Chapter 6*), Managing sites of special significance and public access (*Chapter 7*) and Regulatory

mechanism (*Chapter 8*) are updates of Chapters in the Revised CZMP of 1997. In addition, this Plan includes for the first time a chapter on Integrating coastal fisheries and aquaculture with coastal zone management (*Chapter 5*). This deals with the need to reduce impacts of coastal capture fishery and aquaculture on the Coastal Zone and to identify and regulate activities in the Coastal Zone that have adverse impacts on fishery productivity.

Each issue related chapter provides an insight into the status of the coastal resource or problem needing management interventions (as relevant); the issues to be addressed; and the existing plans, policies, programmes, laws, institutional mechanisms and enforcement regimes that influence management interventions. As in previous CZMPs, each of these chapters contains management objectives, and the related policies and actions. Each objective has been drafted in this Plan as a desired state, and corresponds to a key coastal problem requiring management interventions. The policies indicate the broad courses of action that will be supported and adopted to realize each objective. The strategies target key issues and suggest the different interventions or plans of action that can help achieve a particular objective. The proposed actions identify the specific steps required to pursue a particular strategy.

The current CZMP sets out a comprehensive list of interventions required for management of the Coastal Zone in an integrated holistic manner for conservation and prudent use of its resources while enabling sustainable development. Some of the recommended activities are in progress but are reiterated herein to emphasize their importance and to ensure continuity. Many new actions are proposed to address issues of recent origin or those not fully resolved through previous interventions. The actions listed in this document are not necessarily limited to those which the CCD has to directly carry out through its own institutional programmes. Indeed much of the activities identified here would have to be carried out through other institutions and agencies, for which the CCD would have to evolve mechanisms to enable the required collaboration, coordination and monitoring (*Chapter 9*)

1.5.3 Salient features

An important new feature in this updated CZMP is that it has drawn on the technical backup provided by GIS application, especially in respect of Chapters 3, 6 and 7, in parallel with field investigations. It is noteworthy that the use of GIS tools and aerial photo interpretation have helped to identify more precisely the extents of coastal habitats and to provide an accurate definition of Sri Lanka's estuaries and lagoons (*Chapter 3*). Another positive feature is that the ongoing peace process permitted access to the previously inaccessible areas in the Northern and Eastern Provinces for ground truthing of management issues. This has provided a better understanding of the status of coastal habitats and sites of special significance in these areas as well as the issues to be resolved, enabling the inclusion of management elements to address them. (*Chapter 3 and 7*). Likewise, the inclusion of sites in the north and east has resulted in a more representative and realistic identification of sites for Special Area Management (*Chapter 7*). The Plan also addresses the need for better preparedness to meet the future challenges of climate change (*Chapter 2*). Another new feature is the framework for a plan of action to implement the CZMP, covering identification of responsibilities for such action and areas for coordination and collaboration (*Chapter 9*).

The CZMP of 2004 aims to steer the CCD towards a role that places more emphasis on policy planning and greater involvement in facilitating and coordinating planned integrated coastal zone management. Examples are introduction of the concept of shoreline management for controlling coastal erosion by examining this problem more holistically (*Chapter 2*), and enhancement of Special Area Management (*Chapter 6*).

Main aims of the CZMP 2004

* To identify coastal problems
* To assess the status of the problems to be addressed and the management interventions needed.
* To present the CCD management programme to address the identified problems.
* To identify the role of other governmental and non-governmental organisations to reduce the magnitude of coastal problems.
* To identify research activities of immediate importance for the management of coastal resources.

1.6 WHO SHOULD USE THIS DOCUMENT

The main function of the CZMP is to provide the CCD with broad policy direction and a plan of action to formulate its work programme for the next five years. This document therefore provides a guiding framework for officials of the CCD and other stakeholders including officials of Provincial Councils and Divisional Secretariat Divisions, developers, coastal engineers and users who undertake activities that can affect the Coastal Zone and its resources.

In addition, a varied category of other users such as policy makers, administrators, environmental planners and managers, natural resource users, scientists, conservation agencies, community groups, students and interested members of the public will find the CZMP a valuable source of current reference material and information on the Coastal Zone.

References

1. Gunawardena, A. S. 2002. Organizational Review of the Department of Coast Conservation. unpubl. Draft report prepared under the CRMP Component B: Institutional Strengthening (ADB TANO 3477.

2. Brohier, R.L. 2002. *Discovering Ceylon*. (3 ed. 2002). Sooriya publishers.

3. MOFE, 2001. *Statistical Compendium on Natural Resources Management, Sri Lanka 2000*. Colombo: Ministry of Forestry and Environment.

4. Beny, R. 1970. *Island Ceylon*. London: Thames and Hudson, UK.

5. Tennent E 1860. Ceylon. *An Account of the Island. Physical, Historical and Topographical* Vol.I. London: Longman, Green, Longman and Roberts.

6. Dewaraja, L. 1989. *Sri Lanka Through French Eyes*. Colombo: Institute of Fundamental Studies Sri Lanka.

7. Latham, R. E. 1958. *The Travels of Marco Polo*. Hamondsworth, Middlesex: Penguin Books Ltd.

8. MOFOR, 2002. National Policy and the Development Plan. unpubl. Ministry of Fishery and Ocean Resources.

9. Mangor, K. August 2002. Background Document for the Chapter on Shoreline Management of the Second Revision of the CZMP. unpubl. Institutional Strengthening Component of the Coastal Resources Management Project, ADB TA No. 3477-SRI.

10. Cooray, P. G. 1984. *An Introduction to the Geology of Sri Lanka (Ceylon)*. (2 ed.). Colombo: National Museums of Sri Lanka.

11. Wijesinghe, L. C. A. de S.; Gunatilleke, I. A. U. N.; Jayawardana, S. D. G.; Kotagama S. W.; and Gunatilleke C. V. S. 1993. *Biological Conservation in Sri Lanka. A National Status Report*. Colombo: IUCN Sri Lanka.

12. Manchanayake, E. P., and Madduma Bandara, C. M. 1999. Water resources of Sri Lanka. In: *Natural Resources of Sri Lanka 2000*.
Colombo: National Science Foundation.

13. MOLGHC, 1979. Cyclone Prone Areas of Sri Lanka: Sri Lanka Cyclone study technical report No. 1. unpubl. Ministry of Local Government, Housing and Construction.

14. MOLGHC, 1979. Physical Planning Guidelines for Cyclone Prone Areas in Sri Lanka: Sri Lanka Cyclone study technical report No. 2. unpubl. Ministry of Local Government, Housing and Construction.

15. Fisheries Statistics 2002 : Statistical Unit, Planning and Monitoring Division, Ministry of Fisheries and Ocean Resources.

16. DCS, 2000. Food balance sheet for major animal protein sources in 1999. Department of Census and Statistics.

17. Central Bank. 2001. *Annual Report of 2000*. Colombo: Central Bank of Sri Lanka.

18. Central Bank. 2002. *Annual Report of 2001*. Colombo: Central Bank of Sri Lanka.

19. Ceballos-Lascurain, H. 1996. *Tourism, Ecotourism, and Protected Areas: The State of Nature – Based Tourism Around the World and Guidelines for its Development*. Gland and Cambridge: IUCN.

20. Central Bank. 2000. *Annual Report of 1999*. Colombo: Central Bank of Sri Lanka.

21. MOENR, 2002. *State of the Environment in Sri Lanka - a National Report prepared for the South Asian Association for Regional Cooperation* compiled and ed. J. D. S Dela. Colombo: Ministry of Environment and Natural Resources,

22. ANZDEC, 2002. International Team Leader Completion Report, Coastal Resources Management Project; Component B: Institutional
Strengthening (ADB TA No. 3477). unpubl.

23. CCD/DHI, 1986. *Master Plan for Coast Erosion Management.* Colombo: Coast Conservation Department.

24. Byrne, G., and Nanayakkara, A. 2002, Alternatives for River Sand, Sri Lanka. unpubl. Final Report. Coastal Resources Management Project, Component B: Institutional Strengthening (ADB TA No. 3477).

25. CCD, 1997. *Revised Coastal Zone Management Plan, Sri Lanka*. Colombo: Coast Conservation Department and the Ministry of Fisheries and Aquatic Resources Development of Sri Lanka.

2. MANAGING COASTAL EROSION

2.1 INTRODUCTION

2.1.1Nature of the problem

Coastal erosion is a long-standing problem in Sri Lanka, which results in the loss or degradation of valuable sandy beaches and coastal lands. Erosion occurs due to both natural phenomena and human interventions, and entails considerable public and private costs. These include the loss of beach and landscape quality; damage to or loss of private houses, public buildings, hotels and infrastructure. It also includes considerable annual expenditure for damage mitigation, control and disaster relief. Approximately SLRs 1,520 million has been invested on erosion management in the Coastal Zone during the period 1985 to 1999,[1] and SLRs 3 billion has been allocated for coastal stabilisation works through the Coastal Resources Management Project (CRMP) spanning 2000 to 2005.[2]

Table 2.1 gives the areas with highest erosion rates, of which six sites have been selected for coastal stabilisation under the CRMP 2000. Erosion rates vary greatly between different locations, and maximum local retreat rates of around 12 m/year have been observed in some areas between Maha Oya and Lansigama. Available records[+] indicate an average rate of coastal erosion of about 0.5 m/year and an accretion rate of about 0.2 m/year.

The Master Plan for Coast Erosion Management (MPCEM) of 1986[3] has identified 15 key areas[*] and a further 11 singular sites where erosion is more localised. Twelve key areas and seven singular sites are in the western, southwestern and southern coastal stretches where erosion is most severe; the others are distributed in the northern, northeastern and eastern coasts.[3] Although erosion is not a major problem in the northern and eastern sectors of the coastline, there are certain pockets where significant impacts have been clearly observed. Examples are Sirimapura, Salpearu and Muttur in the Trincomalee District; Kalmunai, Palaimeenmadu and Oluvil in the Batticaloa District; Vankalai and Arippu in the Mannar District; and Vadamarachchi and Munnai in the Jaffna District.[+]

Table 2.1 Overview of critical erosion areas and erosion rates along the west and southwest coasts of Sri Lanka

Main area	Local stretches and time periods (where relevant)	Yearly erosion rate in m/year
Maha Oya – Lansigama	Waikkal* (1988 – 1998) Gin Oya sand bar (1991 – 1999) Wellamankara (1994 – 1998)**	8-10 10-12 11-13
Colombo N – Dickowita	Mutwal to the Kelani River Palliyawatta – Uswetakeiyawa	0 -1 2-3
Moratuwa – tions, Koralawella	-	Seasonal fluctua- no overall erosion
Wadduwa	-	0-2
Kalu Ganga-Payagala	-	1-3
Beruwela – Bentota	Beruwela – Bentota Bentota – Robolgoda Headland	1-2
Hikkaduwa	Seenigama – Coral Garden Headland Coral Garden Headland – Dodanduwa	0-2
Galle north	-	0-1

[+] unpublished records available with the CCD up to 2002
[*] key areas are morphologically complex areas requiring integrated solutions for erosion management while singular cases are defined as areas that can be treated in isolation.

* Ranweli hotel to Dolphin Hotel ** near the church
Source: CCD information 2002[a]

Coastal accretion rates are generally lower than erosion rates, but natural accretion has been notable in Kalpitiya (e.g. near the Kandakuliya fishery camp and towards Talawila) and some areas of Batticaloa, particularly north of Kalawanchikudi. There have also been some sand nourishment initiatives resulting in 'artificial accretion' in Negombo, and this type of intervention is expected at other sites selected for coastal stabilization.

2.1.2Natural processes contributing to coastal erosion

The dynamic nature of Sri Lanka's sandy shoreline results in its continual retreat and accretion; some changes being seasonal while others are more permanent. The natural processes contributing to coastal erosion are summarised below. The impact of winds, waves and surges are balanced to some extent by natural defences comprising the island's coral and sandstone reefs, rocky headlands and gently sloping beaches. Vulnerability to erosion along the coast also differs considerably with shoreline type.

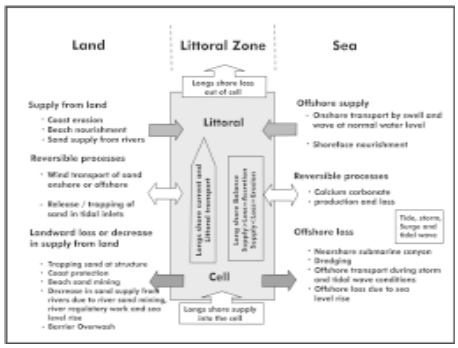
Natural processes contributing to coastal erosion is Sri Lanka

- Increase in gradient of sediment transport rate (e.g. the curved coastline along the southwest of Sri Lanka - from Galle to Akurala).
- Loss of sand inland due to breaching and wash-over of a sand berm (e.g. the Dickowita area).
- Offshore loss during extreme wave and storm surge conditions (e.g. southwest coast).
- Loss of sand into canyons (e.g. the canyon in the Trincomalee Bay traps most of the sediment supplied by the Mahaweli river).
- Deposition of sand at sand spits. (e.g. Negombo).
- Beach rock and reef collapse (e.g. receded coastline north of Pegasus Reef Hotel).
- Loss of material from 'nodal areas'.
- Natural variation in the sand supply to the coast from rivers.
- Seasonal and long-term variations in the wind climate.
- Sea level changes.

Straight sandy shorelines are the most vulnerable to erosion as they have no fixed element. This is exemplified by the heavy erosion along the straight sandy beach at Lansigama, and the emergency protection works required here that are now under construction.
In contrast the bay and headland type coastline is less vulnerable to erosion due to the stabilizing function of the headlands, especially when there is only a short distance between them.

The sediment budget

The most important feature influencing the stability of Sri Lanka's coasts, as elsewhere, is the littoral sediment budget.[+] A generalised overview of sediment sources and losses to the littoral budget is presented in Figure 2.1 The littoral transport results mainly from the action of monsoon waves and swell on the nearshore sediments.



1. *Figure 2.1 Generalised diagram of sediment sources and losses to the littoral budget*

*E*rosion occurs due to an imbalance in the sand supply into and out of a littoral cell in the longshore direction, influenced by the sources and sinks within the boundary of the cell. The supply of less sand to a cell, than is transported out of it, results in a deficit in the littoral budget and causes erosion. Examples are impacts of river sand mining and river regulation works.

Annex 2.1[+] indicates the wave statistics around Sri Lanka's coasts[*] from Kalpitiya on the west coast to Oluvil on the east coast. The southerly swell is dominant along the south coast. There is considerable variation in the net littoral drift capacity (see Annex 2.2), with the transport capacity along the southwest coast being noticeably more than the sand supply from the rivers. This difference constitutes the main cause of erosion in the southwest coast. The erosion north of Negombo is particularly severe because of a high deficit in the littoral budget due to sand mining in the Maha Oya, compounded by the straight sandy shoreline prevalent in this area (see Annex 2.3). The sand supply along the south coast is also low, but the coastline is relatively stable due to the bay and headland shoreline that predominates here. The shoreline in the area north of Sangamankanda Point is, however, the straight sandy type. Thus erosion may increase here with the decreased sand supply (i.e. in the Southern Province and the southern part of the Eastern Province) owing to the dams constructed across the Walawe Ganga and Gal Oya. These dams have already reduced the sand supply from the two rivers, from 160,000 to 15,000 m^3/year, and 70,000 to 15,000 m^3/year, respectively.[4]

Cross-shore loss of sand

Erosion sometimes occurs due to cross-shore loss of sand, which is often seen in connection with extreme events when the coastal profile is exposed to high waves, high tides and storm surges resulting in a 'tidal wave' situation. An extreme event may occur due to the rare combination of monsoon waves and swell, or it may happen because of a cyclone. The effects of such events are usually a combination of flooding and offshore loss of sand. Sea level rise can also cause offshore loss of sand, and thereby increase coastal erosion in the long-term.

2.1.3 Sri Lanka's coastal landscapes

Sri Lanka's coastal area contains a variety of natural landscapes that have intrinsic value in terms of natural beauty, coastal dynamics and habitat diversity. The functions of, and activities connected with, such coastal features range from non-extractive to extractive or transformative. These in turn have different impacts on the status and sustainability of coastal resources and the coastline. Extractive and transformative uses of rivers located largely outside the Coastal Zone have a major impact on the stability of coastal areas. Examples of typical functions and activities connected with coastal and riverine resources are given in Table 2.2.

Table 2.2 Type of coastal and riverine resources, their functions and related activities

Type of activity/ function	Type of resource function	The resource	Example of specific activity/
Non-extractive	Coastal	Beach, spit or barrier	Enables beach landing, drying of gear and fish, recreational activities and tourism; and provides nesting areas for sea turtles
	Riverine	River	Dam construction for power generation
Extractive	Coastal	Beach, spit, or dune Bars or berms	Mining sand Opening inlets and extraction of sand
facilities	Riverine	River sand Shallow river Water	Mining sand Dredging navigation channels Constructing irrigation and tanks
Transformative	*Coastal*	Spit, barrier or dune Dune Sandy beach, spit or barrier	Constructing houses and other infrastructure Grazing Performing coast protection works

[+] all annexes are included a separate document.
[*] computed using wave statistics and information on characteristic directions of the shorelines in selected littoral cells, the coastal profile and sand characteristics.

2.2 ISSUES AND THREATS

2.2.1 Resources and capacity constraints for erosion management

Coastal erosion control has been attempted in Sri Lanka for many decades, but a planned approach to erosion management commenced only in the mid 1980s with the preparation of the Master Plan for Coast Erosion Management (MPCEM). Since then erosion control measures have been implemented at a number of 'key areas' and 'singular cases' identified in the MPCEM. Coastal erosion was subsequently recognised as a key issue in Sri Lanka's first Coastal Zone Management Plan of 1990. Since then, coastal erosion management has consisted primarily of installing traditional coast protection structures, use of setback lines, directing development away from eroding areas and enforcement of regulatory mechanisms. Erosion has so far been felt mostly from Dutch Bay to Hambantota. The length of coast protection structures currently in existence around the island's coastline is summarised in Table 2.3. Several structures are also planned for the north and east, namely two groynes to be erected at Vankali in the north and a 100 m revetment at Jamaliyapura in Trincomalee in the east.

Despite many such initiatives by the government, coastal erosion continues to be a major issue in coastal zone management. This is because managing human activities and development initiatives along an eroding and highly developed coast is complicated, and key problems that underlie erosion - such as the inadequate supply of sand from rivers for beach nourishment - continue unabated. Addressing these complex problems successfully require planning for timely implementation of optimal long-term coast protection measures. The government of Sri Lanka has long recognised this need. Even so, due to the paucity of financial and other resources the emphasis so far has been on short-term emergency protection measures. Such initiatives have generally consisted of placing graded material, or construction of boulder revetments, at the affected sites.

Table 2.3: Length of existing coast protection structures by coastal sector

Coastal Sector	Total length (m) In 2002
*Revetments**	
West coast	21,890
Southwest coast	40,381
South coast	11,227
East coast	300
Total Revetments	*73,798*
Groynes	
West coast	1,168
Southwest coast	1,782
South coast	645
Total Groynes	*3,595*
Coastal breakwaters	
West Coast	1004
Southwest Coast	60
Total Breakwaters	*1,064*
Grand total length	78,457

Approximately 270 to 350 km of Sri Lanka's coastline - from a total length of 685 km between Dutch Bay and Hambantota - is considered erosion prone. The entire erosion prone area does not require active protection with the use of structures, which up to now protect only about 86 km, amounting to 25 - 32 percent of the erosion prone area.

It is noteworthy that a considerable section of Sri Lanka's eroding coastline is still devoid of protection structures. Care should be taken as to how erosion management is carried out in such areas, necessitating use of the most appropriate solutions supported by long-term planning. Short-term emergency measures practised in the past have been essential and instrumental in stemming erosion at critical sites, and have saved public and private property and infrastructure and reduced social costs. Even so, emergency structures require continual rehabilitation to prevent further degradation of beaches and associated landscapes. A key requirement therefore is that funding for coastal zone management is increased, and technical capacity further enhanced to

(a) minimise reliance on emergency protection as a response mechanism, and

(b) to plan and optimise coastal erosion management. This is particularly relevant in respect of managing erosion in the 599 kilometres from Dutch Bay to Hambantota that is yet devoid of any protection. It is also important that the protection works now in place, and the limited emergency protection structures that may be required in the future, are adequately monitored and maintained for sustained erosion control. Although private individuals may engage in coast protection works, funded coast protection measures require CCD approval, and may only be permitted if they will not cause adverse impacts to adjacent areas along the coast. These structures will also have to be modified or replaced, if and when the CCD undertakes planned erosion management interventions at such sites.

2.2.2Human activities that accelerate erosion

Coastal erosion is accelerated along many areas of Sri Lanka's coastline due to human activities both within, and inland of, the Coastal Zone. They include extractive and non-extractive actions, some of which are development oriented. Examples are sand mining on beaches and in rivers, sea coral mining, removal of coastal vegetation, location of buildings too close to the shoreline and the construction of dams and irrigation schemes inland. A summary of human activities and their impacts which contribute to coastal erosion are presented in Table 2.4.

Table 2.4 Human activities with an impact on coastal stability in Sri Lanka

Activity	Results	Effect on Coast	Examples of sites affected
Beach sand mining	Reduction of beach sand volume available for littoral processes	Induces beach and coast erosion	Panadura, Lunawa, Angulana and Palliyawatte
River sand mining	Reduction of river sand supply to the beach	Induces erosion of beaches and of river banks	Nilwala Ganga, Gin Ganga, Kalu Ganga, Kelani Ganga, Maha Oya and Deduru Oya
Inland coral mining	Conversion of productive land into waterlogged areas	Creates inland waste dumps and abandoned pits; reduces long-term coastal stability by creation of low-lying areas	Akurala, Kahawa, Ahangama and Midigama

Activity	Results	Effect on Coast	Examples of sites affected
Collecting coral from beaches and shoreface	Reduction in volume of beach material	Induces beach and coastal erosion	Ambalangoda to Hikkaduwa, Midigama, Ahangama and Polhena
Reef breaking or dynamiting for coral mining or fishing	Damage to the reef, reduction of reef size, creation of gaps in reef	Increases wave energy on beaches and reduces supply of coral debris to beaches resulting in erosion	Ambalangoda to Hikkaduwa, Koggala,Midigama, Polhena, Rekawa, Passikudah, Kuchchaveli and Nilaveli
Constructing buildings and infrastructure installations, etc. too close to the coastline	Reduction of coastal stability	Causes loss of buildings, etc. and require coast protection intervention which may interfere with coastal processes	Hikkaduwa, Bentota, Beruwala, Negombo
Maintenance dredging in access channels and port entrances	Removal of sand from the littoral budget (unless the sand is pumped back to the downstream beach)	Causes erosion in adjacent coastal stretches.	Colombo Port
Sea level rise due to the greenhouse effect	Generation of offshore movement of sand	Expected to cause erosion along all coastlines and to increase the frequency of flooding of low lying areas	Erosion to be expected along all sedimentary shores
Loss of coastal vegetation (e.g. due to grazing and traffic).	Creation of exposed areas subject to more rapid rates of wind erosion	Induces dune and coastal erosion	Palliyawatta, Koggala, Polhena, Negombo

Source: CZMP 1997[5] data updated with current information from the CCD

Coastal structures that interfere with the littoral transport

Coastal structures built in isolation that interfere actively with the littoral transport aggravate coastal erosion. These structures induce downstream lee-side erosion relative to the direction of the net littoral transport. Groynes, detached breakwaters, ports and inlet jetties at tidal inlets and river mouths may cause this type of erosion, as do passive coastal protection structures - such as seawalls and revetments - that do not protrude into the sea (Table 2.5). The fact that protection structures restrict natural coastal processes and may lead to further degradation of coastal resources should be recognised during erosion control and management. Such structures may also hamper the use of beaches for recreation, tourism and fishing. Erosion caused by coast protection structures often occurs in combination with other types of beach loss, making detection of the real cause difficult.

Table 2.5: Coastal structures/activities interfering with the littoral transport contributing to coastal erosion

Structure	Process	Effect on coast	Examples of sites affected
Groynes	Accumulation of sand and offshore loss	Protect upstream shore but cause local lee-side erosion	At all locations where groynes are used
Detached breakwaters	Creation of shelters for waves and trapping of sand	Protect against wave action and provide shore protection behind and upstream,but cause local lee-side erosion	Negombo breakwater scheme
Ports	Interruption of littoral transport, accumulation of sand, causing sedimentation and offshore loss	Protect upstream shore by accumulating sand, but cause lee-side erosion	Beruwala and Kirinda Fishery harbours
Inlet/river mouth jetties	Interruption of littoral transport, accumulation of sand, causing sedimentation and offshore loss	Protect upstream shore by accumulating sand, but cause lee-side erosion	Jetties at Panadura, Wellawatta and Dehiwala
Revetments and seawalls	Stoppage of coastal erosion and flooding at location of structures	Cause beach disappearance and increase downstream erosion	This is a contributory factor to sea erosion north of Lansigama, although the main reason for erosion here is sand mining in the Maha Oya

Development activities that degrade natural coastal resources

Development in the coastal zone

Some development activities in the Coastal Zone, including inadequately planned tourism, have resulted in adverse impacts. Examples are the pollution of beaches and coastal waters due to the release of sewage, solid waste and wastewater. Infrastructure - including dwellings - located too close to the coastline restricts coastal processes and promotes erosion. Addressing this problem requires enforcement of strict setback standards that take into account the specific nature of the coast. The setback standards have been revised (*see Chapter 8*). It is also important that regional and local authorities are involved in planning coastal development. They should issue regional or local zoning plans to direct development activities that are not coast dependent to other areas, and make the setback standards operational. This would also assist with delegating enforcement responsibility to the local administration.

Examples that indicate the importance of setback standards

* The setback standard set as 50 m by the CCD near Eden Hotel in Beruwala was considered too high by local stakeholders, but it was justified as sea erosion in the area later resulted in considerable land loss in the setback area.
* The setback standard set as 30 m in Lewis Place, Negombo in 1980 was justified subsequently as sea erosion caused loss of this coastal strip seven years later.
* A 100 m setback near the Oasis Hotel at Hambantota is considered exemplary for providing protection to the dune system.
* Most hotels bordering the shoreline on the east coast at Passikudah, Kalkudah and Nilaweli were destroyed or damaged during the 1978 cyclone and accompanying tidal waves. There were no setback standards at the time.

Many illegal structures in the Dehiwala-Mt Lavinia coastal stretch which do not adhere to setback standards are often washed away due to sea erosion.

Development landward of the Coastal Zone

There are many ways in which development landward of the Coastal Zone contributes to degradation of coastal resources. They are mostly activities having an impact on river discharge - including establishment of irrigation schemes and tanks - which thereby reduce the supply of sand to the coast. Although reservoirs constructed for hydropower projects may not significantly change the overall river discharge, they cause a decrease in the sand supply to the coast by cutting-off peak flows responsible for much of the sand transport, or by trapping sand in the reservoirs. Deepening of inland navigation channels, water intakes and irrigation schemes, changes in cultivation pattern, etc. also lower the sediment supply to the coast. It is considered increasingly important that EIAs conducted for projects located inland (e.g. major irrigation and hydropower projects, and river basin development schemes) take into account downstream coastal impacts adequately; and this requirement is now being addressed by the relevant authorities.

The negative impacts of river sand mining are many. In addition to its adverse impacts on beach stability and coastal resources it causes lowering of the flow level in rivers; restricts sediment flows and causes deeper tide penetration into rivers and estuaries resulting in saline intrusion. Sand extraction near the river mouth leads to local lowering of the riverbed, a near complete halt to the supply of sand to the shore, and adverse impacts on the ground water table of flood plains.

Sand mining in the rivers

Mining of River sand which decreases the supply of sediment to the shore is widely acknowledged as the main cause of coastal erosion in Sri Lanka. The present sand requirement for the entire country has been estimated at 7-7.5 million cubic metres per year, of which about 40% is used in the Western Province.[1] This problem has other facets in addition to its physical aspects. The construction industry in Sri Lanka is heavily dependant on river sand, and its mining represents a significant economic activity, both in terms of employment generation and the supply of an important commodity for the construction industry.[1]

Sand mining in rivers is most severe in the Northwestern, Western and Southern Provinces where much of the construction activity and the major coastal erosion problems are concentrated. Of concern is the drastic increase in river sand mining over the last two decades. For instance, sand mining has increased in six rivers - Deduru Oya, Maha Oya, Kelani Ganga, Kalu Ganga, Gin Ganga and Nilwala Ganga - from 1.2 million cubic metres in 1984 to 5.5 million cubic metres in 2001.[1,6] The CRMP Sand Study of 2002 has estimated the sand demand by province for the entire country in 2001, and has used it to forecast the sand demand up to 2006 for four provinces based on cement consumption[+] . However, the forecasted demand for sand by 2006 estimated on the same basis for the nine provinces will increase from 8.1 million cubic metres in 2002 to 11.8 million cubic metres by 2006 **(Table 2.6).** While the future sand requirement in the north and east is difficult to assess at present, it can be anticipated that the success of the peace process could considerably increase the sand demand for construction. Overall sand mining in rivers at current rates to meet the requirements of the construction industry is clearly unsustainable, and could lead to rapid riverbed degradation and a further decrease in the supply of sand to the coast in time to come.

It should also be noted that the problem of river sand mining is long-standing, and its impacts are, in many instances, irreversible in the short and medium term. Thus initiatives taken now will not serve to re-establish the sand supply to the coast from several affected rivers in the short or medium term. Management should therefore focus on strict regulation of river sand mining to (a) avoid worsening of the situation, (b) enhance rehabilitation of the rivers subject to sand mining in the past, and (c) ensure that over-exploitation is not repeated in other rivers where new development is taking place.

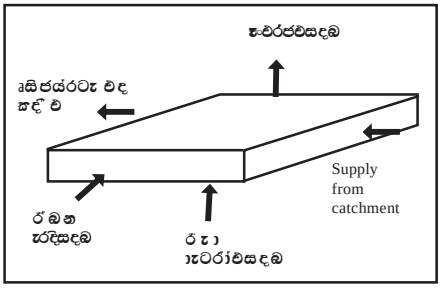


Figure 2.2: Sediment balance for a river segment

The supply of sand to the coast from a river depends on many parameters. There is no simple correlation between sand mining and the decrease of the sand supply to the coast. In general there are five components in the sediment balance for a degrading river section.

+ based on (a) the fact that cement consumption is indicative of the level of construction and (b) a specific cement:sand ratio used for construction

Sand mining in rivers requires a licence from the Divisional Secretary or the Geological Survey and Mines Bureau (GSMB), but much of the ongoing river sand mining is illegal. In some rivers this even extends to large-scale mining with the use of modern hydraulic excavators. River sand mining requires much greater control by the authorities concerned, but the solution to this problem is not straightforward. It raises the issue of social disruption of the miners and the need for alternative livelihoods.[1] An integrated approach is clearly required, necessitating close collaboration between the respective authorities having jurisdiction over the Coastal Zone and river sand mining. Finding alternatives for river sand in construction is equally important. Several alternatives have been given particular attention in a study carried out to support institutional strengthening under the ADB funded Coastal Resources Management Project.[1]

+ based on (a) the fact that cement consumption is indicative of the level of construction and (b) a specific cement:sand ratio used for construction

Offshore sand as an alternative for river sand

The total demand for sand countrywide amounted to about 7.3 million cubic metres in 2001, of which about three million cubic metres - or 40% - was used in the Western Province, mainly in Colombo. An alternative to river sand supplied to Colombo can thus help alleviate the pressure on river sand mining. The only viable source of sand for Colombo in the long-term is from offshore. Studies done in Sri Lanka (and elsewhere) show adequately that offshore sand is suitable for construction, it can be obtained with minimum adverse environmental impacts, and can be placed in a stockpile on land at a reasonable cost. Several major construction projects, such as the Negombo Coast Protection Scheme, reclamation projects in the Colombo Port, the Muthurajawela Reclamation Project and the Colombo Katunayake express highway use offshore sand.

A comprehensive survey is required to determine the characteristics of individual offshore deposits to determine optimal use: whether the sand is best suited for beach nourishment, general landfill or for construction. The most feasible option for mining of offshore sand has also to be determined. To be cost effective, offshore sand mining has to be done on a large scale. This requires acceptance by the construction community in Sri Lanka where the tradition of using river sand is long-standing. A pilot study on the use of offshore sand in the construction industry has been carried out to test the feasibility of using this as a viable alternative to river sand. In view of its encouraging results, a pilot project is to be launched to promote the mining and marketing of offshore sand.

Source: Byrne and Nanayakkara 2002[1]

Table 2.6 Annual projected sand demand from 2002-2006 (based on cement consumption+)

Province	Sand volume in million m^3/year				
	2002	2003	2004	2005	2006
Western	3.2	3.5	3.9	4.3	4.7
Central	1.0	1.1	1.2	1.3	1.4
Southern	1.2	1.3	1.5	1.6	1.8
Northern	0.2	0.2	0.2	0.2	0.2
Eastern	0.3	0.4	0.4	0.4	0.5
Northwestern	0.8	0.9	1.0	1.1	1.2
Northcentral	0.6	0.6	0.7	0.7	0.8
Uva	0.2	0.3	0.3	0.3	0.4
Sabaragamuwa	0.6	0.6	0.7	0.7	0.8
Total	8.1	8.9	9.7	10.7	11.8

* not predicted due to the uncertain conditions that prevailed in these provinces at the time of report preparation

Source: Byrne and Nanayakkara 2002[1]

+ based on (a) the fact that cement consumption is indicative of the level of construction and (b) a specific cement:sand ratio used for construction

MORE ON IMPACTS OF SAND MINING IN THE MAHA OYA, KELANI GANGA AND THE KALU GANGA

In most rivers where sand mining occurs, an immediate halt of sand mining may only enable a return to pre-mining conditions in the very long-term; and in practical terms, this situation may even "never" return. For example, the present supply of sand from the Maha Oya to the coast is very small, comprising only 25% of the original supply. This situation has developed over a short period of time due to a very rapid increase in the rate of extraction. In the Kelani Ganga, a large sand deficit has developed over many years of sand mining; the present supply to the coast amounts to only 33% of the original supply. At both sites re-establishment of pre-mining conditions is not likely in the short-term even if sand mining is completely halted. The present sand deficit is also high in the Kalu Ganga where sand mining is of recent origin, but the supply remains relatively unaffected at 75% of the original supply. Here too, the current rate of mining is unsustainable, but a halt to sand mining in the near future will enable re-establishment of the original sand supply to the coast within a few years.

Table 2.7a Sand mining, sediment supply and deficit for the year 2001 and the period 1976 -2001 for the rivers Maha Oya, Kelani Ganga and Kalu Ganga (million $M^{3)}$

River	Sand Mining		Catchment supply		Deficit	
	2001 (1year)	1976 – 2001	2001	1976 –2001	2001	1976 –2001
Maha Oya	1.8	23	0.2	5.0	1.6	18.0
Kelani Ganga	1.0	32	0.3	7.5	0.7	24.5
Kalu Ganga	1.2	12	0.4	10.0	0.8	2.0
Total	4.0	67	0.9	22.5	3.1	44.5

Source: Mangor 2002 [6]

Table 2.7b Characteristics of sand deficit and past and present supply from the rivers Maha Oya, Kelani Ganga and Kalu Ganga

	Deficit relative to catchment supply		Supply to coast			
	2001 (1 year)	1976 –2001	1976	1984	1991	2001
Maha Oya	8.0 times	3.6 times	0.2	0.15	0.1	<0.05
Kelani Ganga	2.3 times	3.3 times	0.3	0.25	0.2	<0.1
Kalu Ganga	2.0 times	0.2 times	0.4	0.4	0.35	0.3

Sand mining on the beaches

There has been a perceptible decrease of beach sand mining due to the regulatory mechanisms enforced by the CCD, although instances of small-scale sand mining continue. For example, **Table 2.8** shows that the percentage total deficit in the sand supply to the coast from beach sand mining along the coastal stretch between Mount Lavinia to Mirissa had dropped to 7% by 2001 from 32 % in 1984. It also shows that the volume of beach sand mined in this segment is much lower compared with the river sand mined in the Maha Oya, Kelani Ganga and Kalu Ganga.

The data on beach sand mining along other stretches of the island are meagre, although this practice prevails in most coastal areas to meet local needs. Estimates indicate that sand mining in the populated areas along the east coast is around 500 to 1000 m^3/ km/ year. This corresponds to an estimated extraction of 60,000 - 120,000 m^3/year from the coastal stretch between the Yala National Park and Trincomalee, assuming that two thirds of this area is populated. Beach sand mining also occurs at Manalkadu, Tirukkovil, Panama, back dunes of Iranawila, and Talawila. Even so, sand mining in the east coast has had hardly any impact on coastal stability due to the abundance of sand along this stretch.

Table 2.8 Comparison of the estimated volume of beach sand mining from Mount Lavinia to Mirissa by district and DS Division, and sand mining in the rivers Maha Oya, Kelani Ganga and Kalu Ganga

District	D S division	Number of 1000 m^3 removed in 1984	Number of 1000 m^3 removed in 1991	Number of 1000 m^3 remove in 2001
Puttalam	Mahawewa	9.5	-	12
Colombo	Dehiwala - Mt. Lavinia	9.1 22.2	11.3	4
	Moratuwa	- 5.4	46.8	6
Kalutara	Panadura	- 46.2 (32%)	60.2	6
Galle	Bentota	1500	-	4
	Hikkaduwa	1550	11.3	-
Matara	Weligama	100	8.2	-
Sub total, beach mining (and % deficit)		146	137.8 (36%)	32.0 (7%)
River Sand Mining, total Maha Oya, Kelani and Kalu Ganga			2500	4000
Grand total beach and river sand mining		-	2640	4030
Estimated deficit in supply of river sand to shore from three rivers			250	450
Total deficit in supply to coast caused by beach and river mining			388	482

Source: Based on issued permits for Panadura for 3,000 $m^{3,}$ plus illegal mining; all mining except with permits are illegal; the given volumes are based on estimates made by CCD. The values for river sand mining are extracted from Mangor 2002. [6]

Although the volume extracted is less, beach sand mining is much more damaging to the stability of the shore than river sand mining in relation to the volume of sand extracted as it has instantaneous impact on the deficit side of the littoral drift budget. In contrast, there can be a considerable delay in manifestation of the impacts of river sand mining; but this causes a long-term deficit in the sand supply to the coast even after mining operations are halted.

Coral mining

Coral is the principal source of quicklime for Sri Lanka's construction industry, supplying approximately 90% of the lime in use. Part of this is supplied by sea coral mining. Most records of sea coral mining are from the west and south coastal areas. Overall coral extraction (i.e. inclusive of inland coral mining) has increased in this region from approximately 18,000 tons in 1984 to 19,820 and 30,500 tons in 1994 and 1998. Even so, sea coral removal has declined in the coastal stretch between Ambalangoda and Dickwella from 7,660 tons in 1984 to 4,020 and 2,200 tons respectively in 1994 and 1998 (**Table 2.9**). This decline is attributed to the successful enforcement of the ban on sea coral mining since

1988. Despite this, sea coral mining continues to be of concern in the southwest coast, and an estimated number of 211 persons were directly engaged in mining, collecting and transporting sea coral in 1998.[7] The accumulated impact of many years of sea coral mining will also be felt for many years to come. In the east coast[+] too some coral mining occurs from Nilaveli to Akkaraipattu. Active coral mining has been observed specifically at Mankerni, Vandeloos Bay, Passikudah and Kalkudah, and coral lime kilns have been seen at Mankerni and Passikudah.

[+] information obtained from the Eastern Province Coastal Community Development Project.

Impacts of coral mining on coastal stability

Sea coral mining has caused severe coastal erosion along the southwest coast of Sri Lanka. Although coral has been mined for almost four hundred years in certain parts of this coastline, mining was traditionally confined to relic reefs behind beaches. The growth of the construction industry since the late 1960s has led to accelerated sea coral mining which involves the destruction of living reefs that form natural barriers against wave action. Coral mining involves many destructive practices such as reef breaking and blasting, and removal of coral rubble.

Sea coral mining has increasingly become apparent in the east coast.[+] At Mankerni, local fishers have turned to coral mining as a livelihood after the collapse of the lagoon fishery due to a salinity drop in the Upaar Lagoon – attributed by local people to the Mahaweli irrigation scheme. Consequently erosion is reportedly heavy in this coastal segment during the northeast monsoon. At Vandeloos Bay active mining of the reef flat is causing erosion of the beach. A coral rubble islet in this area - considered important as a breeding ground for four species of terns[8] – has [1] eroded rapidly with the protective fringe of *Rhizophora apiculata* either dead or dying. Coastal erosion was taking place at Kayankerni, 9 km north of Valachchenai, due to the removal of sea coral.

Sources: IUCN 1989[8], ADB/EPCCDP, 2002[9] and J Berdach personal communication (EPCCDP)

A total halt of sea coral mining requires more stringent law enforcement, technological enhancement and market based instruments to promote alternatives to coral based lime for construction. It is believed that offshore sand - if used as an alternative to river sand in the construction industry - could contain about 2% of sea shells that can be used for production of quicklime. Enforcing a complete ban on coral mining also has social dimensions. Previous attempts to introduce alternative income generating activities, and to relocate coral miners, have had limited success as most relocated persons moved back to their original areas. This highlights the need for greater participation by affected groups in the planning and implementation of alternative livelihood and relocation programmes. If the ban on sea coral mining is to be made fully operative, there should be (a) more responsibility delegated to relevant local authorities for enforcement, (b) well planned monitoring, and (c) alternative job opportunities for those currently dependant on this activity for their livelihood.

There is also some concern that the continuing growth in market demand for quicklime in the construction industry, combined with the ban on sea coral mining, has caused a drastic increase in the mining of inland coral deposits. About 980 persons were engaged in inland coral mining activities in 1998.[7] While this may create low-lying areas that are more prone to flooding and coastal erosion in the long-term, there are no perceived short-term effects on coastal stability.

Table 2.9: Coral collected from Sri Lanka's western and southern coastal sectors from Ambalangoda to Dickwella in 1984, 1994 and 1998

Type of coral	Amount (tons)	% of total	Amount (tons)	% of total	Amount (tons)	% of total
Inland coral	10,400	58	15,800	80	28,300	93
Sea coral	7,660	42	4,020	20	2,200	7
Total	18,060	100	19,820	100	30,500	100

Source: Premaratna 1985[10]; Ranaweera Banda 1994[11]; Katupotha 1999[12]

2.2.3 Future impacts of climate change

Coastal planning for the future is expected to take into account the impacts of climate change, especially the effects of global warming resulting in sea level rise, higher temperatures, prolonged droughts, high intensity rainfall and other changed weather patterns. The latter includes higher frequency and intensity of extreme events such as cyclones and storm surges.

The projected sea level rise due to the greenhouse effect is expected to cause offshore movement of sand and erosion along all segments of Sri Lanka's coastline. It is also expected to result in:

- sand trapping in the lower reaches of rivers and tidal inlets.
- reduction of the return interval of recurrent flooding of a given level, and
- an increase of flood levels associated with storm surges and tidal wave situations.

This will in turn increase the deficit in the sand supply to the coast from all rivers in addition to the more direct coastal erosion caused by sea level rise.

Sea level rise can cause inundation of low-lying areas, shoreline retreat, saltwater intrusion into inland water bodies, geomorphological changes in sediment transport, etc. This can pose a threat to coastal structures that have not been built to withstand such effects and will affect fishery, tourism and other beach uses. The coastal protection structures built in recent years are, however, constructed to withstand extreme events, storm surges, etc. through the existing safety factors. Such requirements are also accounted for in the current setback standards. Overall, the accepted response to sea level rise is adaptation (by allowing shoreline retreat), accommodation (by making use of the change positively) and protection.

Other natural phenomena important for coastal erosion management planning are cyclones and strong storms which occur frequently in the Bay of Bengal region during October and November when the inter-tropical convergence zone shifts southwards towards the equator.[13]

Predicted impacts of sea level rise

The forecasts for global sea level rise in this century vary considerably, but the International Panel on Climate Change (IPCC) has provided a central estimate of 0.2 m and 0.5 m rise by the years 2050 and 2100 respectively. While sea level rise of this magnitude will cause considerable coastal erosion along all segments of Sri Lanka's coastline, it is expected to be a very slow process. The forecasted sea level rise for 2050 is expected to cause a general shoreline retreat of 10 m along all sandy coasts assuming a mean slope of 1:50 for a typical coastal profile. Over the 50 year period this will correspond to 0.2 m of shoreline retreat per year. By 2100 a general shoreline retreat of 25 m is expected, corresponding to an average retreat of 0.25 m per year. These values are valid for all sandy coasts, but will be negligible in relation to high levels of local erosion caused by other impacts. Even so, the general trend of shoreline setback due to sea level rise should be taken into consideration in future shoreline management planning, including the fixing of setback standards.

Sri Lanka has been less affected by cyclone than landmasses to the north due to its location,[14] with only about 13 cyclones and strong storms being felt in the island from 1901–1995.[15] This situation could change, however, with the alteration of weather patterns due to climate change, and the island could be subject to more frequent and intense cyclones and storms in the future. This should therefore be given due consideration in all future coastal planning and protection initiatives.

Pattern of storm surge in Batticaloa during the 1978 cyclone

The full severity of cyclonic winds has been felt in the northern and eastern parts of the island to date. One of the most serious cyclones in Sri Lanka occurred in November 1978 when it passed over the northern half of the island following a northwesterly path, starting south of Batticaloa and moving out at Mannar with wind speeds of 185 km/h. In the wake of the cyclone, winds of hurricane intensity covered an area of 35 km width, resulting in heavy damage and devastation on the east coast and to a lesser degree in some areas of the North Central Province.

This cyclone inflicted considerable damage to the Batticaloa town. Water levels in the area rose to a maximum of 9 ft (2.73 m) above mean sea level at Kallady Bridge while waves and water over-topped the main coast road north of Batticaloa, indicating a local surge between 0.9 -1.2 m. The penetration of water and waves in uprush reached up to half a mile from the shoreline. Much of the vegetation on the sand bar to the north and east of the urbanised area was destroyed.

Solutions to overcome the problem of future floods from storm surges associated with cyclones should be based on detailed risk analysis of social factors, alternative sea defence requirements, engineering requirements, statistical analysis of storm surges and costs. Precautionary and physical planning interventions proposed include, preparation of maps, building of protection walls and bunds, raising floor levels above surge height, and stabilising sand mounds to accommodate new buildings. Detailed engineering and feasibility studies are, however, required to define the advantages and disadvantages of such solutions.

Source: MOLGHC, 1979[16] ; Arjuna's Atlas[15]; MOENR 2002[13]

2.3 POLICIES, PLANS, LAWS AND INSTITUTIONAL ARRANGEMENTS

2.3.1 Plans and policies

The government's coastal erosion management policies are governed by the Coast Conservation Act No. 57 of 1981 and its amendment Act No. 64 of 1988, as they provide the legal foundation for activities in the Coastal Zone. The first national Coastal Zone Management Plan (CZMP) of 1990, the Revised CZMP of 1997 and *Coastal 2000: A Resource Management Strategy for Sri Lanka's Coastal Region* published in 1992 address the problem of coastal erosion specifically. The Master Plan for Coast Erosion Management (MPCEM) [1] prepared in 1986 identifies medium and long-term measures and the need for investment in coast protection.

The responsibility and discretion for coastal erosion control lies with the Director Coast Conservation. Hence measures for construction of coast stabilisation schemes within the Coastal Zone do not require an EIA. The practice for coastal protection works planned, constructed and funded by the CCD so far has been to prioritise protection of public infrastructure (roads, railway lines, bridges, outlets, etc.); followed by public utilities and buildings; dwelling units such as fishing villages; state land followed by commercial/private buildings and private land. The CCD permits individuals, private or public agencies to implement coast protection measures provided that they are consonant with CCD criteria and guidelines. Management actions and regulatory mechanisms concerning coastal erosion are implemented mainly at the national level.

EIAs may be carried out for development activities in the Coastal Zone - by both private as well as state agencies at the discretion of the Director CCD, in accordance with the CCA (*see Chapter 8*). Development activities that go beyond the boundaries of the Coastal Zone, however, require adherence to EIA requirements of the National Environmental Act No. 47 of 1980 and its amendment Act No. 56 of 1988, but any special concerns of the CCD will also be taken into consideration. In addition requirements of relevant sectoral and inter-sectoral Acts such as the Sate Lands Ordinance No. 8 of 1947 and its amendments, the Agrarian Development Act No. 46 of 2000, etc. will be considered.There are many regulatory mechanisms and institutions that are important in respect of controlling river and

beach sand mining to conserve coastal stability (*Chapter 8*[+]) The CCD regulates sand mining in the Coastal Zone. Sea coral mining and processing is banned under the Coast Conservation Amendment Act No. 64 of 1988, which resulted in the demolition of lime kilns within the Coastal Zone in 1992.

2.3.2 Erosion management initiatives

Early initiatives for coastal erosion management were mainly through emergency protection measures and the construction of coast protection structures. They were later supported by other measures such as the use of setback lines, directing development away from eroding areas and community participation. The CCD has increasingly identified the need for long-term and short-term measures for coastal erosion management. The Master Plan for Coast Erosion Management (MPCEM) prepared in 1986 with DANIDA support involved analysis of the potential for erosion along the coast, and resulted in the installation of coast protection works in several areas such as Negombo, Galle, Akurala, Hikkaduwa and Moratuwa.[16] Since then there has been a further shift in emphasis for coastal protection works worldwide as well as in Sri Lanka. New trends in protection techniques and policies have developed with greater recognition given to the importance of non-structural soft solutions in terms of both cost effectiveness and social and environmental acceptability.

Several major projects implemented by the CCD for management of the Coastal Zone have targeted the problem of controlling coastal erosion (among other issues) over the years. Based on the needs identified in the MPCEM for investment in coast protection the GOSL invested approximately SLRs 851 million[17] for two DANIDA projects (1987-1989 and 1990-1992). The GTZ has provided funds from 1988 to 1996 to strengthen capacity for coastal zone management, including background studies required for coast protection. The ADB funded CRMP of 2000 provides an investment of approximately SLRs 3,000 million for coastal stabilisation.

Coastal Stabilisation for erosion management through the Coastal Resources Management Project (2000-2005)

Six eroding sites have been selected for stabilisation through the 2000 Coastal Resources Management Project. They are Maha Oya to Lansigama, Colombo North to Dickowita, Wadduwa, Kalu Ganga to Payagala, Beruwala to Bentota and Hikkaduwa. The interventions will be a combination of structures (revetments, groynes, breakwaters and coves); beach fill (i.e. the sand is filled in between and supported by the structures); and beach nourishment to benefit the downstream stretches (i.e. sand nourishment of the unprotected beach). The methods used thus combine soft and hard solutions. Such combined schemes often offer the optimal type of erosion management, especially when they take into consideration requirements for protection of facilities on the coast, preservation/re-establishment of beaches, recreation and beach use requirements, impact on the adjacent beaches, protection maintenance requirements and economic aspects.

[+] the chapter on regulatory mechanisms

2.3.3 Future approaches and trends in management practice

Successful shoreline management schemes require long-term planning, mainly on the basis of coastal processes and land use information. This involves comprehensive research, monitoring, time, expertise, planning, funding and stakeholder acceptance.

Approaches to managing coastal erosion that are based on understanding the physical processes that cause erosion, and working with rather than against nature, have emerged around the world over the past few decades. In Sri Lanka too, it is recognised that the best option for long-term protection of areas exposed to coastal erosion is a multifaceted management strategy that goes beyond the traditional protective structures. The advantages of soft methods for erosion management are many, and have been increasingly recognised. Chief among these being that they leave the beach landscape intact, which is the most sustainable and environmentally and socially acceptable way of addressing coastal erosion in the long-term.

The final selection of erosion management methods will, however, have to be a compromise between protection requirements dictated by land use, maintenance capability, environmental requirements and the availability of immediate and long-term funding. These conditions are reflected in the coastal stabilisation schemes undertaken by the CRMP 2000 which use a combination of hard and soft solutions. The CRMP is the largest investment in the history of coastal protection initiatives in the island, and it is expected to considerably enhance coastal protection in terms of both coverage and quality. Even so, owing to the inadequate supply of sand from the rivers, it is expected that there will be further requirements for investment in erosion management and shoreline development in the future. The concept of Shoreline Management (SM) Planning could be introduced to meet this need and to address the problem of coastal erosion more holistically.

Capacity enhancement for erosion management through the Coastal Resources Management Project (2000-2005)

The Coastal Resources Management Project supports capacity building for erosion management through institutional strengthening. It takes into account the fact that despite considerable efforts in the past, the main cause of coastal erosion - river sand mining - remains largely unresolved. New initiatives are developed through this project to introduce offshore sand for construction purposes, including new building specifications to permit the use of offshore sand, and a pilot project to explore the viability of offshore sand for the construction industry. The dredging and transport of sea sand is expected to provide employment opportunities to some of the people now engaged in river sand mining, thereby reducing the social impacts of controlling this activity.

In concept shoreline management is very similar to that of Coast Erosion Management practised so far in Sri Lanka. The main difference is that planning for SM is more localised, although the concept is broader in scope as it involves the study of erosion trends,

land and beach use and socio-economic and environmental conditions (including critical habitats) in a balanced and integrated manner to minimise erosion (see box below). Most Acts, plans, policy papers, permit procedures and EIA requirements that currently address the factors underlying coastal erosion cover the entire island and are more general in nature.

It is expected that the concept of Shoreline Management introduced in this CZMP will help provide more detailed guidance at the regional and local levels for regulation of future coastal development, and thus help prevent problems connected with coastal erosion.

The concept of shoreline management planning

The concept of Shoreline Management (SM) may be defined as the "act of dealing - in a planned way - with actual and potential coastal erosion and its relation to planned or existing development activities on the coast. Shoreline management may be considered the local physical part of CZM."

Shoreline Management Planning requires that the coastline be divided into suitable units for which separate Shoreline Management Plans can be prepared. Each Shoreline Management Plan (SMP) will be a strategic plan for shore protection (or shore development) covering a sediment cell-which is in reality a length of coastline relatively self-contained as far as movement of sand and other sediments are concerned, and where interruptions of such movement will not have a significant effect on neighbouring sediment cells. The boundary of a sediment cell generally coincides with larger estuaries or prominent headlands. In many cases, sub-cells or groups of sub-cells provide a more practical basis for the initial production of plans because they are of a more manageable size. The boundaries of sub-cells are not definitive; they are based on the best available knowledge of large-scale processes and administrative boundaries, and may need to be revised, as further information becomes available.

The objectives of Shoreline Management are to ensure that:

* development activities in the coastal area follow an overall land use plan and a general environmental policy,
* development activities in the coastal area do not contribute to or aggravate erosion,
* development activities do not occur in sensitive areas, and
* erosion control techniques are cost-effective and socially and environmentally acceptable.

Source: NPPD, 2001[18] and Mangor, 2001[19]

The introduction of SM in Sri Lanka is also in good agreement with the recommendation in Coastal 2000 for the CCD to collaborate with the Provincial Councils for preparation of provincial CZMPs. The threat of erosion and flooding by future sea level rise also highlights the importance of long-term planning for coastal development. In view of the provincial, divisional and local effort needed for implementation of shoreline management projects, building adequate capacity at the regional level assumes considerable importance.

Requirements for shoreline management planning at the national level

Shoreline Management is a relatively new concept in Sri Lanka, and hence special care should be taken when selecting sites for management and with the planning process. Consequently shoreline management should be tested on a pilot basis and fine-tuned prior to adoption at the national level. For instance:

* *The criteria* for selection of sites for Shoreline Management Planning should be based on specific factors such as:
  * the rate of erosion,
  * threats to dwellings, infrastructure and utilities, and
  * critical habitats

* *Preparation of shoreline management plans* should involve:
  * identifying and analysing causes for erosion - both natural and human induced;
  * taking into account erosion trends, land and beach use, socio-economic and environmental conditions (including critical habitats) in a balanced way;
  * recommending appropriate solutions that are cost effective as well as socially and environ mentally acceptable;
  * making optimal use of soft solutions, including beach nourishment with sand from offshore sources;
  * considering the possibility of land acquisition and purchase of development rights as a soft solution for managing vulnerable coastal stretches (where necessary) based on surveys, and
  * addressing needs for monitoring and evaluation of plan implementation and communication with stakeholders – including local administrative bodies and people/communities.

Public or private entities can be permitted to prepare and implement Shoreline Management Plans (SMPs) based on site specific TORs (guidelines) prepared by the CCD for each site. The generic TORs for SMPs is provided in Annex 2.4.

2.4 MANAGEMENT OBJECTIVES, POLICIES AND ACTIONS

OBJECTIVE 1

Coastal erosion is addressed by adopting optimal shoreline management works/measures.

Policy 1.1

Coastal protection will be carried out in a planned manner by identification of coastal erosion trends and prioritisation of areas for protection based on specific criteria.

Strategy 1.1.1

Identify coastal erosion trends; prioritise areas for protection based on high levels of erosion and threats to dwellings, infrastructure and utilities as well as critical habitats; and formulate site specific management strategies.

Proposed action

1. Study and identify coastal erosion trends and areas subject to, or liable to, high levels of erosion, including areas where erosion control works have been previously introduced.
2. Prepare a Status Report on coastal conditions to be updated periodically (e.g. every second year).
3. Identify and prioritise areas requiring protection based on the Status Report taking the following criteria into consideration:
   * the rate of erosion,
   * threats to dwellings, infrastructure and utilities, and
   * critical habitats.
4. Develop a programme to introduce Shoreline Management Planning in Sri Lanka where appropriate, including parameters for monitoring and evaluation of the programme.
5. Initiate the process of Shoreline Management Planning at appropriate locations on a pilot basis.
6. Initiate preparation of site specific responses to erosion management, including Shoreline Management Planning where appropriate.
7. Identify areas for land acquisition, and propose financial mechanisms for land acquisition and purchase of development rights.
8. Permit public or private entities to prepare and implement coast protection works which comply with overall CCD require ments and the CZMP.
9. Monitor performance of existing coastal protection works and stability of coastline in areas where some form of control measures have been introduced based on a scheduled plan, and take action to maintain such works.
10. Consider applying the general principles of shoreline management at appropriate locations during project approval procedures in the Coastal Zone.
11. Seek EIAs where warranted for proposed works in the Coastal Zone.

Policy 1.2
The collection of data and the use of scientific information on coastal erosion rates, patterns and trends will be promoted to enhance erosion control/shoreline management.

Strategy 1.2.1
Facilitate the collection, storage and use of all scientific and socio-economic information relevant for erosion control and management through collaboration with research agencies and universities, and develop a database for easy access of such information for shoreline management initiatives.

Proposed action

1. Establish a national programme (in collaboration with universities and other research agencies as relevant) for regular monitoring of coastal erosion and collate and collect related data/information on: scientific investigations of sediment balances and assessments of sediment sources; coastal erosion trends and status; threats to dwellings, land use and critical habitats from erosion; hydrographic conditions; and socio-economic characteristics in the Coastal Zone.
2. Establish and maintain a comprehensive database -through institutional monitoring - on hydrographic conditions, land use, critical coastal habitats and socio-economic characteristics in the Coastal Zone.
3. Establish (a) an inter-institutional metadatabase relevant for coastal erosion management and (b) a survey of coastal erosion and protection status.
4. Use scientific and socio-economic information/data to update the CZMP and for shoreline management planning.
5. Formulate appropriate mechanisms to provide access to the metadatabase (above) as well as an institutional database for public and private agencies and research workers.

Policy 1.3
Severe coastal erosion in highly developed and degraded areas *with existing coastal protection measures* will be addressed by reclamation to enable new development possibilities and enhance economic potential of coastal frontages.

Strategy 1.3.1
Promote measures to expand existing coastal frontages by implementing environmentally acceptable reclamation schemes, *selectively* and only *where feasible*, to provide development possibilities, coastal protection and opportunities to enhance economic potential.

Proposed action

1. Disseminate guidelines provided in the CZMP for reclaiming coastal frontages to:
   * relevant state agencies that are responsible for coastal reclamation works, and
   * potential private developers.
2. Develop internal mechanisms for handling approval procedures in respect of applications for implementation of reclamation schemes.
3. Ensure that (a) there is adherence to guidelines, and (b) reclamation schemes are *limited* to coastal areas which:
   * are congested with highly developed coastal frontages that are in an advanced state of coastal erosion,
   * have existing coastal protection works causing loss of healthy beach resources, and
   * where reclamation is economically and environmentally justified.
4. Provide guidance on the preparation of reclamation plans (on request from the UDA or private developers) to ensure that reclamation is confined to sites where protection costs can be recovered through development consistent with this objective.

Policy 1.4
Dune stability will be enhanced by promoting the growth of vegetation on sand dunes to minimise coastal erosion.

Strategy 1.4.1
Control adverse activities that damage dune vegetation and replant natural vegetation on sand dunes where the original vegetation is damaged.

Proposed action

1. Control activities that cause damage to dune vegetation.
2. Replant sand dunes with natural vegetation.

OBJECTIVE 2
The location and type of development activities in and outside the Coastal Zone are made consonant with conserving the natural shoreline and coastal features.

Policy 2.1
Development activities within and outside the Coastal Zone will be regulated to ensure that natural coastal processes are unhindered.

Strategy 2.1.1
Permit only new development activities landward within the Coastal Zone which are regulated, in accordance with setback standards and in areas not subject to erosion or flooding.

Proposed action

1. Develop a Compliance Monitoring Plan, and enforce adherence to coastal setback standards by conducting permit compliance monitoring surveys as required.
2. Ensure that new development does not occur in areas prone to erosion and flooding.
3. Initiate legal action against non-compliance of stipulated setback standards as required, by working with relevant state agencies.
4. Build awareness of setback regulations in Divisional Secretariat Offices.
5. Prepare an Action Time Schedule for awareness creation activities at the regional level.
6. Demarcate coastal segments and display sign boards indicating the amended setback standards.

Policy 2.2
Adverse impacts of activities in the Coastal Zone from construction of coastal and marine structures will be minimised.

Strategy 2.2.1
Implement mitigation measures according to EIA studies to minimise adverse impacts due to construction of coastal and marine structures.

Proposed action

1. Develop guidelines for minimising adverse impacts in the Coastal Zone from coastal structures and other schemes.

Policy 2.3
Impacts from activities outside the Coastal Zone having an adverse impact on natural coastal features will be minimised.

Strategy 2.3.1
Minimise adverse impacts from activities outside the Coastal Zone affecting natural coastal features through liaison with the authorities responsible for their control and regulation.

Proposed action

1. Prepare a list of relevant actions that have an impact on coastal features and establish liaison with the authorities responsible for regulation of such activities.
2. Prepare a strategy for liaison with authorities responsible for development schemes in and outside the Coastal Zone that have an adverse impact in the area.
3. Promote the introduction of Impact Assessment of land based development activities on coastal features into the national EIA procedures being developed.

OBJECTIVE 3
Beach stability is enhanced by controlling sand mining (within the Coastal Zone and in the rivers) and eradicating sea coral mining.

Policy 3.1
Beach stability will be enhanced by regulating sand extraction from beaches and rivers.

Strategy 3.1.1
Regulate sand mining in rivers and beaches by means of guidelines specifying quotas, time and area limits and imposition of monitoring schemes.

Proposed action

1. Prepare a strategy for enforcement of the 2003 Guidelines for Sand Mining in the Coastal Zone; as well as landward and seaward of the Coastal Zone[+1] (including rivers upstream), in collaboration with relevant state organisations agencies.
2. Undertake or facilitate periodic checking of sand mining in the Coastal Zone and in the rivers inland to curtail illegal sand mining in collaboration with the GSMB and the Divisional Secretaries' offices according to the above strategy.
3. Ensure adherence to guidelines by licensed mining operations.
4. Conduct a survey and collate data on sand mining in and outside the Coastal Zone to identify the present magnitude of the problem, in collaboration with relevant institutions such as the GSMB.
5. Define sustainable limits and site specific sand budgets (using established sediment budgets) in collaboration with relevant state institutes, universities and research organisations.

Policy 3.2
River sand mining will be alleviated by the introduction of alternative sources of sand for construction.

Strategy 3.2.1
Promote research to find feasible alternatives for the use of river sand in the construction industry.

Proposed action

1. CCD to promote research in collaboration with institutions and relevant administrative bodies to:
   * identify new technologies that minimise the use of sand for construction.
   * enhance the use of alternatives to river sand to meet the requirements of the construction industry.

Strategy 3.2.2
Promote the use of sand from offshore sources as an alternative to river sand.

Proposed action

1. Collate all available information and data in Sri Lanka and elsewhere on the use of sea sand in the construction industry in collaboration with research organisations, universities and national organisations funding research, and form a central database.
2. Carry out a cost benefit study of the use of offshore sand in the construction industry.
3. Create awareness on the benefits of the use of offshore sand for the construction industry and beach nourishment in collaboration with national and regional level state organisations, media and NGOs, based on available data and results of impact assessments.
4. Coordinate inter-agency efforts to provide alternative employment for displaced river sand miners.

Policy 3.3
Beach stability will be enhanced by eradicating sea coral mining.

Strategy 3.3.1
Enforce the ban on sea coral mining more stringently to ensure a total halt within a specified time frame.

Proposed action

1. Enforce the ban on coral mining in collaboration with the Police and Local Authorities.
2. Identify alternative sources for coral lime, and plan and promote mining of these resources.
3. Formulate collaborative mechanisms with relevant authorities to promote the introduction of alternatives for coral based lime.
4. Prepare and support implementation of a plan/programme for coordinating inter-agency efforts to provide alternative employment for coral miners displaced due to prohibition of sea coral mining.

OBJECTIVE 4
Ensure the availability of contingency measures to mitigate impacts of climate change on coastal features, infractructure and coastal communities and that systems for timely implmentation of such contingency measures and plans are developed.

Policy 4.1
Possible impacts of climate change will be addressed in shoreline management/ coastal erosion control planning.

Strategy 4.1.1
Quantify impacts of climate change on coastal erosion and flooding through monitoring and establish warning systems and timely mitigatory measures.

Proposed action

1. Collate data from all relevant authorities on climate change parameters such as wind patterns, rainfall, temperature, sea level rise, etc. to predict coastal impacts of sea level rise.
2. Establish a database on climate change features relevant to coastal zone management in collaboration with relevant state organisations.
3. Establish links with international agencies/global programmes to obtain data and information on climate change, related features and mitigatory actions.
4. Analyse impacts of climate change and establish systems for timely adaptive and mitigatory action.
5. Develop an effective mechanism to collaborate with institutions dealing with the scientific and social aspects of natural hazards to minimise impacts and for efficient remedial action.
6. Coordinate inter-agency action required to mitigate impacts of natural hazards in the Coastal Zone and for remedial measures.
7. Establish a mechanism through which realistic estimates of sea level rise and other climate change impacts are taken into account routinely in erosion management and development in the Coastal Zone.

References for Chapter 2

1. Byrne, G., and Nanayakkara, A. 2002. Alternatives for River Sand, Final Report. unpubl. Coastal Resources Management Project, Component B: Institutional Strengthening.

2. CRMP. 2002. ADB coastal stabilisation component. unpubl.

3. CCD/DHI. 1986. *Master Plan for Coast Erosion Management.* Colombo: Coast Conservation Department.

4. Lanka Hydraulic Institute, 2002. Status Report on Coastal Conditions. unpubl. Institutional Strengthening Component of the Coastal Resources Management Project.

5. CCD 1997. *Revised Coastal Zone Management Plan, Sri Lanka.* Colombo: Coast Conservation Department and the Ministry of Fisheries and Aquatic Resources Development.

6. Mangor, K. August 2002. Background Document for the Chapter on Shoreline Management of the Second Revision of the CZMP. unpubl. Institutional Strengthening Component of the Coastal Resources Management Project, ADB TA No. 3477-SRI.

7. Katupotha, K. N. J., and Wickramasinghe, U. 1999. Study on Rapid Assessment of Coral Mining along the Southwest and South Coasts of Sri Lanka. unpubl. Coast Conservation Department.

8. IUCN. 1989. *A Directory of Asian Wetlands*. IUCN, Gland and Cambridge.

9. ADB/ECCDP, *2002*. Eastern Coastal Community Development Project (PPTA No. 3479-SRI).

10. Premaratne, A. 1985. *Socio*-economic survey of those engaged in the coral mining industry in the southwestern coastal zone (from Ambalangoda to Dickwella). unpubl. Internal Report No.3. Coast Conservation Department.

11. Ranaweera Banda, R. M. 1994. A Study on the effects of demolishing of lime kilns on the coral mining and assessment of coral being mined. unpubl. Coast Conservation Department.

12. Katupotha, K.N.J. 1999. Survey on Economic Environmental Linkage Between the Demand and Supply of Sand and Coral in the West and Southwest Coasts of Sri Lanka. unpubl. Ministry of Forestry and Environment and the World Bank.

13. MOENR. 2002. *State of the Environment in Sri Lanka: a Report for SAARC*, compiled and ed. J D S Dela. Colombo: Ministry of Environment and Natural Resources.

14. MOLGHC, 1979. Cyclone study, unpubl. Ministry of Local Government, Housing and Construction. Sri Lanka Technical report no 2,
unpubl. Ministry of Local Government, Housing and Construction of Sri Lanka.

15. Arjuna's *Atlas of Sri Lanka*, 1997 ed. T. Somasekaram, M.P. Perera, and H. Godellawatta, Dehiwala: Arjuna Consulting Co. Ltd.

16. MoFOR, 2002. The fisheries and ocean resources sector National Policy and Development Plan: towards a new era of development, unpubl.

17. FAO/ADB, 1991: Fisheries and Fisheries sector Development Project Preparation report vol 1. unpubl.

18. National Physical Planning Department. 2000. National Physical Planning Policy (NPPP). unpubl. preliminary draft.

19. Mangor, K. 2001. Shoreline *Management Guidelines*. Denmark:DHI Water and Environment.

3. CONSERVING COASTAL HABITATS

3.1 INTRODUCTION

3.1.1 Significance of coastal habitats

Sri Lanka has a variety of coastal habitats that include estuaries and lagoons, mangroves, seagrass beds, salt marshes, coral reefs and large extents of beaches including barrier beaches, spits and dunes (Annex 3.1 gives the extents of these habitats by districts). These habitats comprise a rich component of the country's biodiversity, although much of the various groups of marine coastal organisms are yet incompletely documented. Among the identified species in marine and coastal waters are over 1,800 pelagic species of fish; five species of turtles that come ashore to nest on the beaches; 38 species of endangered and rare marine mammals including the dugong and 37 species of cetaceans.[1] . Several species of sea snakes and a diverse array of coral and reef associated organisms are also found in these areas. Genetic diversity within coastal habitats is also believed to be high, and of possible economic value, but this aspect has not been investigated adequately as yet.

It is well known that coastal resources have been of economic and subsistence value to coastal communities since time immemorial. The available fish/shrimp catch data underscore the role of estuaries, lagoons and coral reefs as fishing grounds and a source of protein. For instance, Negombo estuary yielded 1,024 t of shrimp in 1999,[2] and the Puttalam estuary provided 4,800 t of fish, annually, during the period 1990-1991.[3] Coral reefs contain many resources that have export value such as ornamental fish, lobsters etc. The data for 1998 show that many of the 250 species of fish and 50 species of invertebrates collected for ornamental fishery were from coral reefs. These accounted for about 40-50% of the US $ 6.6 million received from all ornamental fish exports.[4] Estuaries and lagoons, coral reefs, mangroves, seagrass beds and salt marshes also function as vital breeding and/or nursery grounds for numerous species of fish, crustaceans and molluscs, many of which are of commercial value.

The scenic beauty of coastal habitats such as coral reefs, mangroves, estuaries/lagoons and beaches have considerable economic and aesthetic value. They are also used for mooring of small fishing crafts and for many other fishery related activities. Beaches around the island accommodate sites of religious, archaeological and historic value as well as homesteads for a considerable section of the coastal population, particularly for fishing communities.

Coastal vegetation is traditionally used by coastal communities for various purposes, such as providing food and beverages, timber for house building and boat construction, firewood, material for preparation of fishing accessories, etc. Many coastal habitats, particularly coral reefs and sand dunes help stabilize the shoreline. Coral reefs especially act as natural barriers against coastal erosion by dissipating high-energy wave action, which is particularly heavy during the monsoons.

3.1.2. The coastal habitats

Coral reefs

Coral reefs provide habitats for a variety of flora and fauna. Three types of reefs have been identified around the island. They are: (a) coral reefs, (b) sandstone reefs, and (c) rocky reefs. The latter two reef types may also be covered by corals in varying degree. All three habitats are distinctly different, but may be found mixed together.[5,6] Annex 3.2 shows the locations of reefs around the country, while Annex 3. 3 gives information on the present status of coral reefs.

*C*oral reefs are rigid structures that stand above the surrounding sea floor and are formed from the biological secretion of calcium carbonate by living organisms, namely, reef building corals and coralline algae. The former constitute the most important component by forming the main structural component of the reef. The vivid colour of the coral is derived mostly from symbiotic unicellular yellow-brown algae called zoozanthellae (dinoflagellate) that live in them. These algae also provide the corals with most of their food and oxygen requirements, stimulate calcification indirectly and assist with waste removal. Since the algae living in the reef building corals need ample sunlight for their food production, such corals are limited to shallow tropical seas.

The most extensive coral reefs in Sri Lanka are the patchy coral reefs in the northwestern coastal and offshore waters, occurring within the Gulf of Mannar and west of the Kalpitiya Peninsula. Patchy coral reefs have also been recorded in the western and eastern coastal areas of the island at a distance of about 15-20 km from the shore, at an average depth of 20 m. The southwestern, eastern and northern coasts also contain fringing coral reefs adjacent to the shore, growing from the sea floor usually on a nucleus of rock.[6] It has been estimated that about 2% of the coastline contains fringing coral reefs.[7] Hikkaduwa, Unawatuna and Rumassala are some of the main fringing reefs along the southwestern coast and Passikudah is one of the known fringing reefs in the eastern coast. Coral reefs also occur around the Jaffna Peninsula - mainly around the small coastal islets, but they are not extensively developed.[4,6] Barrier coral reefs, consisting of ridges of coral lying some distance from the shore, parallel with it, and forming a broad 'reef lagoon', are rare in Sri Lanka but some are found at Vankalai and Silavathurai.[5]

Sandstone reefs are widespread along the coast. Many of these are located along the bathymetric contours of the continental shelf. Rocky reefs occur from south of Colombo in the west coast to the southern areas of the Trincomalee District in the northeast.[5]

Seagrass beds

*S*ea grass beds contain rooted seed-bearing marine plants (halophytes) that occur in shallow sheltered near-shore coastal waters and as underwater meadows, some of which may be seen during low tides. Sea grasses and the associated epiphytes trap and accumulate detritus. This makes seagrass habitats very productive and support diverse organisms including commercially important species.

Sri Lanka's coastal waters have extensive sea grass beds, often occurring in association with coral reef ecosystems or in estuaries and lagoons. They are particularly found in the basin estuaries and lagoons of Puttalam, Negombo, Mawella, Koggala, Kokilai, Jaffna and Batticaloa.[+ 8 + +] Extensive seagrass beds have been reported from the Dutch Bay (in Kalpitiya) to the western end of the Jaffna Peninsula, and from Mannar to the northwest across the Palk Bay and to Rameswaram Island on the Indian coast.[8] Seagrass beds in Sri Lanka are of particular interest since they are believed to be the main habitat of the endangered dugong (*Dugong dugong)*.

Annex 3.2 shows the extent of seagrass beds in the coastal areas around the island. Annex 3.3 provides information on the present status of seagrass beds .

Estuaries and Lagoons

*C*lassification of estuaries differ from country to country as the principal factor on which they are classified - the perennial inflow of freshwater and the tidal action – vary considerably. The accepted feature of Sri Lanka's estuaries as having a 'free connection to the sea' needed modification as some are clearly closed to the sea during a part of the year.

Thus Sri Lanka's estuaries have been defined here as natural systems that are transitional between rivers/ streams and the sea, and within which the salinity of the water is measurably different from the salinity in the open ocean. All estuaries have free connection with the open sea – either continuously (e.g. Puttalam, Negombo, Jaffna, Batticoloa, Kelani Ganga, Bentota and Kalu Ganga estuaries) or intermittently (e.g. Maha Oya, Kirindi Oya, Kirama Oya, Madu Ganga, Menik Ganga and Walawe Ganga estuaries).

Sri Lanka's coastline is characterized by a series of picturesque estuaries and lagoons. They are complex systems containing a diversity of species and a variety of coastal habitats including, mangroves, salt marshes, seagrass beds and mud flats. Estuaries, lagoons, bays and salterns in the island are listed in Annex 3.2. Annex 3.3 provides information on the present status of estuaries and lagoons. Annex 3.4 gives the details of estuaries and lagoons of the country.

There are two different types of estuaries; Riverine estuaries where the rivers or streams discharges directly into the sea through relatively narrow channels (e.g. the Kelani Ganga, Maha Oya, Kalu Ganga and Nilwala Ganga estuaries) and basin estuaries where the river or stream first discharges into a relatively shallow basin before entering the sea (e.g. Puttalam, Negombo, Jaffna, Batticaloa estuaries). In some places riverine estuaries open into a bay that opens to the sea (e.g. the Kala Oya riverine estuary opens to Dutch Bay; the Mahaweli estuary opens to Koddiyar and Thambalagam Bays, and the Polatumodara estuary to Weligam Bay). Overall, there are 45 estuaries** of which 28 are of the riverine type and 17 of the basin type. The total extent of basin estuaries in the country amounts to 90,965 ha (basin area only), and riverine estuaries cover about 2,110 ha.+

*S*ri Lanka's lagoons are defined here as coastal bodies of water that may be brackish, fresh or hypersaline, and are separated from the sea over a very long period of time by any of several types of barriers that restrict water circulation.
(All lagoons cited here are those for which aerial photographs showed no connection to the sea since 1956).

There are around 89 lagoons ranging from 3 ha to 7,589 ha in extent, of which 8 cover more than 1,000 ha each. Total extent of lagoons amounts to about 36,000 ha. Lagoons are more abundant along the southern, southeastern and eastern coasts where the littoral drift causes an accumulation of sand to form barriers and spits at river mouths through which the freshwater discharge is low.

+ Source: CRMP Coastal Habitat Survey of 2002
* they may also sometimes reach upstream as far as 20 km due to extensive sand mining in rivers.

Mangroves

*M*angrove ecosystems consist of inter-tidal zones of muddy shores in bays, lagoons and estuaries, dominated by highly adapted woody halophytes associated with continuous water courses, swamps and back waters, together with their population of plants and animals. The mangal vegetation in Sri Lanka comprises around 40 different species of trees, bushes, herbs and vines. Of these about 25 are true mangroves occurring only in mangrove areas, while the other mangrove-associated species can be found in other aquatic environments as well. Mangroves of considerable extent can be found in areas with relatively low population densities (e.g. in the eastern and northwestern coasts). Recent surveys have shown relatively undisturbed mangals in the Kala Oya estuary, the islands in the Puttalam estuary and Dutch Bay, the Kokkilai estuary, the Nai Aru estuary, the Panama lagoon, the Uppar (Panichchankerni) estuary, the Nanthikadal lagoon, the Yan Oya estuary and in some areas of the Batticaloa estuary.

Sri Lanka's mangrove areas amounted to about 6080 ha in 2002.[+] Sri Lanka's tidal variation being low and rarely exceeding 75 cm, mangroves generally occur as a narrow belt in inter-tidal areas of lagoons, estuaries or associated islands and river mouths. However, they do not occur in all inter-tidal areas and are confined to areas with low wave action. Although mangroves rarely extend beyond 1 km landwards from the mean low water tidal level [9] they may spread upriver to the upper limit of brackish water intrusion in some riverine estuaries, even up to a distance of 20 km (e.g. Galatara in the Kalutara district). [+*] Annex 3.2 shows the locations of mangrove areas around the island and Annex 3.3 provides information on the present status of mangroves.

Salt marshes

*S*alt marsh vegetation typically contains small herbs that tolerate high salt concentrations in the soil (i.e. halophytes). They generally occur in tidal flats or areas that are periodically inundated by the sea. In most areas they occur as sparse, short growths interspersed with mangrove vegetation. Mundel Lake is an example of this type of salt marsh/mangrove association which results when the canopy provided by the mangrove stand is removed totally or partially, causing dehydrated and hypersaline soil conditions which encourage the development of salt marsh vegetation. During the rainy season an algal mat consisting mainly of nitrogen fixing organisms covers the soil surface, providing habitats for many young stages of aquatic organisms (including milk fish) – a feature clearly seen in the Mannar and Puttalam salt marshes.

There are around 23,800 ha of salt marshes in the country.[+] The conditions under which salt marshes occur vary, but more often they are found close to the landward margin of the inter-tidal zone where the soil salinity is relatively high due to insufficient freshwater runoff to flush out the accumulated salts. Annex 3.2 indicates the locations of salt marshes in the country while Annex 3.3 furnish some information on their present status.

Extensive salt marshes also occur in the Mannar area (mainly on tidal flats and containing about 56 species of marsh vegetation) in the coastal belt from Mantai to Vankalai. Patchy salt marshes also occur mainly in sedimented lagoon/estuarine areas such as Hambantota, Puttalam, Kalpitiya and Mundel. [8+]

Barrier beaches, spits and dunes

Sri Lanka's wide and sandy beaches along much of the 1620 km coastline [+] are famed for their scenic beauty and support a distinct littoral fauna and flora. Beaches have been formed by accumulation of sediment deposited on the shore. Among them, barrier beaches, spits and dunes are the most delicate and vulnerable due to their changing nature. Annex 3.2 shows the location of barrier beaches, spits and dunes along the coast of Sri Lanka. Annex 3.3 gives information on their present status.

Barrier beaches

Barrier beaches are accumulations of unconsolidated sediments transported ashore by waves and moulded into a form that lies across a body of water, isolating it from the sea.

Coastal areas around the island contain barrier beaches that isolate lagoons and swamps from the sea (e.g. the beaches at Rekawa, Kosgoda, and Panama). Barrier beaches are found mainly between Bentota and Balapitiya on the southwest coast. Along the southern coast there is a barrier beach at Weligam Bay, and several between Dondra and Ambalantota. Thambalagam Bay, a westward embayment of Koddiyar Bay, is almost entirely cut off as a barrier beach which gets partially breached during the northeast monsoon. Some barrier beaches are free at both ends and form islands (e.g. at Karaitivu).

Spits

*S*pits are incipient barrier beaches that project from the shore in the direction of the dominant drift and are free at one end.

Spits are frequently observed along the western and eastern coasts of the country and are associated with estuaries. Examples are the shoal that builds seasonally at the mouth of the Negombo estuary and the sand spit at the Kalu Ganga estuary. Some of the barrier beaches and spits have extensive dunes associated with them as seen at Kalpitiya. Most spits appear to be unstable, especially those which protrude into estuaries (e.g. the Kalu Ganga spit).

Consequently they shift position from time to time, causing changes in the form and precise location of the inlets of estuaries. For example, the inlet of the Batticaloa estuary has shifted northward to its present position from a previous location 5 km to the south.

*T*he most commercially important spit is in Pulmoddai, north of Trincomalee at the outlet of Kokkilai estuary. The ilmenite rich deposits that constitute this spit are mined on a large scale but are replenished annually from terrestrial sources during the northeast monsoons.

Some spits are formed seasonally at estuarine inlets and tend to obstruct the natural water flow patterns, often resulting in the inundation of low-lying lands (e.g. the Kalu Ganga and Maha Oya estuaries).

+ Source: CRMP coastal habitat survey, 2002
+ (including the shoreline of bays and inlets, but excluding lagoons)

Dunes

*D*unes are wind blown accumulations of sand which are distinctive from adjacent land forms such as beaches and tidal flats mainly due to the fact that dunes do not get the effect of tides. Dunes typically have a bare zone with saline and loose sand as the outermost margin towards the sea, and four overlapping vegetation zones landward that are discernible above the high water mark.

Three types of dunes have been identified in the country. They are:

* low, flat to slightly undulating, isolated platforms of sand less than 1m in height (e.g. incipient dunes found at Koggala, Matara, Akurala and Uswetakeiyawa);
* transverse primary dunes, consisting of single fore- dune ridges of undulating sand masses associated with stable beaches, exceeding 5 m in height (e.g. dunes at Mannar, Pooneryn, Kalpitiya and along the southeastern coast).
* secondary transgressive dunes; usually exceeding 3 m in height (e.g. dunes at Mannar, Pooneryn,Kalpitiya and Jaffna); most of which are longitudinal, some are parabolic, and a few are complex in form.

The most prominent sand dunes lie along the northeastern, northwestern and southeastern coasts of Sri Lanka. These extend from Mullaitivu and Point Pedro, Elephant Pass and Chavakachcheri across Mannar Island towards Kalpitiya and Ambakandawila. On the southeast, they extend from Ambalantota (Godawaya) in the Hambantota district to Sangamankande Point in the Ampara district. The latter is identified as the longest stretch of dunes in the world close to the equator.

3.2 NATURE OF THE PROBLEM

Most of Sri Lanka's coastal habitats have undergone degradation in different degrees during the past resulting in the decline of their resources as well as extents at an unprecedented rate. The extent of such degradation over the past two decades is depicted in Annex 3.1. +

Underlying the apparent degradation of coastal habitats is the fact that they are very fragile and vulnerable to many dynamic processes occurring on land and in the sea, due to both natural causes and human interventions. The perceptible increase in human populations in Sri Lanka's Coastal Zone during the past two decades has resulted in a tremendous increase in the disruption of coastal processes caused by human intervention.

3.2.1 Issues and threats

Damage and destruction of coral reefs

*P*rior to 1998, Sri Lanka had many healthy reefs remote from human settlements, such as the Bar Reef. In contrast marine surveys in 1999 and the early 2000s have shown that live coral cover in shallow reef habitats at about 3 m depth was near zero in the Bar Reef Marine Sanctuary; only 7% at Hikkaduwa Marine Sanctuary; and down to 28% at Weligama and 20% at the Rumassala reef.

Famed for their spectacular beauty, coral reefs were among Sri Lanka's most valuable shallow water marine habitats. These reefs are now degraded at many sites, due to both natural causes and human impacts. Especially affected are the near-shore coral reefs in the western and southern coastal areas (*chapter 2*). The principal cause for coral reef destruction is the mining of corals for the lime industry. This is despite the ban imposed in 1988 on mining, collecting, transporting and processing of sea coral.

*A*t Hikkaduwa many coral patches are dead or dying. There has been excessive damage to the coral reefs from glass bottom boats overloaded with tourists viewing the reefs, pollution from hotels, oil pollution from ships and tankers, heavy sediment transport by rivers, trampling by divers and collectors of reef organisms, and the anchoring of boats. A very high per cent of the corals have also been affected by coral bleaching+ as a result of the El Nino related sea surface temperature elevation during April-May 1998.

(MOENR, 2002) [1]

The available data show a perceptible decline of sea coral mining between 1984 and 1998 (*see chapter 2*). Even so, about 211 persons were engaged in mining, collecting and transporting of sea coral in 1998.[10] Some coral mining also occurs in the eastern coastal stretch[1] from Nilaveli to Akkaraipattu (*chapter 2*).

The use of destructive fishing methods such as the use of dynamite, moxy nets to catch ornamental fish, and bottom set nets on coral reefs to catch lobsters are other factors that cause damage to these habitats. Unregulated fishing effort has also reduced valuable and rare fish species inhabiting the reefs.

Unregulated growth of the coastal tourist industry has also caused damage to the coral reefs, particularly those in the southern and eastern coastal areas. Direct habitat loss or damage was evident in these areas due to stepping on the reef, ramming of glass-bottom boats against the reef and collection of reef materials as souvenirs. In addition, indirect impacts such as pollution due to incorrect siting of tourist facilities, inadequate or poorly designed infrastructure are quite evident in these areas.

Coral destruction in most shallow areas was evident in 1998 due to bleaching caused by high water temperature associated with 'El Nino" Southern Oscillation (ENSO) effect (see Annex 3.3).

Other natural causes such as the proliferation of the crown of thorns starfish (*Acanthaster planci*) and other invasive species have compounded the damage to Sri Lanka's coral reefs. Annex 3.3 summarizes the uses/functions and related activities in connection with coral reefs and the threats to this valuable habitat.

Damage to seagrass beds

The seagrass beds in lagoons and around the coral reefs (see Annex3.3 for the uses/functions and related activities in connection with seagrass beds) are often damaged due to destructive fish harvesting techniques. Large scale commercial trawling and drift netting over the seagrass beds that occur between Puttalam and Jaffna and beach seining in certain sections of the coastline affect seagrass beds. In certain areas commercial polycheate harvesting as broodstock feed for shrimp hatcheries also causes severe damage to seagrasss beds (e.g. Negombo and Chilaw estuaries). Other adverse impacts are from siltation resulting from land-based activities such as changes in catchment hydrology through irrigation schemes. Sandbar formation, either through natural causes or those induced by human activity may also cause degradation of seagrass beds (Annex 3.3).

+[1] information obtained from the Eastern Province Coastal Community Development Project.

Degradation of lagoon and estuarine habitats

*T*he effective water area of the Negombo estuary has diminished by 791 ha between 1956 and 1981. This has happened as a result of land filling for encroachment facilitated by planting mangrove seedlings on the pretext of *in situ* conservation to help stabilise temporary shoals; deposition of garbage that helps in the stabilisation process; and building new piers, jetties, and bridges that restrict water flow and promote siltation.

Lagoons and estuaries and the biodiversity they contain are increasingly affected by pollution due to the inflow of sewage, untreated industrial effluents, urban wastes and waste oil. In the northwestern coastal belt, lagoons and estuaries are polluted due to chemical compounds from shrimp farms. Some of the lagoons/estuaries are degraded by coconut husk retting (e.g. Madu Ganga estuary, Bolgoda estuary, Negombo estuary), sand mining and use for anchorage of boats. Other adverse impacts felt are increased siltation due to development activities inland such as irrigation schemes, soil disturbance from agriculture, deforestation, mining and construction. The salinity regimes in several lagoons/ estuaries have been affected by changes in natural flows due to irrigation schemes. This sometimes triggers off the growth of invasive plant species such as *Najas marina* and *Salvinia molesta*. These habitats are also affected by indiscriminate harvesting of commercially important species.

A marked drop has occurred in the salinity of the Kalametiya lagoon due to the overflow from the Uda Walawe reservoir which was diverted into the lagoon in 1950. In contrast the salinity of the Puttalam estuary has increased by 25% in last 30 years, due to the decreased freshwater input from the Kala Oya and Mee Oya as a result of dam and irrigation construction.

Other issues connected with these habitats are the loss of functional lagoon/estuarine area due to unauthorised encroachment and land reclamation (e.g. the Bolgoda and Negombo estuaries, and the Mawella and Lunawa lagoons). There has also been loss of ecological and aesthetic value in some of the estuaries and lagoons (e.g. Bentota, Negombo and Madu Ganga estuaries and the Bolgoda lagoon). All these adverse impacts hamper the use of lagoons/estuaries for fishery, tourism, scientific research and education. This is of concern as, for instance, 30,000 part-time and full-time fishermen are engaged in the lagoon/ estuarine fishery in Sri Lanka.[10] Annex 3.3 provides specific details about the uses/functions of lagoons and estuaries, and the threats these habitats are currently faced with.

Damage and destruction of mangrove areas

Extensive damage to the naturally fragmented mangrove swamps has been caused by the transformation of large mangrove areas to other uses such as shrimp culture, lowland agriculture and housing construction. Overall, there has been a reduction of about 50% of the mangrove cover between 1986 and 2002 (Annex 3.1) largely due to encroachments. There is also over-use of mangrove resources (Annex 3.3). For example, the extraction of poles and fuelwood for domestic use and twigs for brushpile fishery is beyond sustainable levels. Mangrove ecosystems are also degraded by water pollution and siltation.

Destruction of salt marshes

Salt marsh areas in the country serve many vital ecological functions (Annex 3.3). They have been reduced quite considerably in the district of Puttalam where they have been converted for establishing shrimp farms. It is reported that the extent converted was nearly 2,960 ha between 1986 and 2002 (Annex 3.1). The main threats to these systems are summarized in Annex 3.3.

Degradation of sand dunes, barrier beaches and sand spits

Annex 3.3 summarizes the uses/functions and related activities and the main threats to this valuable habitat. Sand dunes, barrier beaches and sand spits in Sri Lanka are increasingly affected due to encroachments for construction of dwellings, indiscriminate allocation of land for construction of hotels, and transformation to agricultural lands for cultivation of coconut, tobacco, chilli, onion and other crops. Consequently, the littoral woodland zone' which typically

The formation and persistence of dunes depend on the delivery of sand by wind, and retention of sand by moisture and vegetation. Hence dunes become unstable unless covered by vegetation. On the other hand, barrier beaches that have remained stable over relatively long periods have been used for cultivation. Most of the stable dunes occurring close to city centres such as Kalpitiya and Hambantota have been cleared and converted to coconut plantations, vegetable plots (mainly tobacco, gerkin and onion), homesteads and for siting tourist hotels and other buildings. This can decrease dune stability. The removal of vegetation also results in dune migration as seen at Manalkadu.

has a thick growth of shrubs and low tree species is now greatly reduced in many areas. It is also evident in some areas of the southern and eastern coasts that some beaches and spits, as well as mangroves, have been lost due to sea erosion. This problem has been aggravated by coral mining, improperly sited coastal structures and sand mining on beaches and in the rivers.

Another problem is that beaches are treated as dumping grounds of solid waste, particularly in urban areas. Beaches are also polluted due to accumulation of tar balls formed when bilge waters from ships get washed ashore as reported from Wadduwa to Mirissa on the western and southern coasts.[11] (This may also adversely affect other coastal habitats such as coral reefs and sea grasses). In some coastal areas (e.g. Hambantota district) exotic plant species have been introduced for dune stabilization; concerns have been expressed of their adverse effects.

The main beaches along the southern coast from Kosgoda to Palatupana, Palaitivu islands in the northern coast and Arugam Bay in the eastern coast provide nesting sites for five turtle species that come ashore for nesting.

These habitats are getting degraded at a repaid rate due to indiscriminate allocation of land for construction of hotels, the proliferation of slums and shanties, incorrect siting of tourist facilities and ribbon development.

3.3 ADDRESSING HABITAT CONSERVATION

3.3.1 Policies, Plans, Laws and Institutional Arrangements

The rapid degradation of coastal habitats in the country highlights the need for their conservation and rational management. The management of coastal habitats in a comprehensive and holistic manner was initiated by the CCD with the two CZM Plans of 1990 and 1997 and the "*Coastal 2000: Recommendations for a Resource Management Strategy for Sri Lanka's Coastal Region*" produced in 1992. This led to the formulation and adoption of several management strategies covering regulation, education and awareness creation, planning and policy development, monitoring, research and coordination. These are included in **Table 3.1**. Conservation of coastal and marine habitats and their biodiversity are also addressed in the National Biodiversity Conservation Action Plan implemented

The conservation of coastal habitats in Sri Lanka dates back to 1938 when Wilpattu, Yala, Chundikulam and Telwatte areas bordering the Coastal Zone were declared Nature Reserves/ Wildlife Sanctuaries. The first declaration exclusively of a coastal habitat was in 1940 when the Ambalangoda- Hikkaduwa Rocky Islets were declared a Sanctuary. Since then several coastal areas have been given protected status and many conservation efforts have been initiated to conserve the diverse coastal habitats and their resources.

by the Ministry of Environment and Natural Resources. Provisions in the Coast Conservation Act No 57 of 1981and the Amendment No: 64 of 1988 also promote conservation of coastal habitats through regulatory action.

Table 3.1 Key management strategies adopted by the CCD for coastal habitat conservation

Regulatory	* Banning of all activities pertaining to sea coral mining * Permits from CCD made mandatory for all development activities in the Coastal Zone
Education and awareness	* Dissemination of knowledge through printed materials on the value of, and issues pertaining to coastal habitats * Inclusion of facts about problems affecting coastal habitats into the secondary school curriculum * Conducting awareness programmes on different coastal habitats for school children, teachers and key stakeholders
Planning and policy development	* Conservation of coastal habitats through Special Area Management Plans at Hikkaduwa Marine Sanctuary and the Rekawa lagoon
Monitoring	* Implementing a monitoring programme on coral and sand mining
Research	* Supporting research on coral reefs and mangroves
Co-ordination	* At the national level: Coast Conservation Advisory Council * At the local level: The Coast Conservation Coordinating Committee, Steering Committees and Community Coordinating Committees (CCCs)

3.3.2 Institutional mechanisms and key initiatives

There are several ministries, government departments and other agencies that are responsible for the conservation and management of coastal habitats. The CCD, the Ministry of Fisheries and Ocean Resources, The Ministry of Environment and Natural Resources, the Department of Wildlife Conservation (DWLC), The Forest Department, the National Aquatic Resources Research and Development Agency (NARA), the Central Environmental Authority (CEA) and the Urban Development Authority (UDA) each have a specific role to play in the conservation and management of various coastal habitats. The activities of the Irrigation and Agriculture Department also have major impacts on coastal habitats, as do the respective Provincial Councils, *Pradeshiya Sabhas* and Divisional Secretariat Offices.

MAJOR INITIATIVES TO CONSERVE COASTAL HABITATS

Coral reefs

* Establishment of two marine protected areas containing coral reefs: the Hikkaduwa Nature reserve (declared in 1979 and upgraded from a Marine Sanctuary in 1998) and the Bar Reef Marine Sanctuary (declared in 1992). Both are managed by the DWLC, and are selected as SAM sites under the CRMP 2002-2005. A management plan was developed for the Hikkaduwa Marine Sanctuary in 1996 and some activities have been implemented (*See Chapter 6 for details*). Management of the Bar Reef Marine Sanctuary is underway.

* Establishment of the coral reef research programme of NARA in 1985

* Identification of more than 20 coastal sites to be declared as Marine Parks and Sanctuaries by the Inter-Ministerial Committee on Marine Parks and Sanctuaries set up by NARA in 1982. This is yet to be achieved.+However It should be noted that most of these sites have now degraded due to natural causes (e.g. El-Nino) as well as human interventions.

* Declaration of a Fisheries Management Area in July 2001 off Yala, encompassing the Great and Little Basses reefs, the Kumbukkan Oya estuary and the Buttuwa rock, identified for protection due to their undisturbed reefs, unique setting and archaeological importance, especially due to the presence of several ancient ship-wrecks.

* Declaration of the Madiha-Polhena coral reef ecosystem as a Fishery Management Area in July 2001.

* A survey of coral reef fish and invertebrates and the socio-economic status of user communities through the Sri Lanka Marine Ornamental Fishery Project (1995-1998) carried out by NARA in collaboration with the Marine Conservation Society (UK). A handbook on protected marine species in Sri Lanka was published, and two workshops held for those in the ornamental fish trade.

* A meta database for coral reefs has been developed by the GCRMN and NARA and is currently been published and will be made available in CD and through the NARA web site.

* The Cabinet has approved and given directives to all government departments to ban the use of coral based lime in government construction projects.

* Coral reef areas within Arugam Bay, Kalkudah- Pasikuddah Bays, Pirates cove, Polhena, Weligama Bay, Nilaweli and Pigeon Island, Sillavathurai, Trincomalee Bay, Bar Reef and Unawatuna Bay are prioritised for management (*see chapter 6*).

* Declaration of protected and restricted marine fish species for export purposes under the Fisheries and Aquatic Resources Act No. 2 of 1996 and the Flora and Fauna Protection Ordinance (Amendment) of 1993

Estuaries and lagoons

* Declaration of several Fisheries Management Areas* in estuaries and lagoons to regulate and manage the fishery. Management has commenced in two by local communities through the establishment of Fisheries Committees (i.e. Negombo and Rekawa).

* Introduction of Regulations in 1998 under the Fisheries and Aquatic Resources Act No 2 of 1996 to protect groupers (listed under the restricted export category) from export.

* Action by NGOs for the protection and conservation of lagoons and estuaries.

* Preparation of a series of Wetland site reports covering several lagoons and estuaries (e.g. Koggala, Madu Ganga, Puttalam, Lunama - Kalametiya, Palatupana, Bundala, Karagam lewaya, Negombo–Muthurajawela, Mundel lake, Bentota, Chilaw, etc.).

Mangroves

* Conservation and management of ten mangrove habitats south of Colombo (Kaluawamodera, Ollewa, Meegama, Ittapana, Galatara, Berutuduwa/Hikkaduwa, Madu Ganga, Maagalla, Rekawa and Kahandamodera) and ten northwest of Colombo (Wanatavillu, Seguvantivu, Etthala, Kalpitiya I, Kalpitiya Ii, Mundalama, Merawala, Pambala, Talawila and Munnakara) by the Forest Department based on management plans.

Barrier beaches, spits and dunes

* Commencement of a programme by the Forest Department for development of *Casuarina* plantations on sand dunes for multipurpose investment.

* A district level project zoning plan is under preparation for the Hambantota District taking into consideration ecologically sensitive areas. Under this project, a dune protection line has been established.

* The Negombo Lagoon Fisheries Management Area declared in July 1998; The Rekawa Lagoon Fisheries Management Area declared in February 1999;The Bolgoda Lake Lagoon Fisheries Management Area declared in July 2001;The Batticoloa Lagoon Fisheries Management Area declared in January 2001.

Among the more specialized development oriented agencies operating in the Coastal Zone, the Ceylon Tourist Board has prepared a Master Plan for development of tourism, which includes guidelines

for hotel developers on pollution control. Considering the many institutions with responsibility for conservation and management of coastal habitats and their resources, an efficient mechanism to co-ordinate all such activities is required if effective management of coastal habitats is to be achieved.

Several Acts, which restrict the export of marine species including the Fisheries and Aquatic Resources Act No. 2 of 1996 and the Fauna and Flora Protection Ordinance No. 2 of 1937, and especially its subsequent amendment Act No. 49 of 1993 are also important in protecting resources of coastal habitats.

3.3.3 Future trends in management practices

Preparation of status reports on coastal habitats requires greater attention. They should be based on research to determine size of area, carrying capacity, threats, future trends and sustainable yield of resources; followed by dissemination of information to sectoral agencies and private sector organisations involved in planning, development or other activities in the area. A comprehensive database on coastal habitats to which interested public and private agencies and research workers can have easy access is a major need, along with a mechanism to regularly update such information. Developing a programme for monitoring and evaluating the success of coastal habitat management is also an important requirement.

Attempts at adopting an integrated approach to management of coastal habitats in the past indicate a need for closer co-ordination among institutions that have jurisdiction over various coastal resources.

Future strategies for conservation and rational management of coastal habitats should take due cognizance of the constraints encountered in the past. The management measures adopted by the CCD in respect of coastal habitats have relied considerably on regulatory initiatives. Strengthening institutional integration and community participation should receive high priority, since they have been identified as the weak links in implementing coastal resources management plans. Community participation is vital to resolve user conflicts encountered in different ecosystems, and Special Area Management should be adopted as a tool where possible to promote community participation in dealing with specific coastal habitats and the various issues connected with them.

The adoption of an integrated approach is required for law enforcement and the implementation of recommendations in other action/management plans pertaining to coastal habitats (e.g. the Biodiversity Conservation Action Plan prepared by the Ministry dealing with environment). There should also be adequate institutional co-ordination and co-operation in the preparation of all Coastal Resources Management Plans. For instance, integrated coastal habitat management involves close links with watershed management thus all agencies in the relevant discipline should get involved in the management process. It is also extremely important to ensure that development activities are regulated through appropriate procedures to address the crucial issue of coastal pollution. Public awareness is also considered to be an effective tool for habitat conservation. Therefore adequate emphasis has to be given in this respect in future management practices.

Future approaches for coastal habitat management should also be geographically specific and based on well-explained links between human activities and changes within the natural systems. The overall management objectives in respect of coastal habitats in the future should be to ensure the sustainable management of coastal habitats and for the preservation and enrichment of their natural features. Achieving this requires addressing the issues pertaining to each habitat separately in view of their specific characteristics and requirements. Care has to be taken to ensure that all policies and actions for conservation of coastal habitats comply with the National Physical Development Plan, the National Environmental Action Plan and the National Biodiversity Conservation Action Plan and the other national planning initiatives. It is important to implement coastal habitat management on a prioritized basis as some habitats are faced with severe threats that require immediate attention. While no attempt has, however, been made to prioritize coastal habitats for management action in this document, this could be an important aspect to be addressed in implementing the CZMP.

In order to address the future requirements for coastal habitat conservation, this chapter has identified a range of actions after analysis of the gaps in interventions adopted in the past as well as the current management requirements. Specific conservation issues have been identified for each habitat, and the policies, strategies and actions required to remedy these situations are provided accordingly in view of their present status and associated uses.

* The Negombo Lagoon Fisheries Management Area declared in July 1998; The Rekawa Lagoon Fisheries Management Area declared in February 1999;The Bolgoda Lake Lagoon Fisheries Management Area declared in July 2001;The Batticoloa Lagoon Fisheries Management Area declared in January 2001.

3.4 MANAGEMENT OBJECTIVES, POLICIES AND ACTIONS

OBJECTIVE 1
Coral reefs are conserved to enhance biodiversity, permit sustainable use of Bio-resources, sustain economic activity and provide a barrier against erosion

Policy 1.1
The degradation and depletion of coral reefs due to development activities within and outside the Coastal Zone will be minimised.

Strategy 1.1.1
Formulate, introduce and enforce (as relevant) appropriate legislation and regulations to minimize/eradicate damage to and destruction of coral reefs through development activities.

Proposed action

1. Enforce existing laws/regulations to prevent the degradation of coral habitats (*see also recommendations in Chapter 2 - Erosion Management*).
2. Implement the prevailing laws against sea coral mining more effectively.
3. Assist with controlling collection of inland coral in collaboration with the relevant authorities.
4. Carry out customised communication programmes (including awareness creation) for identified target groups such as coral-based lime users, coral miners, ornamental fish collectors, fishermen, tour guides and glass-bottomboat operators on laws/regulations relevant to preventing damage to coral reefs.

Strategy 1.1.2
Promote the use of alternative sources of lime to meet the requirements of the construction industry and agriculture.

Proposed action

1. Provide appropriate publicity to alternative substitutes for coral-based lime *(see also recommendations in Chapter 2-Erosion Management).*
2. Use market instruments to promote the use of substitutes to coral-based lime among different user groups.
3. Ensure the implementation of policy on the restriction of the use of coral-based lime in state construction works.

Strategy 1.1.3
Promote alternative livelihoods and/or facilities for those engaged in activities that damage or destroy coral reefs (such as coral mining, blast fishing and coconut husk retting) through community participation and awareness creation.

Proposed action

1. Initiate a programme of action to provide alternative livelihoods to sea coral miners.
2. Introduce alternative processing techniques in lieu of coconut husk retting in reef areas.
3. Implement the actions proposed in the chapter on Fisheries and Aquaculture (*Chapter 5*) to prevent destructive fishing practices that damage coral reefs.
4. Wherever possible, relocate anchorage facilities outside reef areas and facilitate relevant action.

Strategy 1.1.4
Prevent/minimize the adverse impacts of pollutants/sediment on coral reefs by supporting and promoting relevant initiatives through inter-agency collaboration.

Proposed action

1. Promote activities carried out by other agencies to reduce pollution of coastal waters, with special consideration to impacts on coral reefs.
2. Promote inter-agency collaboration to minimise the effect of marine pollution and its impacts on coral reefs.
3. Conduct customised communication initiatives and awareness campaigns to reduce pollution of coastal waters and encourage community group cleaning programmes of beaches +
4. Ensure strict adherence to guidelines provided by the CEA for all development activities that cause coastal pollution.
5. Initiate a programme to sample water quality in reef areas on a regular basis in collaboration with relevant organisations (*see also recommendations in Chapter 4 – Coastal Water Pollution Control).*

Policy 1.2
The biodiversity of coral reefs will be conserved/enhanced through adherence to sustainable fishery management practices.

Strategy 1.2.1
Prevent/minimize through appropriate management practices, over-exploitation of reef organisms such as aquarium fish, lobsters, chank, sea cucumber etc.

Proposed action

1. Implement the actions proposed in the chapter on Fisheries and Aquaculture *(Chapter 5)* pertaining to fishery associated with coral reefs.

Strategy 1.2.2
Integrate action relevant to conservation of biodiversity in coral reefs with other inter-sectoral plans and programmes.

Proposed action

1. Support implementation of actions proposed in the Biodiversity Conservation Action Plan as relevant for conservation of coral reef associated biodiversity.

Policy 1.3
Scientific research relevant to coral reef restoration and conservation will be promoted.

Strategy 1.3.1
Promote coral reef survey and restoration through collaborative research on these habitats and their resources and promote measures for sharing/effective dissemination of information.

Proposed action

1. Identify and disseminate information regarding priority sites for coral restoration, and the methods and the technology for reef restoration.
2. Initiate a programme in collaboration with local/foreign funding organisations and research institutions/universities to replant corals in areas where heavy destruction of corals is evident, with community participation.
3. Initiate a mechanism to promote collaborative research on coral reef organisms that could enhance quality of life (e.g. organisms of medicinal value).
4. Carry out a 'Crown of Thorns' starfish (Acanthaster plancii) eradication programme.
5. Study the impact of ascidians in coral reefs of the Unawatuna area and identify possible measures for mitigation.
6. Regularly update the meta-base developed by the GCRMN and NARA on corals and establish an inter-institutional meta-database on coral reefs and establish a mechanism to provide access to this information.
7. Improve socio-economic data collection on reef resource uses to facilitate management of reef harvesting and other uses.

Policy 1.4
Measures will be taken to ensure that tourism associated with coral reefs will be non-destructive of the resource.

Strategy 1.4.1
Promote tourism that is eco-friendly and non-destructive of coral reefs and the resources they contain through collaborative measures.

Proposed action

1. Promote participation of private entrepreneurs to establish ecotourism projects in suitable areas with the required community participation.
2. Collaborate with relevant stakeholders to identify tourism related practices that are destructive of coral reefs and initiate remedial measures
3. Initiate collaborative programmes with hotels/Tourist Board to provide interpretative facilities in hotels in areas with potential for coral reef viewing to increase enjoyment of the resource and for conservation.
4. Promote awareness among tourists on the conservation status of reefs and reef organisms through collaborative programmes with the Tourist Board, hotels and tour operators, Customs and Airport authorities.
5. Coordinate and support customised training programmes and reference material to assist with identifying coral reef organisms prohibited for export for relevant state officials.

OBJECTIVE 2
Lagoons and estuaries are conserved to sustain and enhance ecological functions and promote socio-economic activities connected with them

Policy 2.1
The degradation of estuaries and lagoons due to development activities within and outside the Coastal Zone will be minimised.

Strategy 2.1.1
Minimize the discharge of untreated industrial effluents and sewage into estuaries/ lagoons through monitoring and enforcing compliance with existing regulations and guidelines.

Proposed action

1. Carry out periodic sampling of water quality in estuaries/ lagoons to determine the impacts of industrial effluents (including effluents from shrimp farms) and sewage discharged into them.
2. Initiate and implement or support existing programmes in collaboration with Local Authorities and other relevant agencies to develop mitigatory measures to minimise adverse impacts of industrial pollution and curtail direct discharge of sewage to lagoons and estuaries.
3. Formulate a monitoring programme to ensure that all industries within the Coastal Zone adhere to environmental guidelines, standards and EIA procedures of the CEA.

Strategy 2.1.2
Minimise changes in estuarine/lagoon environments from adverse impacts of water diversion and irrigation schemes through collaborative programmes.

Proposed action

1. Develop a mechanism to integrate lagoon and estuary management with watershed management to minimise pollution/siltation/salinity changes caused by upstream development activities, including irrigation works.
2. Study the impacts of water diversion/irrigation on selected estuaries/lagoons and identify measures to mitigate adverse effects.

Strategy 2.1.3
Minimise reduction of functional area of estuaries/lagoons due to encroachment, reclamation and sand bar formation.

Proposed action

1. Survey and demarcate the boundaries of estuaries/lagoons after identification of institutions with jurisdiction over them.
2. Establish reservations around lagoons/estuaries to prevent illegal encroachments.
3. Ensure wherever possible that the lagoon front remains a common access area. In cases where water front development activities require restrictions, ensure that cross access is provided.
4. Provide adequate access by resource users to enter lagoons/ estuaries.
5. Enforce prevailing regulatory measures against reclamation and encroachment.
6. Study the impacts of sand bar formation/removal on selected estuaries/lagoons and identify measures to mitigate adverse effects.

Strategy 2.1.4
Support action to minimise pollution from adverse agricultural practices in the Coastal Zone and inland through collaborative efforts.

Proposed action

1. Initiate a monitoring programme to determine the effects of agricultural run-ff on estuaries/lagoons.
2. Coordinate with the Department of Agriculture and other relevant agencies, and their extension officers, to formulate programmes to regulate the excessive use of fertilizers and pesticides used in agriculture.

Strategy 2.1.5
Minimise threats to estuaries/lagoons from solid waste disposal.

Proposed action

1. Develop and implement programmes with Local Authorities and communities to minimise solid waste disposal into estuaries and lagoons in accordance with the Solid Waste Management Strategy developed by the Ministry of Environment and Natural Resources.
2. Plan and implement a programme to relocate existing solid waste dumping sites within the Coastal Zone (see also Chapter 4).
3. Promote activities to transform solid waste into economic products such as biogas and compost.

Policy 2.2
The economic, ecological and social values of estuaries and lagoons will be enhanced.

Strategy 2.2.1
Promote sustainable management of resources in estuaries and lagoons with community participation.

Proposed action

1. Ensure that the fishery in estuaries/lagoons is at sustainable levels by regulating gear, methods and effort.
2. Establish effective modes of communication with resource users and other key stakeholders to conserve and enhance the ecological, aesthetic and recreational value of estuaries/lagoons and their natural environs.
3. Promote ecotourism associated with lagoons with community participation at suitable sites.
4. Establish a mechanism to ensure the application of the 'polluter-pays' principle for conservation and community development activities.
5. Implement the relevant recommendations of the National Biodiversity Conservation Action Plan implemented by the Ministry of Environment and Natural Resources.

OBJECTIVE 3
Seagrass beds are conserved to sustain ecological functions and socio-economic values

Policy 3.1
Damage to seagrass beds from activities within and outside these habitats will be minimised.

Strategy 3.1.1
Minimise activities that damage seagrass beds through existing and proposed regulatory measures through collaboration with relevant agencies.

Proposed action

1. Enforce existing/proposed regulatory measures to prevent pollution, sand mining, destructive fishing methods and other activities that damage seagrass beds (*also see actions in Chapter 5 on destructive fishing methods*)

Policy 3.2
Research on seagrass beds in Sri Lankan waters will be promoted.

Strategy 3.2.1
Initiate inter-agency collaborative research and monitoring programmes that will help enhance management of seagrass beds.

Proposed action

1. Initiate and support existing programmes o carry out systematic mapping of critically threatened seagrass beds in Sri Lankan waters.
2. Initiate a programme to study the adverse effects of catchment hydrology and sand bar formation on seagrass beds and propose management measures

OBJECTIVE 4
Mangrove ecosystems are conserved to maintain biodiversity, sustain ecosystem services and socio-economic activities connected with them.

Policy 4.1
Further depletion and degradation of mangroves due to unplanned development activities will be prevented/minimised.

Strategy 4.1.1
Formulate and implement guidelines and regulations to prevent or minimise damage to mangrove systems through appropriate management strategies.

Proposed action

1. Identify sensitive mangrove areas where management is urgently needed, and formulate and implement suitable manag ment strategies.
2. Support implementation of conservation management plans prepared by the Forest Department for selected mangrove areas.
3. Formulate guidelines for mangrove replanting schemes to rehabilitate degraded mangrove areas. Regulate new development activities in mangrove areas through EIA procedures and permits.
4. Introduce a monitoring mechanism to identify the adverse impacts of present and future development activities within mangrove ecosystems and formulate suitable mitigatory measures.
5. Identify suitable sites where sustainable extraction of mangrove resources can be permitted, and formulate and implement guidelines for such uses.

Policy 4.2
The sustainable use of mangrove resources connected with economic activities will be supported.

Strategy 4.2.1
Support and promote sustainable management of mangroves for economic activities through agency collaboration and community participation.

Proposed action

1. Promote private entrepreneurs to establish ecotourism projects in suitable areas with community participation.
2. Formulate and implement customised communication/ awareness programmes for key target groups including school children, resource users and landowners in mangrove areas to promote understanding about the value of mangroves and inculcate commitment for conservation action.
3. Develop new alternative livelihoods/methods for current mangrove resource users to wean them away from destructive practices and to reduce resources dependency.
4. Identify other non–destructive uses of mangrove resources at community level and disseminate such information to stakeholders.
5. Establish a suitable mechanism to ensure inter-agency coordination and participation to promote sustainable use of mangrove resources.

OBJECTIVE 5
Salt marshes are conserved to sustain ecological functions and socio-economic values

Policy 5.1
Coastal development activities that degrade salt marsh areas will be minimised/ prevented.

Strategy 5.1.1
Ensure compliance with guidelines/regulations for new developments by strengthening coordinated action between relevant agencies.

Proposed action

1. Identify critical and important salt marsh areas in terms of their ecological and socio-economic importance, and formulate guidelines for planning development activities in them.
2. Determine carrying capacity/potential and prepare appropriately detailed zonal plans for prospective development in salt marsh areas jointly with relevant agencies and communities.
3. Regulate new activities and expansions (e.g. for salterns, shrimp ponds) in salt marsh areas according to existing laws, regulations and permits.
4. Develop a mechanism for relevant agencies to coordinate development activities within and around salt marsh areas.

Strategy 5.1.2
Promote sustainable development of salt marshes through planned communication for relevant stakeholders.

Proposed action

1. Formulate and implement a customised programmes for communicating about salt marshes and their values to key stakeholders (e.g. resource users and land owners) to enhance commitment for conservation.

OBJECTIVE 6

Barrier beaches, spits and sand dunes are conserved to sustain ecological functions and socio-economic and aesthetic values.

Policy 6.1
Coastal development activities that degrade barrier beaches, spits and sand dunes will be regulated.

Strategy 6.1.1
Minimise adverse impacts of development activities on barrier beaches, spits and sand dunes through regulatory measures and establishment of Dune Protection Lines (DPLs)

Proposed action

1. Declare barrier beaches, spits and sand dunes located in front of low-lying areas as Critical Zones and prohibit all activities detrimental to these declared areas.
2. Declare and implement siting criteria for new development activities close to barrier beaches, spits and sand dunes.
3. Make EIAs mandatory for siting new development in close proximity to barrier beaches, spits and sand dunes where necessary in areas outside the Coastal Zone.
4. Enhance co-ordination with relevant agencies to ensure compliance of all regulations pertaining to new development in close proximity to barrier beaches, spits and sand dunes.
5. Collaborate with concerned organisations to prevent allocation of crown land adjoining barrier beaches, spits and sand dunes for development purposes.
6. Establish Dune Protection Lines (DPL) in important dune areas based on a land surveys, considering the 2002 setback standards stipulated in this document.
7. Prohibit all new development activities, and further expansion of already existing structures within the DPLs.
8. Devise effective programmes to communicate with key stakeholders on the importance of maintaining Dune Protection Lines (DPLs).
9. Manage and regulate exploration/extraction of commercially valuable minerals and mineral sands from barrier beaches, spits and sand dunes in conformity with the Minerals and Mines Act No 33 of 1992 and in consultation with the GSMB and enforce legal action against violators.

Policy 6.2
Coastal pollution that degrades barrier beaches, spits and sand dunes will be minimised/prevented.

Strategy 6.2.1
Mobilise Local Authorities and stakeholders to minimise dumping of solid wastes and dredged material on barrier beaches, spits and sand dunes.

Proposed action

1. Assist the Local Authorities to relocate existing dumping sites located within the barrier beaches, spits and sand dunes.
2. Launch beach cleaning campaigns with the participation of all stakeholders and Local Authorities
3. Formulate management groups among dwellers in beach areas and jointly develop guidelines to maintain barrier beaches, spits and sand dunes and prevent pollution of these areas.

Policy 6.3
Activities that promote degradation of biodiversity in barrier beaches, spits and sand dunes will minimised.

Strategy 6.3.1
Conserve the biodiversity of barrier beaches, spits and sand dunes through effective communication.

Proposed action

1. Collaborate with Local Authorities and formulate protection societies with a view to effective communication and education to enhance interest and commitment for conservation of barrier beaches, spits and sand dunes.
2. Prepare and distribute printed materials on environmental significance of this ecosystem.
3. Display sign boards indicating the importance of clean barrier beaches, spits and sand dunes.

Strategy 6.3.2
Minimise human activities that lead to the reduction of biological diversity through inter-agency collaboration.

Proposed action

1. Prohibit removal and destruction of fauna and flora from barrier beaches, spits and dunes
2. Promote and launch a programme in collaboration with the Forest Department to plant suitable indigenous flora in damaged areas (*see also recommendations in Chapter 2 on dune vegetation*).
3. Identify areas important as nesting sites for sea turtles and take collaborative action to conserve such areas.
4. Take necessary collaborative action to prevent and mitigate problems of invasive species such as *Prosopis juliflora*.

References:

1. MOENR. 2002. *State of the Environment in Sri Lanka: a Report for SAARC,* compiled and ed. J D S Dela. Colombo: Ministry of Environment and Natural Resources.

2. Sanders, M., Jayawardene, A., and Ediriweera, S. 2000. *Preliminary assessment for the shrimp fisheries of the Negombo Lagoon (Sri Lanka)*. Rome:FAO Fisheries Circular 958, (FAO, Rome).

3. Alwis, M. M., and Dayaratne, P. 1992. Present status of the fishery for fin fish and shell fish resources of the Puttalam estuary in the northwestern province of Sri Lanka. Paper presented at the 3rd Asian Fisheries Forum, Singapore.

4. Rajasuriya, H. Zahir, E.V. Muley, B. R. Subramanian, K. Venkataraman, M.V.M. Wafar, S.M. Munjurul Hannan Khan and Emma Whittinham , 2000. Status of coral reefs in South Asia: Bangladesh, India, Maldives and Sri Lanka. In status of coral reefs of the world:2000 A GCRMN publication Edited by C. Wilkinson, pp 95- 113

5. Rajasuriya, A., and White, A. 1995. Coral reefs of Sri Lanka: Review of their extent, condition and management status. Coastal management, Vol. 23, pp77-90

6. Rajasuriya, A. and Premaratne, A. , 2000. Seas at the millennium: An environmental evaluation. Volume II, regional Chapters: The Indian Ocean to the Pacific. Edited by C. Sheppard, Pergamon press: 175-187.

7. Swan, B. 1983. An Introduction to the Coastal Geomorphology of Sri Lanka. Colombo: National Museums of Sri Lanka.

8. Samarakoon, J.I.and pinto, L., 1988 Synthesis report for information on critical habitats in the coastal zone . Workshop on critical habitats in the coastal zone CCD/USAID/URI pp106

9. Amarasinghe, M. D., 1996 mangrove eco-systems in Sri lanka-flora, fauna and their socio-economic significance published by Mangrove Information Centre, Small Fisheries Federation, Pambala, Sri Lanka. 25pp.

10. FAO/ADB,1998. Sri lanka Fisheries sector study. Report of the FAO/ADB Cooperate Program, Rome:FAO

11. Wickremaratne S W and Pereira R P (1986) Observation on the deposition of tar balls on beaches of Sri Lanka, Proceedings of the 41st annual sessions of SLAAS, Colombo Sri Lanka.

4. CONTROLLING COASTAL WATER POLLUTION

4.1 INTRODUCTION

4.1.1. Significance of the problem

*P*ollution in its wider perspective could be interpreted in many different ways. 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 of animals, birds, wildlife, aquatic life or to plants of every description."

The problem of water pollution in Sri Lanka's coastal region+ has been growing over the past few decades. Ocean waters, coastal surface waters - comprising rivers, streams, estuaries and lagoons - and ground water in coastal areas receive high pollution loads from development activities and human settlements located in and outside the Coastal Zone. The sustainable development of fisheries, tourism and other industries and subsistence of local communities depend considerably on the productivity of the diverse habitats and resources within this area. The near shore waters in particular are used extensively for recreation, fishing, etc. for which different levels of water quality are required.

The degree of pollution should be closely monitored within the coastal waters, and their uses should be regulated according to existing guidelines (e.g. for contact recreational activities such as swimming and snorkelling and non-contact recreational activities such as boating and wind surfing).

The impacts of pollution on the coastal and marine ecosystems and their resultant biological as well as socio-economic implications are many and varied. There are strong indications that the cost of coastal water pollution in Sri Lanka is on the rise. For example, the cost to human health from coastal water pollution in the Colombo Metropolitan Area is estimated to have increased from SLRs. 2 million in 1992, to SLRs. 4 million in 1997 and SLRs. 14 million in 2002 respectively[1]. There are also losses associated with decreased biological diversity, reduced aesthetic, recreational, cultural and archaeological value; declining land prices and reduced revenue from tourism, fisheries and other development activities. There are also some definite links between increasing levels of pollution and loss of coastal land values and fishery productivity. For example, the estimated annual loss of income from fish sales in the Lunawa lagoon due to pollution is approximately SLRs 1,963 million and the total annual land value decline in the area is estimated to be SLRs 712 million[2,3]. Since the benefits expected from coastal water pollution management are substantial, reducing water pollution in the coastal region is of paramount importance.

The Lunawa lagoon has been severely affected by industrial effluents. The Negombo estuary has been affected due to industrial effluents, sewage, oil from fishing crafts, boat repair stations and fuel supply stations along the bank; the Kelani estuary is polluted with industrial effluents and sewage; and the Valaichchenai and Walawe Ganga estuaries are polluted due to wastes received from state owned paper factories.

MORE ON COASTAL WATERS AS THE CONDUIT OF POLLUTION

Coastal near shore waters receive considerable pollutants by way of sewage, industrial and domestic wastewater and solid materials from land-based activities. They are released directly into the ocean or are conveyed through rivers, estuaries and lagoons. This is of concern particularly as the designated uses of near shore waters are dependant on specific levels of water quality.

Coastal waters in estuaries and lagoons are subject to heavy pollution loads, though the level of pollutants in them changes due to dilution and flushing by riverine flow or tidal action. Pollution of these waters has an impact on the important habitats associated with them and the diverse and economically important fauna and flora they contain.

Sri Lanka has 103 rivers that radiate from the central hills and flow down to the coast. These rivers are subject to different pollution stresses; some carry very high pollution loads consisting of organic and inorganic pollutants, faecal matter, waste oil and visual pollutants. The degree of pollution in rivers may differ temporally as well as spatially as pollution loads entering them at various points vary considerably.

Groundwater is derived mainly from rainwater seepage and the recharge from surface water bodies such as streams, canals and reservoirs. The estimated ground water availability in the island is around 7,250 million cubic meters[4]. The richest source of ground water in Sri Lanka is the Karst limestone aquifers in the coastal districts of Puttalam and Mannar extending to the Jaffna peninsula[4]. Over the past years, ground water has been extracted increasingly for domestic, agricultural and industrial purposes, from both shallow dug wells and deep tube wells.

Serious threats to ground water have been observed in many coastal areas due to nitrate and bacterial contamination. The main pollution problems in the ground water of coastal areas are leachate of fertilizers causing nitrate pollution; seepage from faecal matter and pollution with heavy metals in industrial zones[5]. Treatment of ground water is very costly so that preventing pollution is of considerable importance. Another concern is that higher rates of water extraction in coastal areas than is sustainable has led to brackish water intrusion into wells, particularly in the northern and north western coastal areas where well water is extensively used for agriculture.

Pollution of ground water

Although an accurate assessment of water pollution caused by agricultural run-off has not yet been carried out, some studies indicate a link between the two. In the Kalpitiya peninsula, characterised by highly permeable soils and a shallow water table, the irrigation wells in extensively cultivated areas have high nitrate concentrations (i.e. in excess of the WHO guideline of 10 mg/1) and a chloride concentration ranging from 50-200 mg/1. In contrast, domestic wells located outside these areas have nitrate levels less than 2 mg/1 and chloride concentrations less than 100 mg/1[6]. There is widespread ground water contamination in the Jaffna peninsula attributed to agricultural run-off and the extensive use of pit latrines[6]. High concentration of nitrates has been recorded in the ground water of the Jaffna peninsula resulting in the "*methaemoglobinaemia*" or blue baby syndrome among those who use the contaminated waters [4].

Source: Manchanayake and Madduma Bandara 1999[4] and Mubarak 2000[6]

4.1.2 Nature of coastal water pollution

Key factors underlying coastal water pollution

The main factors underling water pollution in the coastal region are the high human population densities particularly in the areas where industrial and tourism related activities are predominant. (*see Chapter 1*). Problems related to coastal pollution can be expected to increase further in the future as major social, and economic development activities continue to take place along the coastal belt.

Types of pollutants and their sources

Coastal waters are polluted mainly due to the release of untreated or partially treated wastewater and toxic substances from industries, tourist resorts and shrimp farms, the dumping of solid waste in coastal areas, the receipt of raw sewage and contamination with waste oil released from fishing boats, ships, coastal service stations and oil spills. These waters also receive fertilizer and agro-chemical run-off from agricultural lands, and waste from squatter settlements and other domestic sources. The pollutants that reach coastal waters vary from faecal matter, visual pollutants that float or are in suspension, nutrients rich in nitrogen and/or phosphorus, toxic and non-toxic organic substances and heavy metals, waste oil and thermal discharges (Table 4.1). They may originate from specific point sources such as industries, urban sewers or sewage treatment plants and coconut husk retting sites, and (a) be transported through coastal waterways such as rivers, streams and estuaries, or (b) through direct leakage and seepage. They may also originate from non-point sources (run-off) that are more difficult to control, such as agricultural lands, sewage from built-up areas and mines.

Table 4.1:Type of pollution, sources and main adverse impacts

Type of pollution	Key sources	Adverse impacts
Faecal pollution	* Municipal sewage * Industries * Tourist sector * Aquaculture * Squatter settlements	* Water related diseases * Affects the growth of marine flora and fauna * Foul odours, Spoils scenic value * May lead to anaerobic environments

Type of pollution	Key sources	Adverse impacts
Visual pollution	* Industries * Tourist sector * Agriculture and aquaculture * Squatter settlements * Municipal and domestic solid waste	* Spoils scenic value * Affects habitats and breeding grounds of fauna * Affects growth of marine vegetation such as sea grass by reducing light penetration
Enrichment with nutrients such as nitrogen and phosphorus	* Municipal sewage * Industries * Tourist sector * Agriculture and aquaculture * Squatter settlements * Municipal and domestic solid waste	* Stimulates algal growth * Causes change or decline of biodiversity * Changes water quality
Organic (non-toxic and toxic) and heavy metal pollution	* Industries * Tourist sector * Agriculture and aquaculture * Squatter settlements * Municipal and domestic solid waste	* Bio-accumulation of substances that are carcinogenic or causes health hazards in marine fauna * Decline of biodiversity * Persistence in the marine or coastal environment for long periods * Affects growth and reproduction of marine fauna
Oil pollution	* Industries * Boats, ships, oil spills and service stations	* Spoils scenic value * Destroys marine fauna and flora
Thermal pollution	* Power sector * Industries	* Affects benthic fauna with the formation of oil slicks and tar balls * Affects migration patterns of fauna * Affects the growth of marine flora and fauna * Causes changes inecosystems * Stimulates algal growth

4.2 ISSUES AND THREATS

4.2.1 Inadequate municipal sewage disposal facilities

Faecal pollution is a major problem in some coastal waters due to the direct discharge of untreated municipal sewage into land and waterways. Colombo is one of the few cities in Sri Lanka with an installed sewerage system. A part of the sewer connection is diverted to the sea at Mutwal through a long sea outfall located north of the Colombo Port, and the rest is sent out through another long sea outfall at Wellawatta. The capacity of the sewerage system is inadequate to cater for the entire Colombo city as it is about 100 years old, and needs frequent repair. Another problem is the illegal sewage connections to sewerage lines and unauthorized connections to storm water drainage systems and combined sewers.

Sewage disposal facilities in the greater Colombo area

Faecal contamination of surface and ground water is compounded by the growing urban population in coastal areas with inadequate housing and sewage disposal facilities. For instance, the Colombo Municipal Council Area had a population of 642,163 in 2001*. In 1992, roughly about 19% of the Greater Colombo Population was served by sewers, 59% had onsite facilities, but about 22% had none, or grossly inadequate sewage disposal systems. The latter category - primarily from low-income squatter settlements that are underserved - releases about 138 tons of sewage/ day into the city's waterways.

NWSDB 1993 cited in Mubarak 2000[6]; Department of Census and Statistics, 2001[7]*

4.2.2 Inadequate facilities for waste disposal in underserved settlements

*M*any highly populated coastal low-lying areas have a shallow water table and a high vulnerability for flooding. Inadequate drainage facilities and ad hoc development in these areas have further intensified the impacts of inappropriate sewage disposal in low-lying flood prone coastal areas, leading to severe faecal pollution in internal and near shore waters.

The problem of sewage disposal in Colombo is compounded by the inadequacy of urban infrastructure for the city's poor. At the turn of the last century there were about 1,500 shanty settlements in the city, comprising around 66,000 households sheltering about 51 per cent of the city's population[8]. These settlements are under-served in respect of sanitation, safe water and waste disposal facilities[6]. Pollution from these sources cause reduction of dissolved oxygen in the canals and streams, resulting in an anoxic environment and a foul odour that is harmful to human health and aquatic organisms.

4.2.3 Industrial effluents

*T*here are nine Export Processing Zones (EPZ) and two large scale Industrial Parks (IP) operating under the purview of the BOI. Of these, two EPZs (Katunayake and Koggala) and one IP (of 20 ha in Mirijjawila) are located in the coastal region. In addition, there are seventeen other Industrial Parks managed by the Ministry of Industries Of these, three parks - at Bata-atha, Ratmalana and Udukawa - are located in the coastal region. Four other IP s at Panadura, Weligama, Ekala and St. Martin Estate Chilaw are also located in the coastal region.

Industrial effluents that have undergone little or no treatment are frequently received by near shore waters, lagoons and estuaries through run-off, leakage and seepage.

Most of the industries located in the coastal area belong to either the medium or low polluting category. In 1994, Sri Lanka had 336 industries with a high or medium pollution potential in the Coastal Zone[6]. Industries that contribute most to water pollution are those dealing with textiles, paper, tanning, metal finishing and engineering, paints, chemicals, cement, food and beverages and distilleries. Small Industries that deal with coconut fiber retting also have highly localized impacts on water pollution as they result in high BOD_5 * and COD values.+

Most industries are not yet equipped with the basic infrastructure for waste treatment, while others are constrained in the use of available waste treatment facilities due to the high costs involved. Only the Export Processing Zones at Katunayake (KEPZ) and Biyagama (BEPZ) have facilities for central treatment of wastewater prior to discharge.

Table 4.2 shows the number of industries located in coastal areas with their respective wastewater loads. These include those set up under the Board of Investment (BOI). Table 4.3 depicts the tolerance limits for industrial and domestic discharges into coastal waters.

Table 4.2: Industries located in coastal areas with high or medium pollution

Type of industry or process	No. of units	Total waste water කල්පරාන	Estimated pollution load (kg/day)		
			BOD_5	COD	Total toxic metals
Textiles	41	7100	4970	11360	-
Food and beverages	47	4111	6166	12333	-
Desiccated coconut	53	1200	4200	7200	-
Rubber processing	229	4840	9670	29040	-
Tanning+	15	750	2000	5200	-
Metal finishing and preparation	76	6692	-	-	669*
Paints and chemicals	33	928	-	-	92.8*

- not measured * based on assumed average concentration of 100 mg/l
Source: ERM 1994 cited in Mubarak 2000[6]; +MoEDIPIP 2002 (unpubl)

* Biochemical Oxygen Demand (BOD) measures the amount of dissolved oxygen that micro organisms consume as they oxidize organic materials over a given period.

\+ Information provided by the Ministry of Enterprise Development Industrial Policy and Investment Promotion, 2002

Table 4.3: 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 plus10%
Particle size of	
(a) Floatable solids, max	3mm
(b) Settlable solids, max	850 mm
P^H range at ambient temperature	6.0-8.5
Biochemical Oxygen Demand (BOD_5) in 5 days at 20^0C, mg/l, max	100
Temperature, max (^{0}C)	45^0C 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, m curie/ml, max	10^{-8}
(b) Beta emitters, m curie/ml, max	10^{-7}
Organo-Phosphorus compounds, mg/I	1.0
Chlorinated hydrocarbons, mg/I 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 1980 as amended by Act No. 56 of 1988.

The impact of industrial pollution in the Lunawa Lagoon

The Lunawa lagoon is a coastal water body seriously affected by industrial pollution. About 07 large scale and 14 small-scale industries for dying and finishing of textiles/garments, washing plants and manufacturing foot wear directly discharge their effluents into the lagoon. As a result, the once flourishing fishery in this lagoon has almost ceased; and it is now a mosquito-ridden body of stagnant water with a dense growth of water plants and thick sludge at the bottom.
Source: Ministry of Urban Development, Construction and Public Utilities, 2001

4.2.4 Pollution from tourist establishments

It is significant that about 89% of Sri Lanka's tourist arrivals are for pleasure. This type of tourism depends on the quality of the environment, especially as tourists today are increasingly sensitive to pollution or environmental degradation at their travel destinations. For tourism in the Coastal Zone to be sustainable, coastal pollution has to be managed to prevent adverse impacts on the industry.

MOENR, 2002

About 70% of tourist hotels registered with the Tourist Board are within the coastal region (*Chapter 1*). The adverse aspects of uncontrolled mass tourism at the start of the tourist boom are now becoming apparent in many coastal resorts where there are clusters of restaurants and guesthouses, and other major tourist centres. The near shore waters receive untreated sewage, sullage

in the form of kitchen and laundry wastewater, and solid waste including plastics. This causes pollution problems, as apparent in most major tourist centres along the south and southwest coasts. Tourism expansion in Hikkaduwa, Beruwala and Unawatuna areas has led to water quality degradation as well as visual pollution of beaches and near shore waters. The problem of sullage is particularly perceived as a problem associated with the larger hotels.++ Squatter settlements connected with tourism development is another cause for concern as it contributes to faecal pollution which is a severe threat to recreational activities such as contact sports in coastal waters.

4.2.5 Pollution from the power sector

At present Sri Lanka depends mainly on hydropower, which is low in terms of environmental pollution for power generation. In 2001 hydropower contributed 61 % to the total installed capacity of 1,909 MW. However, its contribution towards annual power generation is steadily decreasing[9]. The shortfall between power demand and hydropower output is expected to be bridged in the future by the establishment of thermal power plants and the establishment of these plants in the coastal region can result in the thermal pollution of coastal waters.

++ CRMP water quality monitoring study, 2002

4.2.6 Pollution from the fisheries sector

Expansion of fishery harbours and fish landing sites too contributes to pollution of coastal waters due to improper disposal of used oil from fishing boats and accidental release of oil. The improper handling of fish and the resultant fish waste in fishery harbours/ landing sites also cause higher COD levels in the affected coastal waters.

4.2.7 Unsanitary disposal of solid waste

Solid wastes include non-liquid garbage and refuse from domestic, institutional, market, medical, commercial and industrial sources, and street and garden wastes. This also covers discarded organic wastes (i.e. food, vegetation, paper, cardboard, rubber, leather, discarded clothing, etc.); packaging in the form of metals, plastics or glass; and cut pieces from garment factories.

Source: MOENR (2002)[11]

Sometimes, solid waste is dumped indiscriminately into canals and streams and is carried into coastal waters due to tidal action (e.g. Negombo estuary).
When the water level recedes with the onset of low tides the solid waste remains at the shoreline and gives rise to visual pollution.

Environmental hazards related to solid waste have been growing in Sri Lanka during the last few decades, and continue to be a problem. The rate of waste collection by the Local Authorities island-wide is estimated to be about 2,694 t/day[10] but the problem is essentially urban and 54 percent of the waste is generated in the Western Province[10].
Table 4.4 depicts solid waste disposal sites in the Coastal Zone of some areas in four coastal districts and the quantity of waste disposal. It shows that the section of the Colombo district from Wellawate to Panadura contains much of the coastal dumping sites followed by Kalutara.

Table 4.4: Quantities of solid waste dumped in the Coastal Zone in selected areas of four coastal districts in 2002

District	Less than 3 (m^3)	Between 3 and 10 (m^3)	Greater than 10 (m^3)
Colombo (from Wellawatta to Panadura)	03	15	13
Kalutara	08	11	08
Matara	04	05	04
Gampaha	00	03	05

Source: CCD unpublished data, 2002

4.2.8 Pollution from agriculture and aquaculture

Agriculture

There is heavy use of chemical pesticides, herbicides and fungicides in agriculture, some of which are persistent. These substances degrade the soil as it adsorbs contaminants in the leachate, culminating in pollution of ground water. Polluted ground water used for agriculture and the resultant run-off from agricultural lands contaminates coastal surface waters. In addition, the excessive use of fertilizers causes nitrate pollution in coastal areas.

The impact of agriculture on water pollution

One of the adverse impacts of the green revolution is the trend towards the high use of agrochemicals due to the use of new high yielding varieties in agriculture that are very susceptible to various pests and diseases and have increased nutrition requirements[11].

Consequently, the artificial fertilizer use in Sri Lanka has increased from 20,000 t of N, P, K during 1950-51, and 195,000 t in 1974-1975 to 525,651 t in 1995. This trend has continued and use had increased by 9% from 1998 to reach 612,000 t in 1999. It is significant that the annual average level of chemical fertilizer use in Sri Lanka is estimated to be 77 kg/ha, which is two to eight times more than tha usage in other Asian countries.

Source: MOENR 2002[11], Central Bank 2000[8]; ed. Somasekaram et al, 1997[12]

Aquaculture

Shrimp farm effluents reaching the Dutch Canal are high in total suspended solids (200-600 mg/l) and have high BOD levels (60-180 mg/l). These effluents cause heavy siltation in the canal, increasing turbidity. High sulphides and ammonia levels in these waters are also attributed to shrimp farm effluents.

Source: Corea et al 199513

Much of the coastal pollution in the Northwestern Province has been attributed to ad hoc development of shrimp farming leading to the discharge of high loads of effluents from shrimp ponds. This has already caused considerable pollution in the Dutch Canal and the surrounding coastal areas. High levels of nitrates and phosphates released from shrimp farms into the coastal waters have caused eutrophication of nearby watercourses in the region and pollution of ground water.

4.2.9 Pollution from oil spills and other discharges

Major commercial ports contribute to pollution of coastal waters due to accidental release of oil. Poor reception facilities for waste oil, ballast and bilge waters cause the port waters to be polluted. Such facilities, as well as pollution abatement plans, are a vital requirement for the proposed Ports in Hambantota, Colombo South and Galle.

Waste oil from oil tankers, discharge of oil in bilge and ballast waters, cleaning out of fuel tanks and repair and maintenance work by motorized fishing boats and ships around ports and fishing harbours, cause minor oil discharges and slicks. While they may not cause serious impacts, they result in visual pollution leading to depreciation of aesthetic quality of the beaches for recreation. There have also been four moderate spills of crude oil reported in Sri Lankan marine waters[14] and intrusions of tar balls on to the beaches. As they pose a risk to coastal habitats and species, abatement plans for oil discharges are required. Waste oil from service stations also ends up in coastal waters, underlining the need for service stations to intercept the oil with separators. Currently most lack these devices, and even when present they are often defective.

There are specific arrangements for the disposal of waste oil from ships that call at the Port of Colombo during loading or unloading of cargo. About 36 private companies are registered with the Marine Pollution Prevention Authority (MPPA) to collect the oil waste, which is pumped into bowsers directly from the ships[15]. Table 4.5 depicts the waste oil collected by the operators over the past five years at the Colombo Port. Even so the final disposal of this oil is not monitored by any regulating authority.

Table 4.5: Amounts of waste oil collected or removed by collectors in the Colombo Port

1998 (t)	1999 (t)	2000 (t)	2001 (t)
1403.6	1667.5	2078.0	1878.0

Source: MPPA database, 2002[14]

4.3 PLANS, POLICIES AND IMPLEMENTATION STRATEGIES

Coastal pollution was not addressed in the first Coastal Zone Management Plan of 1990, but had been brought in to the revised CZMP of 1997. There are many policies, laws and programmes in place that have a bearing on controlling coastal water pollution. For instance major development projects taking place in the Coastal Zone (except fishing) are subject to Environmental Impact Assessments. These include the prescribed projects listed in the National Environmental Act No. 56 of 1988, with the CCD functioning as the Project Approving Agency (*see Chapter 8*).

The key regulatory tools in place that could stem industrial pollution of coastal waters are the Environmental Impact Assessment (EIA) procedures and the Environmental Pollution Licensing (EPL) scheme. The latter is mandatory for the prescribed activities under the gazette notification extraordinary No. 1159/22 dated 22nd November 2000. An EPL can be obtained from the CEA, BOI or a Local Authority and is valid for three years. Even so, lapses in enforcement of pollution control, and poor technology for pollution abatement in a large number of industries result in coastal water pollution from industrial sources.

The CCD is currently engaged in various corrective and preventive activities to either control or minimize water pollution in the Coastal Zone. Many of these require mechanisms for effective coordination and collaboration with other institutions and agencies. For instance the National Water Supply and Drainage Board (NWSDB) is responsible for providing good quality water and adequate sanitation in rural and urban areas at the national level. The problem of inadequate sanitation for under-served settlements in Colombo is also being addressed by many agencies. An example is the Sustainable Township Programme (STP) for occupants in under-served settlements in Colombo under the direction of the Real Estate Exchange Ltd (REEL).

Although water quality monitoring is essentially a pre-requisite for mitigation of pollution in coastal waters, there is so far no single institution mandated with legal responsibility for regular water quality monitoring in the near shore waters, lagoons and estuaries, and inland in the Coastal Zone. The MPPA is mandated to control the pollution of marine waters, but only when it involves offshore sources. Several agencies such as the BOI, the CEA and CCD, however, have the authority to monitor water quality in the Coastal Zone and to regulate discharges from development activities; and some line agencies such as NARA, NWSDB, SLRDC and ITI and universities and other research institutions carry out monitoring and research from time to time.

Sri Lanka is yet to develop ambient water quality standards for different uses of coastal waters. The CEA has proposed ambient water quality standards for different uses of coastal waters, but these require review prior to finalization, as the changes of water quality due to seasonal effects have to be addressed more adequately.

The government's decision to establish more industrial parks where facilities for pollution abatement will be provided will be a major step towards reducing pollution incidences in coastal waters. The government has also prepared a National Solid Waste Management Strategy based on suitable regulatory controls necessary for its implementation. Regulations for control of collection, storage, transport and disposal of hazardous waste have been gazetted in 1996, and the Ministry of Environment and Natural Resources is working towards setting up a hazardous waste management system[16,17]. On the other hand, addressing non-point sources - including pollution from agrochemicals - is difficult as there are no specific policies and effective implementation mechanisms to address such problems.

Future directions for managing coastal water pollution

Although coastal water pollution is a key issue to be addressed in the management of the Coastal Zone, the CCD cannot tackle this problem alone. Taking cognizance of the large number of institutions and agencies that play a role in coastal pollution control, there is a clear need for integrated coastal zone management based on collaborative arrangements. This will require considerable strengthening of the capabilities of Local Authorities to play an

important role in monitoring coastal water bodies within their jurisdiction. A budgetary allocation to monitor coastal water pollution by each Local Authority is required for spatial and temporal water quality monitoring at pre-determined sites. Proper water quality indices should be developed to enable the ranking of coastal water resources, and engineering interventions are required to rectify conditions in coastal water bodies that are of poor quality.

Laws and regulations should be strengthened to regulate major sources of pollution; thereby reducing pollution loads entering coastal waters. More stringent enforcement mechanisms should also be in place to reduce the frequency and magnitude of major pollution incidences in coastal waters.

4.4 MANAGEMENT OBJECTIVES, POLICIES AND ACTIONS

OBJECTIVE 1
Acceptable coastal water quality is maintained by minimising the discharge of untreated or /and partially treated effluents from development activities.

Policy 1.1
All existing development activities in the Coastal Zone will be required to comply with CEA standards on disposal of effluents.

Strategy1.1.1
Ensure that all exiting development activities in the coastal region comply with CEA standards for effluents through regular monitoring of coastal water quality.

Proposed action

1. Initiate a water quality monitoring programme to check ambient water quality in the coastal waters to capture high incidence of pollution and help identify polluting industries in the area.
2. Identify low and high polluting development activities in the coastal region and prepare a database in collaboration with the CEA.
3. Take necessary and appropriate actions to ensure that development activities likely to pollute the coastal zone and coastal waters adhere to CEA standards on disposal of effluents.
4. Promote the formulation of effluent standards for those development activities that do not have disposal standards (e.g. for Aquaculture), in collaboration with the relevant authorities.

Policy 1.2
Support the relocation of high polluting industries that significantly degrade ambient water quality of coastal waters and promote the use of pollution abatement technologies.

Strategy 1.2.1
Identify high polluting industries and facilitate their access to technology for controlling emission of effluents degrading ambient water quality of coastal waters; encourage relevant authorities responsible for their relocation and assist with providing such industries with appropriate pollution abatement technologies and/ or financial incentives.

Proposed action

1. Coordinate with the relevant authorities and stakeholders for relocation of high polluting industries.
2. Facilitate access to information on technology providers for pollution abatement and on cleaner production technologies among industries affecting the Coastal Zone.
3. Assist the relevant agency to provide possible financial incentives to relocate industries to enable better access to pollution abatement technologies.

Policy 1.3
Only those development activities that are consonant with ambient water quality parameters at selected sites will be permitted.

Strategy 1.3.1
Carry out periodic monitoring of coastal waters at selected sites to check whether new development can be permitted in them without exceeding the maximum permissible levels of ambient coastal water quality parameters stipulated in the guidelines prepared by CCD/ CEA for various designated uses.

Proposed action

1. Select coastal sites of critical economic importance and establish ambient water quality for each site with spatial and temporal water quality monitoring.
2. Identify potential designated use/s of selected coastal waters in consultation with other relevant authorities.
3. Identify sites where new development can be permitted, based on designated use/s and ambient water quality of the site.
4. Carry out a study to identify likely sources of pollution at 'critical sites' where ambient water quality of coastal waters does not match designated use/s, and propose appropriate interventions for pollution abatement to enable further development.

OBJECTIVE 2
Coastal water quality is enhanced by management of pollution sources and types other than effluents.

Policy 2.1
Solid waste management within the Coastal Zone will be promoted to minimise coastal water pollution.

Strategy 2.1.1
Solid waste management plans will be prepared to reduce adverse impacts on coastal water pollution.

Proposed action

1. Formulate and implement a programme to prepare plans at appropriate levels (i.e. local/regional/national) to control the dumping of solid waste in the Coastal Zone by Local Authority,

2. Identifying urban centres, industries emitting solid waste, coastal tourist centres, fishing harbours and other areas for which solid waste plans are urgently needed;
3. Assisting Local Authorities to identify alternate dumpsites in environmentally less vulnerable locations for relocation of coastal dumpsites.
4. Monitoring the environmental degradation of sites located within the Coastal Zone affected by dumping of solid waste;
5. Encouraging and assisting relevant Local Authorities to implement environmentally sound ways of waste minimisation (as an alternative to haphazard dumping of solid waste in the Coastal Zone) through projects for composting, biogas generation, etc.
6. Take necessary legal action against Local Authorities in order to curtail dumping of solid waste in the Coastal Zone.

Policy 2.2
Faecal pollution of coastal waters will be reduced by collaborative action with Local Authorities

Strategy 2.2.1
Identify coastal waters/ sites where faecal pollution exceeds specified threshold levels for designated uses and address the problem in collaboration with Local Authorities.

Proposed action

1. Decide on critical sites where faecal contamination should be curtailed in the Coastal Zone, using selection criteria.[+]
2. Monitor such sites that are extensively used for various designated uses such as contact recreation, etc. so as to estimate the level of faecal pollution in them.
3. Make the Local Authorities aware of the problem and the sites and assist them in reducing faecal contamination.

Policy 2.3
The adverse impacts of oil pollution on coastal waters will be reduced.

Strategy 2.3.1
Identify the major sources of oil discharge in coastal waters and formulate curative/remedial action in collaboration with relevant authorities.

Proposed action

1. Coordinate with MPPA to identify sources of oil discharge into the Coastal Zone [++]
2. Formulate and implement programmes with relevant authorities to reduce or capture oil discharges into the coastal waters, particularly in harbours and SAM sites.

Policy 2.4
Measures will be taken to reduce nitrate pollution and salinization of coastal ground waters.

Strategy 2.4.1
Identify the major sources of nitrate pollution and causes of high salinization and implement collaborative remedial action.

Proposed action

1. Decide on likely areas with high nitrate pollution and salinization, based on objective criteria.
2. Monitor sites so affected and collaborate with relevant authorities in order to reduce pollution mentioned above.
3. Make the Local Authorities aware of the problem and assist them in reducing faecal contamination.

OBJECTIVE 3
Pollutant loads entering coastal waters are estimated and minimised through regular monitoring and research.

Policy 3.1
Collaborative measures will be taken to estimate the loads of pollutants entering coastal waters from major surface water bodies.

Strategy 3.1.1
Identify pollution loads in major surface waters entering the coastal zone, and enable improving water quality in collaboration with relevant agencies.

Proposed action

1. Identify the surface water bodies that are conveying pollutants into coastal waters and estimate the pollution loads during dry and wet weather flows.
2. Assist Local Authorities /CEA and other relevant authorities to take necessary steps to reduce high pollutant loads by providing the necessary information.
3. Collaborate with other competent agencies for possible research on water quality improvements in such water bodies.

Policy 3.2
Collaborative activities will be carried out to reduce pollution of coastal ground water.

Strategy 3.2.1
Identify levels and types of pollution in ground water, assess pollution potential and take appropriate action to improve water quality in collaboration with relevant agencies.

Proposed action

1. Select critical sites of high economic value, and monitor water quality of such sites in relation to designated water uses.
2. Assist relevant authorities to abate incidences of coastal round water pollution.

OBJECTIVE 4
Coastal pollution is minimised through education and the dissemination and sharing of information using strategic communication.

Policy 4.1
Collaborative programmes will be undertaken with competent agencies/[+] NGOs to educate relevant persons on pollution abatement.

Strategy 4.1.1
Undertake collaborative programmes with competent agencies for training and skills development for improvement of water quality.

Proposed action

1. Carry out a needs assessment to gauge the target groups and specific issues and needs that need to be addressed
2. Identify pressure groups and communication mobilisers to collaborate with for effective training and awareness creation programmes and formulation of collaborative programmes.
3. Train relevant personnel from the target groups for professional development on water pollution abatement and provide awareness on pollutions sources/types, level of pollution and abatement methods.

Policy 4.2
Target groups directly or indirectly involved with pollution emission will be made aware about the adverse impacts of coastal pollution and pollution reduction mechanisms

Strategy 4.2.1
Carry out appropriate awareness programmes in collaboration with relevant partner organisations/communication mobilizers to educate target groups (school children, people polluting the environment, Local Authorities. Policy makers, etc.) connected with coastal pollution.

Proposed action

1. Together with communication partners /relevant organisations carry out a needs assessment to gauge the target groups and specific issues for which awareness creation/communication activity is required.
2. Formulate and carry out customised training/awareness programmes for selected target groups based on communication needs.
3. Organise workshops and campaigns for school children to reduce the pollution incidences in the Coastal Zone.
4. Put up signboards and distribute leaflets to get public participation in coastal pollution control efforts.

References

1. MOFE, 2001. *State of the Environment. Sri Lanka*. Colombo: Ministry of Forestry and Environment.
2. UDA, 1994a. *Environmental Management Strategy for Colombo Urban Area* – (III): Colombo, Urban Development Authority.
3. UDA, 1994 b. Colombo Environmental Improvement Project, Colombo: Urban Development Authority, 1994.
4. Manchanayake, E.P. and C. M. Madduma Bandara, 1999. *Water Resources of Sri Lanka*. Colombo: National Science Foundation.
5. University of Moratuwa, 2001. Feasibility study report for establishment of a central wastewater treatment plan for Ratmalana/Moratuwa industrial/residential areas, unpubl. University of Moratuwa.
6. Mubarak, A.M. 2000. Water Pollution. In: *Natural Resources of Sri Lanka 2000*. Colombo: National Science Foundation.
7. Department of Census and Statistics, 2001. *Census of Population and Housing 2001: preliminary release*. Colombo: Department of Census and Statistics.
8. Central Bank of Sri Lanka, 2001.*Annual Report of 2000*. Colombo: Central Bank of Sri Lanka, Sri Lanka.
9. Central Bank of Sri Lanka, 2002. *Annual Report of 2001. Colombo:* Central Bank of Sri Lanka, Sri Lanka.
10. MOFE (1999). *Database of Municipal Waste in Sri Lanka. Colombo:* Ministry of Forestry and Environment.
11. MOENR. 2002. *State of the Environment in Sri Lanka: a Report for SAARC*, compiled and ed. J D S Dela. Colombo: Ministry of Environment and Natural Resources.
12. Arjuna's *Atlas of Sri Lanka*, ed. T. Somasekaram, M.P. Perera, and H. Godellawatta, Dehiwala: Arjuna Consulting Co. Ltd., 1997.
13. Corea, A.S.L.F., J. M. P. K. Jayasinghe, S. U. K. Ekaratne and S. D. Johnston, 1995. Environmental impact of prawn farming on Dutch canal: the main water source for the prawn culture industry in Sri Lanka, AMBIO (24): 423-427
14. Marine Pollution Prevention Authority, 2002. Database on accidental spills in Sri Lankan waters.
15. Jayaweera, M. 1999. Environmental improvement study, Port of Colombo. Unpubl. Sri Lanka Ports Authority.
16. MOFE, 2000. *The National Strategy for Solid Waste Management*. Colombo: Ministry of Forestry and Environment, Sri Lanka.
17. Bandarathilake, K. G. D. 1999. Hazardous waste management in Sri Lanka. *Paper presented at Sub Regional Training Seminar for the Implementation of the Basel Convention on the Control of Transboundary Movements of Hazardous Waste and their Disposal*. Mar. 15-19, 1999. Colombo.

5. INTEGRATING COASTAL FISHERIES AND AQUACULTURE

5.1 INTRODUCTION

5.1.1 Importance of the coastal fishery and aquaculture

Fishing in the marine and brackish waters of Sri Lanka is one of the most important economic activities within the Coastal Zone. In the year 2002, the fisheries sector including aquaculture, produced 302,890 tons of fish. Out of this, 286,000 tons were utilized locally, while the balance was exported. During the five year period 1998-2003, the contribution of the fisheries sector to the Gross Domestic Product (GDP) of Sri Lanka was 2.7 %. The sector also earned foreign exchange to the value of SL Rs.8,047 million in 2002 through the export of marine and aquaculture products. In addition to these, the fisheries sector provides direct employment to about 150,000 people, and sustenance to at least a million while around 100,000 fishing families with a population of nearly 450,000 inhabit the Coastal Zone.[1] While there are no recent estimates of people engaged specifically in the lagoon fishery, studies conducted in 1988 indicated that there may be around 30,000 part-time and full time fishermen.[2] Shrimp farming is another important coastal zone activity and provides employment to around 8,000 persons.[3]

5.1.2 Nature of the problem

Many habitats in the coastal environment (*see Chapter 3*), particularly, mangroves, sea grass beds, coral reefs and estuaries that are among the most productive ecosystems play a major role in supporting fisheries. The dynamics of fishery resources in the near shore marine waters, and coastal water bodies such as lagoons and estuaries, are closely interlinked with the dynamics of the rest of the Coastal Zone and its resources. Despite its undeniable socio-economic importance, the coastal and marine capture fishery and aquaculture make heavy demands on the coastal environment.

Fisheries though highly beneficial to the economy of the country can have harmful impacts on the coastal environment unless they are properly managed. Similarly, other development activities in the Coastal Zone have significant impacts on productivity and sustainability of the traditional coastal fishery. The multiplicity of uses of the Coastal Zone often leads to conflicts among resource users and cause social tension and strife. Overall, these combined impacts can have marked socio-economic consequences at the national level and localised impacts on coastal fishing communities.

It is increasingly recognised that issues related to the well being of fisheries are not only sector related, but encompass other sectors and economic activities within the Coastal Zone. Similarly, fisheries and aquaculture are also affected by other economic activities within and outside the Coastal Zone. It is in this context that a multi-sectoral approach that is best achieved through Integrated Coastal Zone Management is required. This is the rationale for the inclusion of a chapter on fisheries and aquaculture in the current CZMP.

The mandate for fisheries and aquaculture development, management and research in Sri Lanka lies with agencies such as DFAR, NAQDA and NARA. This chapter is primarily concerned with identifying the means whereby the composite and entwined requirements of both coastal zone management as well as fisheries management can be achieved through inter-agency co-operation.

5.2 ISSUES AND THREATS

The expanding fishing effort in response to the growing demand for fish supplies to cater to the requirements of local and foreign markets has placed the coastal fisheries under considerable pressure. Fishing methods and practices harmful to coastal fish resources and habitats continue to be used partly since the fishermen are ignorant of the damage they cause or are unaware of the more environment friendly fishing methods. This highlights the need for an adequate dialogue between the fishermen and administrators during the formulation of fishery management plans and programmes. In this regard, the Information Education and Communication (IEC) programme of the Ministry of Fisheries and the Fisheries Management Committees could play a pivotal role.

5.2.1 Impacts of fishing and fishery related activities on the coastal environment

One of the significant negative impacts of coastal fishing is the damage caused to marine and brackish water habitats from some of the fishery and fishery related activities. These impacts include the pollution of coastal waters by the dumping of waste oil, bilge water and fish waste/offal by the boats anchored in the harbours, village fish landing places or in lagoons/estuaries. (*see Chapter 4*). A good example is the Negombo estuary where around 100 multi-day boats and 200-250 sea going FRP boats powered by outboard motors are anchored.

Other fishery related activities or services required for large sea-going boats located near lagoons may also contribute considerably to pollution. It is estimated that 40,000 litres of waste oil from motorised crafts, and 13,000 litres of oil from service stations, are discharged into the Negombo estuary annually.[5] In addition, many of the fishery harbours, anchorages as well as fish markets are faced with the problem of fish waste as there are no adequate infrastructure and service facilities to ensure sanitary disposal.

Mangrove habitats are particularly affected by fishery related activities due to the extraction of wood for various fishery connected uses such as fishing craft (to produce oars/outrigger arms), fish traps, kraals, brush piles (*mas athu*) and stains for nets and sails, etc. They are also widely used by coastal communities including fishermen, as material for house construction, fencing and as firewood. The destruction of mangroves leads to reduced feeding, breeding and nursery habitats for commercially important coastal and marine finfish and shellfish.

Among the other habitats prone to damage from fishing activities are coral reefs. In some locations such as in the Madiha-Polhena in the Matara district, fishermen have blasted the reef to move in

and anchor their boats in the calm sheltered waters behind the reef. In Hikkaduwa, the coral reef is being damaged by fishing boats and glass-bottomed boats ramming the corals in shallow areas.[4]

Haphazard construction and expansion of piers and fish landing points in lagoons also interferes with the flow of water, causing siltation as in the case of the Negombo estuary.

5.2.2 Negative impacts of human activity on the coastal capture fishery

Human interventions including development activities within and outside the Coastal Zone often result in adverse impacts on the resources as well as fishing operations and results in a decline in fish catches in both marine and brackish water fisheries. Among these are development activities such as the construction of coastal protection works, up-stream irrigation schemes, tourism development and other activities such as sand mining, coral mining, discharge of untreated pollutants etc. The productivity of the lagoons are particularly affected by land reclamation, sedimentation and dumping of garbage the combination of which results in reducing the basin area available for fishing. Very little information is available, however, on the magnitude of the decline in fish production and resources resulting from specific human interventions or processes for specific locations.

Impact of shoreline protection structures

Since the mid-1980s, the CCD has constructed a large number of coast protection structures, such as groynes and revetments to mitigate coastal erosion. These structures alter the pattern of sand movement along the coast and have resulted in major physical changes in the coastline over time causing the loss or degradation of many traditional coastal fish landing sites, particularly sites for beach seining (see Box below). However, there are also instances where some of the coastal protection work/ structures have had favourable impacts on fisheries due to the formation of beachfronts which fishermen use as new landing sites.

The impact of beach loss on the beach seine fishery

The beach seine fishery has particularly got affected due to changes in the beach environment stemming from many factors, including tourism and the construction of coast protection structures and coastal erosion. The beach seine fishery accounted for over 40% of the total national fish landings until the early 1950s, before the advent of motorised fishing crafts and synthetic nets. However by the late 1980s, its contribution had dropped to a mere 5% of the total fish landings in the country. Beach seining, which is conducted in bays and in calm waters requires fairly large tracts of beach area for hauling the net manually by about 40-100 people, and for drying the nets and fish. The Department of Fisheries in 1984 has designated sites termed '*Madel Paduwa*' for the operation of beach seine nets. Land adjacent to these sites have been used for hotel construction and other tourism related activities thus virtually shutting out beach seining in many parts of the island. Coastal erosion too has a negative impact on the beach seine fishery due to the consequent loss of beach area for hauling of nets, and drying/stacking of nets.

Fishing industry has lost a number of traditional beach seining sites due to the construction of revetments. Information on the impact of coast protection structures on capture fisheries is available only in respect of a few districts. This needs to be updated and extended to enable quantification of the number of landing sites affected, and the number of fishing crafts and fishermen displaced in this connection.

Tourism

Available data and information indicate that tourism can have several negative impacts on fisheries. For instance, traditional rights of public access to fish landing places on the beaches and lagoon fronts enjoyed by the local fishing communities over generations have been denied to them at several places due to various tourism related activities. This has led to disputes between fishermen and hoteliers at various places (Table 5.1).

Glass bottomed boats carrying tourist for viewing coral reefs have caused damage thus posing threats to the habitats of marine ornamental fish species and other commercially important food fish including lobsters. This clearly indicates the need for integration and coordination of development efforts of various sectors active in the coastal zone to achieve optimum economic and social benefits.

Table 5.1: Selected impacts of tourism development on coastal fisheries

Administrative Division	Location	Impact on coastal fisheries
Chilaw	Marawila	Kurusagaha *paduwa madel pola* was abandoned due to the construction of a tourist hotel.
	Thongalwatta Karukkapone	An illegal boundary wall constructed by a developer on the beach, limits available space for *madel* operations.
Galle	Ahungalle (Balapitiya)	A hotel project has limited available space for *madel* operations.
	Unawatuna (Koggala)	Stilt fishing in Koggala area (in front of the Koggala beach hotel) is disturbed due to the activities of local tourists who come for bathing, swimming and other activities.
Tangalle	Kapuhenwala	Construction of a hotel project (boundary wall, etc.) has obstructed the landing of fishing crafts.

Pollution

Coastal marine waters are often polluted by oil waste either dumped by or leaking from fishing vessels, cargo vessels, oil tankers and oil leaks in the bunkering terminals. Several lagoons and estuaries and environs are also used both by Local Authorities and individuals for discharge of sewage. Dumping solid waste on the beaches by the local authorities continues unabated.

Excess agro-chemicals, pesticides, weedicides and fertilizers used for agricultural crops entering estuaries and lagoons frequently cause the overgrowth of aquatic plants and algal blooms due to increased nutrient levels. This can be seen in the Negombo and Chilaw estuaries and in the Dutch Canal. Fishing gear and nets frequently get entangled in plants hampering the efforts of fishermen engaged in small scale fishery; algal blooms hinder sunlight penetrating the water column, affecting the normal growth patterns of aquatic flora and fauna.

Coastal waters are also polluted with industrial effluents discharged into estuaries and lagoons. Sometimes the degradation and damage caused to the habitat is irreversible. In the Lunawa lagoon where aquatic life is almost non-existent, a total collapse of the fishery has taken place. Fish kills have been reported in areas such as Valachchenai, Kelani Ganga, and Negombo estuaries and in the Mawella Lagoon. As most rivers and estuaries in the western and the southern region receive industrial effluents, quantification of the impact of industrial effluents on fisheries is required through a systematic and long-term monitoring of the fishery in these water bodies. To prevent pollution levels increasing above critical limits in the near future, it is also important for continuous monitoring of the coastal waters, as well as the sources of pollution, by relevant agencies such as NARA, CEA and the MPPA.

Pollution in the Negombo estuary

Untreated industrial effluents from the Ekala Industrial estate with 65 industries, the Ekala Area with 60 industries as well as partially treated effluents from the Katunayake EPZ, are discharged into the Negombo estuary. Periodic occurrences of fish kills reported from the area have been often attributed to the discharge of toxic effluents. Pollution here has now become chronic, as indicated by the persistence of skin ulcerations among sensitive fish such as the rabbit fish. The Negombo estuary also receives approximately 90 tons of raw faecal matter annually. The resultant eutrophication may partly underlie the observed decline in fish catches in the estuary.

Coral mining

The destruction or degradation of the reef habitat affects the coastal fishery as coral reefs support numerous species important in the commercial food fishery, the bait fishery and the marine ornamental fishery. Coral reefs are among the most preferred habitats of lobsters, and there are indications that coral mining may add to the depletion of the lobster resource, particularly on the south coast. Coral mining also causes the indirect loss of many traditional sites for the beach seine fishery due to accelerated sea erosion following the degradation of coral reefs.

Landfill

Filling and reclamation of estuaries and lagoons are carried out for unauthorized construction of houses and commercial and industrial buildings as well as for construction of ponds and dykes for aquaculture. Munnakkara housing project in Negombo and the shrimp farms in Chilaw are good examples of this trend. This results in the reduction of the effective area of the lagoon/estuary basins with possible adverse effects on the extent and distribution of the fisheries resources they contain.

Change in salinity

The flow of excess fresh water into estuaries and lagoons from upstream irrigation projects implemented for agricultural expansion particularly in the south has resulted in considerable adverse impacts on lagoon fisheries. Malala lagoon, which receives excess fresh water from the Lunugamwehera tank due to excessive run-off identified as the main cause for the decline of the traditional shrimp fishery is a good example. The inflows of excess fresh water from the Kirama Tank into the Rekawa lagoon too has deprived many fishermen of their livelihood.[6] In contrast, there has been an adverse impact on the fishery at the Koggala lagoon due to an increase in the salinity level caused by breaching of the sand bar and the limited inflow of freshwater into the lagoon.

Impact of quasi–natural causes

Quasi-natural causes such as accelerated coastal erosion and sedimentation, which are often compounded by human activity affect the coastal fishery in many respects. As already mentioned, coastal erosion has led to loss of fish landing centers. Accelerated sedimentation and siltation in lagoons arising from the disposal of solid waste and garbage by the Local Authorities, individuals and households results in a reduction of the basin area (*See also Chapter 3*). Soil erosion in the upstream and catchment areas of rivers causes a large amount of silt flowing into estuaries while damage caused to river banks by speedboat movements and water skiing also lead to increased sedimentation in coastal waters. About 50,000 m^3 of sediment is trapped annually in the Negombo estuary and the local fishermen attribute declining fish catches to the reduction of fishing area due to the sedimentation. However, there is no quantified information regarding the extent to which the fishery has been so affected.

5.2.3 Impact of coastal aquaculture on the coastal zone

At present, brackish water aquaculture in Sri Lanka consists mainly of shrimp culture. There has been a considerable expansion of the industry since the late 1970s when commercial shrimp farming commenced in the country, with the establishment of the first shrimp farm in Batticaloa. A large number of shrimp farms are currently located in the western and northwestern coastal belt, mainly between Maha Oya and Puttalam/Kalpitiya. They comprise about 1,300 farms covering approximately 5,000 ha. Shrimp farming on the east coast has now recommenced, and there are reportedly more than 25 shrimp farms around the Batticaloa lagoon area.

Pollution

The practice of discharging pond water from shrimp farms to the adjoining waters often twice a week leads to water pollution since the discharge contains high levels of nutrients and chemicals (lime and pesticides). Around 1,699 m^3 of pond water is reported to be discharged weekly from shrimp farms in the Northwestern Province, while shrimp hatcheries in this area are also said to discharge about 1,246 m^3 of water daily. The Dutch Canal in Puttalam and the Puttalam estuary act as the source of water for shrimp farms as well as the 'sinks' for their wastes/effluents. The resultant loss of water quality at the source can cause a drop in shrimp productivity itself, increase the incidence of disease, and endanger the sustainability of shrimp aquaculture in the Puttalam area.

Pollutants from shrimp farms entering lagoons and estuaries also result in eutrophication - causing algal blooms that are often toxic, and oxygen depleting that can lead to fish and shrimp mortality.

Loss of coastal habitats

Mangrove swamps and salt marshes have been identified as areas with potential for brackish water aquaculture. Initially 6,000 ha were identified in 1986 as suitable for shrimp culture in Sri Lanka,[7] but the currently used area used in the NWP has far exceeded the estimate for this province. The clearing of mangroves for the construction of ponds for shrimp farming has been particularly severe and out of the 750 ha of mangroves lost in the Puttalam area between 1981 and 1992, around 160 ha (21%) have been lost due to shrimp farming.[8] Now there appears to be a better recognition regarding the unsuitability of mangrove habitats for intensive aquaculture ; mixed mangrove – aquaculture systems are being used to restore previously degraded mangrove areas.[9] Additionally Salt Marsh areas too have come under stress and several stretches have been converted to shrimp farms, especially in the Chilaw, Puttalam, Negombo areas.

Adverse social impacts of shrimp farming

The benefits expected by the local communities from the Shrimp farming in the NWP have not been realized particularly since the industry has offered relatively few employment opportunities for the local people. In addition there are many adverse social impacts of shrimp farming. These include loss or limitation of access for the local communities to the sea front or the lagoons to conduct their legitimate activities as a result of land enclosure for shrimp farming, the conversion of agricultural land to shrimp farms and the resultant loss of livelihood for those engaged in agricultural activities. It has been estimated that there was a loss of 292 ha of paddy land (currently valued at SLRs. 108 million) and 340 ha of coconut land (valued at SLRs. 255 million) due to the shrimp farming industry.[8] The shallow ponds constructed in shrimp farms also disturb local drainage patterns as demonstrated when heavy monsoon rains in 1995 inundated the Chilaw and Puttalam areas with disastrous consequences on over 3,000 households.[10] Salinization of wells used for drinking purposes has also been reported from some villages where shrimp culture is prevalent.[11]

In view of its economic potential and the availability of adequate environmental conditions, the prospects for development of shrimp culture in areas other than the NWP - in the northern, eastern and southern provinces - are promising. A study conducted by NARA in 1988-1989 concluded that 4,720 ha of land, consisting mainly of scrubland, grassland, mangroves and salt marshes in the coastal belt could be considered as potential areas for aquaculture. Profiting from the experiences already gained in the north western coast, expansion of the industry to other areas should be based on proper zoning plans, guidelines, etc. to ensure the prevention of adverse impacts which can be anticipated. An effective monitoring mechanism is required to ensure compliance with the requisite conditions for operation while guidelines are required to promote self-monitoring by the developers. It has been recommended that the extent of the total culture area of the NWP be reduced by at least 20% by implementing environmental guidelines.[12]

5.3 POLICIES,PLANS, LAWS AND INSTITUTIONAL ARRANGEMENTS

The role of the CCD in regard to fisheries and aquaculture is to assist and support DFAR in its fisheries management activities within the coastal zone and to facilitate the management of other coastal activities that impinge on fishery and associated activities. Fisheries and Aquatic Resources Act No. 2 of 1996 provides the legal basis for the management of fisheries mainly through Fishing Operational Licenses and community participation through Fisheries Committees.

The definition of "development activities " as set out in Section 42 of the Coast Conservation Act No 57 of 1981 excludes "fishing" so that the permit system administered by the Department of Coast Conservation does not apply to this activity. Consequently, fisheries concerns were not addressed in the Coastal Zone Management Plans of 1990 and 1997. Although Section 42 of the CCA does not specifically refer to "aquaculture" as a development activity, the 1997 CZMP recognises the construction of aquaculture facilities as such.

The MFAR which is the line ministry in charge of the subject of fisheries and aquatic resources is primarily responsible for formulating policies, plans and programmes for the development of fisheries and aquatic resources. In the implementation of its plans and programmes, MFAR is assisted by two Departments, five statutory bodies and a public company.. The Department of Fisheries and Aquatic Resources (DFAR) is the government agency mandated with the management, regulation, conservation and development of fisheries and aquatic resources in the country while the National Aquaculture Development Authority (NAQDA) is the main state sector organization responsible for the development of aquaculture and inland fisheries. As the research arm of MFAR, the National Aquatic Resources Research and Development Agency (NARA) is responsible for carrying out research activities on all living and non-living aquatic resources.

MFAR, recognises the need to promote "responsible fishing" through greater stakeholder participation in fisheries management and reaffirms its active support to international and regional organisations, protocols and other instruments that deal with the sustainable use of marine resources. The Ministry has already initiated action to revise the existing Fisheries Laws and Regulations and to strengthen monitoring, controlling and surveillance (MCS) capabilities to facilitate effective fisheries management to prevent over-use of resources and destructive fishing. It will also incorporate cleaner production concepts and practices into the fisheries production processes and services to ensure the preservation and the protection of the environment. The need for better resource management and the recommendations in that regard are also emphasized in the National Biodiversity Conservation Action Plan.

5.3.1 Addressing fisheries and Aquaculture in coastal zone management

Addressing fisheries and aquaculture related issues linked with Integrated Coastal Zone Management require considerable inter-agency coordination and collaboration. In this, emphasis needs to be placed on ensuring the success of a two pronged management approach namely, that fisheries and aquaculture related issues do not adversely affect the resources and the environment in the Coastal Zone, and that other development activities within the Coastal Zone and outside do not adversely affect fisheries. Consequently,

management challenges for the coastal capture fisheries and aquaculture should be examined in three dimensions ie: (a) the need to address and prevent and mitigate the impacts of capture fisheries on the stability of coastal habitats and resources; (b) to help mitigate the impact of anthropogenic and quasi-natural activities in the Coastal Zone that could influence the sustainability of the marine and coastal capture fisheries and aquaculture; and (c) to support the regulation of coastal aquaculture in order to ensure a healthy coastal environment.

5.4 MANAGEMENT OBJECTIVES, POLICIES AND ACTIONS

OBJECTIVE 1
Conservation of the coastal environment is promoted through sustainable management of fisheries and fishery related activities.

Policy 1.1
Harmful fishing practices that degrade coastal marine habitats and the bio-resources they contain will be controlled and minimized.

Strategy 1.1.1
Identify harmful fishing practices in the marine fishery and formulate site-specific community management strategies supported by appropriate legislation and other measures to promote alternate, environmentally friendly fishing practices.

Proposed action

1. Establish a database on harmful fishing practices that destroy coral reefs, rocks and sea grass beds (e.g. using bottom set gillnets, trammel nets, explosives, etc.) and endangered species on a district basis, and assess their impact on the fishery/ biodiversity.
2. Introduce community based management systems with provisions to stop/phase out harmful fishing practices, for selected fisheries/sites where such fishing practices are prevalent through establishment of Fisheries Committees under the Fisheries and Aquatic Resources Act.
3. Provide appropriate support to fishers engaged in harmful fishing practices to enter other fisheries, and/or other economic activities and assist Fisheries Committees to implement their management plans.
4. Examine the adequacy and justification of existing laws and regulations enacted to prevent the use of harmful fishing practices; amend existing laws, or introduce new laws as appropriate with community participation.
5. Strengthen enforcement of regulations banning illegal/harmful fishing practices (‘dynamite fishing’, unsustainable lobster fishery, threatend spcies etc.) through appropriate institutional arrangements.
6. Initiate a comprehensive study to estimate the wild stocks of marine mammals around Sri Lanka, and assess the impact of by catch on the wild population through periodic surveys at selected sites.
7. Conduct island-wide awareness programmes to minimise catch or sale of the flesh of threatened species.

Policy1. 2
Harmful fishing practices that degrade brackish water habitats and their bio-resources will be controlled and minimized.

Strategy 1.2.1:
Minimize harmful fishing practices in selected lagoons/estuaries by mobilizing fishing communities to develop and implement site-specific management plans, and by introducing and implementing appropriate legislation and economic instruments.

Proposed action

1. Identify and prioritise lagoons and estuaries having harmful fishing practices and, conduct periodic studies to assess trends in the use of such practices in selected major lagoons/estuaries.

2. Identify harmful fishing methods and their impact on sea grass beds and mangroves associated with selected lagoons/estuaries.

3. Introduce appropriate legislation and, mobilise and support fishers in selected lagoons/estuaries to set up Fisheries Committees and implement community based fishery management under the Fisheries and Aquatic Resources Act to reduce the use of harmful fishing practices.
4. Assist fishers engaged in harmful fishing practices to enter other fisheries and/or other economic activities.
5. Prepare status reports on the fisheries profile of selected lagoons/estuaries and evaluate the impact of management measures through suitable indicators.
6. Integrate fishery management plans developed for selected lagoons/estuaries with SAM plans wherever appropriate.

Policy 1.3:
Adverse impacts on coastal resources/habitats due to over-exploitation of the coastal fishery resources will be minimized.

Strategy 1.3.1:
Identify and minimize adverse impacts of over-exploitation of fish resources on coastal habitats and their bio-resources by formulating resource/site specific community management strategies and appropriate legislation for fisheries and fishing communities threatened by over-exploitation of resources.

Proposed action

1. Identify fisheries threatened by over-exploitation in selected coastal areas, lagoons and estuaries, and assess sustainable levels of harvesting.
2. Establish fisheries data collection and monitoring systems for major lagoons/estuaries and assess impact of over exploitation on the bio-resources and habitats.
3. Initiate community based fisheries management in selected coastal areas, lagoons and estuaries, including programmes to rehabilitate resources/stocks through the establishment of Fisheries Committees under the Fisheries and Aquatic Resources Act.

4. Assess impact of such management measures on production and income to the fishing communities in respect of fisheries brought under community-based management.
5. Introduce alternate livelihood/income enhancement measures for fishing families affected by introduction of management measures associated with the selected coastal, lagoon/estuarine fisheries.
6. Conduct community awareness programmes to mitigate adverse effects of over-harvesting coastal and brackish water fisheries resources and on the maintenance of a healthy coastline, and identify instruments and measures to support these initiatives.
7. Monitor and provide guidelines for harvesting export oriented coastal resources such as ornamental fish, sea-cucumber, molluscs, sponges, chank, etc.
8. Conduct impact assessment studies to assess the ecological impact of selective over-harvesting of species in the ornamental fishery in selected areas, and design and implement suitable management strategies to minimize adverse impacts through greater stakeholder participation.

Policy 1.4
The coastal and marine environment will be protected from adverse impacts of fishery related activities.

Strategy 1.4.1
Identify coastal sites (fishery harbours, anchorages, landing sites, market places, etc.) affected by harmful fishery related activities (pollution, solid and fish waste disposal, etc.) and, initiate programmes to minimize impacts through provision of facilities and increased stakeholder participation.

P r o p o s e d a c t i o n

1. Provide adequate infrastructure facilities and arrangements at fishery harbours, anchorages, markets, etc. to minimize problems of solid waste (i.e. fish waste) disposal.
2. Introduce and implement programmes to mobilise stakeholder participation for better use of available infrastructure facilities to minimize problems of solid and fish waste disposal at fishery harbours, anchorages, markets, etc. and dumping of bilge water and oil from fishing boats into coastal waters.

OBJECTIVE 2
Traditional fisheries within the marine and brackish water environments are protected through effective management of other development activities within and outside the Coastal Zone.

Policy 2.1:
The traditional marine fishery will be enhanced by management measures that address threats from other development activities and processes within and outside the Coastal Zone.

Strategy 2.1.1:
Identify fisheries and fishing communities threatened by other development activities on the basis of socio-economic factors, and evolve site specific, inter-agency management and regulatory mechanisms.

P r o p o s e d a c t i o n

1. Study and compile a comprehensive database on social impacts of tourism and other development activities (such as the loss of traditional fishing operations and landing sites, and access to the beach), during the last 20 years with the assistance of DFAR through its district offices.
2. Identify illegal or unauthorised structures associated with tourism and other development activities that have adverse impacts on fishermen and fishing activities and initiate action for their removal/demolition.
3. Demarcate boundaries of all madel padus (waraya) as provided under the Madel (beach seine) Fishing Regulations of 1984, and provide protection to madel padus from other development activities.
4. Study the impact of coral mining on fisheries in major coral mining areas (in terms of direct loss of production from reef fisheries, and indirect losses through reduced bait supplies from reefs for other fisheries, etc).
5. Conduct research and study incidence of pollution of marine waters from oil pollution, untreated industrial effluents and sewage discharged from tourist industry etc. in selected areas and assess their impact on marine fisheries.
6. Assess the impact of development activities causing coastal erosion on fisheries in terms of production and income loss.
7. Regulate development and economic activities within and outside the Coastal Zone that affect the marine fishery, through appropriate regulations/guidelines of CEA and other agencies with inter-agency cooperation/coordination.

Policy 2.2:
Brackish water fish production will be enhanced by management measures that address threats from other development activities and processes within and outside the Coastal Zone.

Strategy 2.2:
Identify threats on lagoon/estuarine fisheries and assess their impacts on fishing communities and formulate inter-agency mechanisms for effective implementation and monitoring of regulations /guidelines.

P r o p o s e d a c t i o n

1. Establish a fisheries database through the introduction of a fisheries statistical collection system for major lagoons and estuaries.
2. Carry out surveys to identify loss of traditional access roads of fishing communities associated with selected lagoons and estuaries and implement programmes to restore them.
3. Estimate the functional area of selected major lagoons and estuaries lost due to reclamation, landfill, sedimentation, etc. and assess its impact on fisheries and fish production.
4. Demarcate lagoon and estuarine boundaries and enforce regulations against illegal encroachment by coordinating with other agencies and mobilise community participation.
5. Identify, together with relevant agencies the sources of industrial pollution into lagoons and estuaries and establish inter-agency mechanisms to minimise adverse impacts on fisheries and fish resources (*see also recommendations in chapter 4*).

6. Assess impact of excess fresh water run-off on the fishery in selected lagoons and estuaries, and examine options available for rehabilitation of lagoons and estuaries and the measures required to provide relief to affected fishing communities.
7. Assess the impacts of tourism activities such as the operation of speedboats on fishing activities in estuaries, and identify and implement measures to mitigate such adverse impacts.
8. Assess the impact of sand bar formation on fisheries in selected lagoons and estuaries and implement measures to mitigate such adverse impacts.

Policy 2.3:
The socio-economic status of fishing communities displaced due to existing and future development activities and quasi-natural causes occurring in the Coastal Zone will be safeguarded.

Strategy 2.3.1:
Identify fishing communities affected by development activities and natural causes and initiate programmes to relocate them with minimum adverse impacts on their socio-economic status.

Proposed action

1. Compile a database on fishing communities affected by existing development activities and natural causes and take measures to relocate affected communities.
2. Implement all future development activities within the Coastal Zone under the framework of Zoning Plans which adequately address the issue of displacement and relocation of communities.
3. Ensure that all EIAs for development activities have provisions to safeguard the interests of fishing communities.

OBJECTIVE 3
The coastal environment is conserved through sustainable management of coastal aquaculture development.

Policy 3.1:
Adverse impacts on coastal communities and environment due to aquaculture in the North- western Province will be minimized.

Strategy 3.1.1:
Identify the ecological and socio-economic issues related to shrimp culture in the Northwestern Province and take measures to rehabilitate the industry through inter-agency stakeholder cooperation and effective enforcement of regulations and compliance with guidelines.

Proposed action

1. Introduce a five-year moratorium on approvals for new shrimp farms in the NWP.
2. Undertake a comprehensive study to determine the optimum carrying capacity for shrimp culture in the region.
3. Take appropriate action to require existing unauthorised farms to comply with the environmental guidelines and other relevant conditions, and provide adequate publicity/awareness and an amnesty.
4. Reduce the extent of the total culture area of the NWP by at least 20% by implementing environmental guidelines.
5. Withdraw aquaculture licences of all defaulters and withdraw all state assistance/concessions given to them.
6. Prepare a proposal highlighting multi-benefits of the Dutch Canal, and seek external funding (i.e. from foreign and local stakeholders) for its rehabilitation.
7. Mobilize developers to implement programmes to modernise and restructure existing hatcheries and farms in order to improve performance and to minimize threats to the environment.
8. Improve enforcement and monitoring capabilities of NARA/ NAQDA and the NWP Provincial Council.
9. Establish a Technical Group to provide training and technical guidance particularly to small farmers/breeders, and to promote and strengthen self-monitoring/ disease prevention/control capabilities.
10. Carry out a survey to mark all traditional access points in the farming area and restore access points to local people where necessary.

Policy 3.2:
Aquaculture initiatives will be promoted in areas other than the NWP in harmony with integrated coastal zone management.

Strategy 3.2.1:
Promote aquaculture development in other areas of the country on a planned basis by preparing and using zonal plans, land use plans, models and guidelines.

Proposed action

1. Determine capacity/potential for various aquaculture practices in different parts of the country.
2. Prepare detailed zoning plans in advance; provide manuals/ guidelines to prospective developers to assist in project planning, and make the approval procedure simple and transparent.
3. Prepare appropriate models based on the out-grower concepts to suit the requirements of specific areas to be opened up for shrimp farming.
4. Allocate state land with due regard to the development needs, traditional land use practices, traditional user rights of local communities with priority being given to local entrepreneurs and individuals as far as possible.
5. Develop criteria for land allocation (by MFAR/NAQDA and relevant provincial administration) while ensuring community consultations/transparency during allocation of state land.
6. Design and provide basic infrastructure such as canal systems on a cluster basis.
7. Control and prevent the development of aquaculture in mangrove areas and salt marshes to ensure prevention of excessive biodiversity loss, and preserve all biodiversity rich areas as habitats for aquatic fauna and flora.

Policy 3.3:
Prospective entrepreneurs will be assisted and mobilized to engage in responsible aquaculture

Strategy 3.3.1:
Coordinate and support initiatives to promote commitment among aquaculture entrepreneurs in order to minimize adverse impacts on the environment.

Proposed action

1. Develop capacity among prospective entrepreneurs and provide guidelines to mobilize stakeholder participation in the preservation of the natural environment.
2. Introduce legislation to make developers responsible for meeting the cost of rehabilitation to rectify/mitigate any damage/destruction caused to the environment.

Policy 3.4:
Community participation in coastal aquaculture will be promoted to meet the socio-economic aspirations of the local people.

Strategy 3.4.1:
Enhance capacity of local communities to engage in sustainable aquaculture that is in harmony with the environment.

Proposed action

1. Conduct livelihood analysis of communities in areas identified as potential aquaculture sites.
2. Arrange for technical and investment support for community participation in coastal aquaculture.
3. Provide awareness creation and training in coastal aquaculture for local communities to engage profitably in these activities in an environmentally friendly manner.

References

1. NARA, 2001. *Sri Lanka Fisheries Year Book 2000*. Colombo: National Aquatic Resources Research and Development Agency.

2. FAO/ADB, 1988. Sri Lanka Fisheries Sector Study. Report of the FAO/ADB Cooperate Programme. Rome: FAO.

3. Hettiarachchi, A. 2000. Shrimp Farming Industry in Sri Lanka: Experience in the North Western Province – unpubl. Ministry of Fisheries and Aquatic Resources Development.

4. Nakatani, K.; Rajasuriya, A.; Premaratne, A.; and White, A. T. eds. 1994. *The Coastal Environmental Profile of Hikkaduwa, Sri Lanka.* Colombo: Coastal Resources Management Project.

5. MOFE, 1998. Study on Economic-Environmental Linkages of Lagoon and Near Shore Coastal Fishing: Environment Action 1 Project. Unpubl. Ministry of Forestry and Environment.

6. Jayakody, D. S. and Jayasinghe, J. M. P. K. 1992. Report of the Development Potential of Rekawa Lagoon. unpubl. NARA.

7. Samaranayake, R.A.D.B. 1986. Status and Prospects for Brackish Water Aquaculture in *Sri Lanka. Jour. Inld. Fish.* Vol. 3: Ministry of Fisheries.

8. Siriwardena, P. P. G. S. N. 1999. *Shrimp Culture in Sri Lanka: The benefits, problems and constraints associated with the development and management and responses to address problems*. FAO Fisheries Report No. 572. Bangkok:FAO Technical Consultation on Policies for Sustainable Shrimp Culture.

9. Siriwardena, P.P.G.S.N.,; Phillips, M.J.,; and Baird, Ian G. 2001. Impact of aquaculture on the environment. In: *Utilising Different Aquatic Resources for Livelihoods in Asia: A Resource Book*. IIRR/ IDRC/ FAO/NACAP/ ICLARM.

10. Firth, O. B. 1997. Small fisherfolk and shrimp big business. *Logos*, Vol. 35(4)

11. Foell, J., Harrison, E., and Stirrat, R. L. 2000. Participatory Approaches to Natural Resources Management – The Case of Coastal Zone Management in the Puttalam District. Unpubl. Project R 6977, Brighton: School of African and Asian Studies, University of Sussex.

12. Fernando. C. 2000. Policy guidelines for the development of a sustainable shrimp farming industry in Sri Lanka. Unpubl.

13. MOFOR, 2002. National Policy and the Development Plan: towards a new era of development, unpubl. Ministry of Fisheries and Ocean Resources

6. SPECIAL AREA MANAGEMENT

6.1 INTRODUCTION

The concept

The concept of Special Area Management (SAM), which involves a collaborative, adaptive and flexible approach to resource management within a defined geographic area is now an integral component of national coastal zone management policy. It was first introduced to Sri Lanka in the late 1980s to address the resultant adverse impacts of increasingly rapid economic growth in environmentally sensitive areas such as coastal wetlands, which required new management tools and greater collaborative efforts with other agencies and the public.

Special Area Management (SAM) Planning

"Special Area Management (SAM) is a locally based, geographically specific planning process that in theory is a highly participatory practice and allows for the comprehensive management of natural resources with the active involvement of the local community as the main stakeholder group.[1,2] It involves co-management of resources through which decision-making, responsibility and authority in respect of natural resource use and management are shared between the government and the local resource users or community.[3] The government institutions and other planning agencies assume the role of facilitator by providing technical and financial assistance to the local community management effort. The local community groups are considered the custodians of the resources being managed under the SAM process through which sustainable livelihood practices allow for sustainable natural resource use and management within the designated site.[4,5] One of the major objectives of SAM is to resolve competing demands of natural resource use - within a specific geographical boundary - by planning optimal sustainable use of resources.[6] In a broad sense the SAM approach seeks to ensure both economic well-being of the local communities as well as the ecological well-being of the natural ecosystems by the practise of sound natural resource management. The SAM concept is now considered a key component of Sri Lanka's coastal zone management policy.

Source: Senaratna, 2003[7]

Evolution and operational experience

The first national CZMP prepared in 1990, which is a major landmark in coastal zone management, addressed critical issues such as coastal erosion and the degradation and loss of critical habitats and sites of historic, cultural, scenic or recreational value within the Coastal Zone.[2] In keeping with the overall national policy the emphasis here was on regulation as the most important management tool. While this approach was instrumental in preventing many adverse impacts on the Coastal Zone at the time, the need was increasingly felt for greater emphasis on local stakeholder participation in the management of coastal resources by addressing coastal zone management on a holistic basis. Such a move requires that the social and economic needs of resource users and other stakeholders be duly considered. The SAM concept was introduced in the 1980s as a key tool for effective management in the Coastal Zone based on its adoption elsewhere in the world. Consequently the SAM process evolved in Sri Lanka in recognition of the need for greater importance to be given to local stakeholder involvement in the management of coastal resources.

The adoption of SAM planning in Sri Lanka was preceded by two pilot projects at the Rekawa Lagoon and the then Hikkaduwa Marine Sanctuary (since elevated to a Nature Reserve), where the concept and viability of the SAM in the local scenario was tested. Encouraged by the outcome and experience gained from these initiatives, the second generation CZMP of 1997 promoted the SAM process by recommending the formulation and implementation of Special Area Management (SAM) Plans for 23 selected coastal areas. The selection was based on four criteria, namely: severity of issues, biodiversity, viability of the project and economic significance.[2] The CCD is now recommending the incorporation of SAMP activities into district and national level development projects.

The CCD under the auspices of the CRMP of 2000-2005 has extended the SAM process to several sites, namely the Bar Reef, Negombo Estuary/Muthurajawela marsh, Lunawa Lagoon, Madu Ganga Estuary, Hikkaduwa Nature Reserve and environs, Unawatuna Bay including Koggala Estuary, the Mawella and Kalametiya Lagoons, and the coastal stretch in Hambantota.

MORE ON the evolution of SPECIAL AREA MANAGEMENT IN SRI LANKA

Local level . . .
The first attempts at SAM planning and management in coastal areas by the CCD were at Rekawa and Hikkaduwa in 1991.These projects received financial and technical assistance through the USAID funded Coastal Resources Management Project (CRMP). The pilot project at Rekawa led to the preparation of a SAM Plan for the Rekawa Lagoon and the surrounding environs during 1992–1995and the subsequent implementation. The Hikkaduwa SAM Plan was completed in 1996 and was followed by implementation.
Currently the CCD is associated with the ADB funded RETA Project in preparing a similar plan for Chilaw, and with the IUCN in preparing a plan for the Rekawa-Ussangaoa—Kalametiya (RUK) area with GEF funds.

District level . . .
The CCD has moved ahead by introducing the SAM concept and related activities into district level projects. This has led to the incorporation of SAM planning activities in the Hambantota Integrated Coastal Zone Management Project (HICZMP), where SAMP activities focused on the Hambantota dunes and the Mawella Lagoon - Kudawella (blow hole) and coastal area. A main difference in the application of the concept here was that whilst the basic principles were the same, operational and administrative procedures were not necessarily similar. Another salient feature here was the implementation of some activities of the SAM process in concurrence with the planning phase.

Multi-sectoral . . .
In addition to the above projects the National Aquatic Resources Research and Development Agency (NARA) has also launched a multi-sectoral project which is closely related to the SAM concept in the Puttalam/Mundel estuarine system in 1990. This served to investigate the current state of the resource base and the factors governing the productivity and sustainability of the site, with a view to identifying strategic options for management. The work was supported by the Swedish Agency for Research Cooperation with Developing Countries (SAREC).

Integration with Master Plans . . .
Coastal resource based management was initiated in 1989 for the Muthurajawela marsh and the Negombo estuarine coastal wetland system by the Board of Investment+ with Dutch financial and technical assistance on a directive of the Executive President of Sri Lanka. The approach adopted was based upon the special area management guidelines formulated through a worldwide institutional survey relating to coastal management.[8] The planning was concluded in 1991 where upon the Plan received Cabinet approval. Implementation of the Master Plan for the Muthurajawela marsh and the Negombo estuarine coastal wetland system was subsequently assigned to several government agencies. This project was carried out through the Wetland Conservation Project (1991-1997) and the Integrated Resources Management Programme (IRMP of 1998-2002) of the CEA. The implementation phase started in 1989 and ended in 2002.The main focus in this project was largely on catchment management for which the CEA had a national mandate. This was in contrast to CCD's SAM planning where the focus was limited to the Coastal Zone.

Operational experience of the SAM process at the Muthurajawela Marsh and the
Negombo Estuarine Coastal Wetland System*

The Muthurajawela Marsh and the Negombo Estuarine Coastal Wetland System

The Muthurajawela Marsh-Negombo Estuarine Coastal Wetland is located in the western coast of Sri Lanka just north of Colombo, and covers an area of 6,232 ha. This Estuary is connected to the sea by a single narrow opening. The *Dandugam Oya* which is the main river that supplies this area drains a catchment of 727 km^2 and discharges where the Estuary and marsh are linked up.

Source: CEA/Euroconsult,1994[9]

Procedure adopted . . .

Selection of management area and boundary delineation to integrate all activities relevant for management of the Coastal Zone into the regional and national development process eg. the boundary was identified to include the upstream catchments of the target area (within which falls the Ekala Industrial Estate) and the Negombo Estuary which is a valuable natural resource for multiple uses.

* Facilitating SAM planning and implementation by:
  * strategic zoning to safeguard the ecological functions and biodiversity of the downstream marsh-Estuary system while enabling land development and economic growth in a mixed-urban zone.
  * providing community benefits through diverse investments for income generation and housing development.
  * integrating the management of upstream land use and industrial pollution impacts with management of the downstream marsh-Estuary ecosystem.
  * obtaining greater involvement of stakeholders in the SAM process through facilitation of the formal registration of a network of community organisations associated with the site, enabling community participation in the decision-making process; establishment of Environmental Protection Committees (EPCs) in the *Dandugam Oya* catchment and networking them with industry, *Pradeshiya Sabhas* and the Central Environmental Authority (CEA); facilitating establishment of a GIS database with the assistance of community-based EPCs to support monitoring of land use and water quality impacts.

Benefits gained . . .

* Strategic zoning of the site to guide land allocation to ensure unhampered ecosystem functions.
* Using the zoning plan as an instrument for negotiation to minimise adverse impacts of the Colombo-Katunayake Expressway.
* Enhancing fishery management in the Negombo Estuary by strengthening the relevant Fisheries Committees through financial assistance.
* Poverty alleviation of residents by providing facilities for livelihood enhancement by (a) constructing jetties, (b) providing training to economically deprived local women and enabling them to enter private sector employment, and (c) establishing animal husbandry programmes for supplementary incomes.
  Social upliftment by (a) providing supplementary education for school children to prevent early dropping out, (b) community-based health and nutrition programmes, (c) providing permanent and serviced housing to low-income encroacher families, and (e) establishing the multi-functional 'visitor centre' concept at Muthurajawela which involves employment opportunities for local people.

Lessons learnt through an evaluation of the Muthurajawela Marsh - Negombo Estuary SAM programme

An evaluation of the activities based on SAM concepts at the Muthurajawela marsh - Negombo Estuary carried out in 2002 has offered many lessons for enhancement of the SAM process.

* Land use zoning helps to:
  * conserve ecosystems, reduce adverse impacts of major development activities and resolve conflicts among traditional uses of resources and permit multiple use of the area. However, the Cabinet Approval is required for it to be effective.
* Winning the trust and confidence of communities is essential to obtain their participation in decision-making; this can be achieved through:
  * implementing diverse income supplementation initiatives; enhancing education, health and nutrition; and initiating small infrastructure projects identified by the community members.
  * social mobilisation by trained field staff resident in the area.
* Initial financial support is required until local communities acquire organisational strength to participate in decision making and resources management.
* Conflicting interests and poor collaboration among government agencies should be overcome satisfactorily for effective implementation of management plans.
* Public awareness should be based upon reliable scientific information.
* Support of a strong community network can considerably help mitigate adverse external impacts that may impede special area management.

Operational experience of the SAM process at the Hikkaduwa Marine Sanctuary and environs

The Hikkaduwa Marine Sanctuary and Environs

Hikkaduwa is located approximately 100 km south of Colombo in the Galle District of the Southern Province. Due to its beautiful nearshore coral reefs and sandy beaches it became the most popular beach resort area in the country with thousands of tourists visiting the area annually. This brought in undeniable benefits in terms of foreign exchange to the country, but on the downside there were severe environmental costs of tourism for the community. SAM planning was introduced to Hikkaduwa to address these problems with the main goal of protecting and managing the coastal resources of the area to enable local tourism and fishing economies to be sustainable, and for

communities to derive continued benefits from the rich biodiversity and environmental quality of the area. Hikkaduwa was first declared a Sanctuary under the Department of Wildlife Conservation in 1979 and upgraded to a Nature Reserve in August 1998.

SAM activities at the Hikkaduwa Marine Sanctuary and Environs are implemented by various government agencies and non-government stakeholders. They include the Coast Conservation Department, Department of Wildlife Conservation, National Aquatic Resources Research and Development Agency, the Ministry of Fisheries and Ocean Resources, the Ceylon Fishery Harbour Corporation, the Ministry of Environment and Natural Resources, Central Environmental Authority, Urban Development Authority, Ceylon Tourist Board and the Local Government Authorities. The coordination of SAM activities in Hikkaduwa is done by the Hikkaduwa Special Area Management and Marine Sanctuary Coordinating Committee (HSAMMSCC). The Hikkaduwa SAM Plan has been included in the proposed Southern Area Development Plan to enable financial assistance for future activities.

Source: HSAMCC, CCD, NARA,CRMP, 1996[10]

Procedures adopted. . . .

* Conserving the resources of the Hikkaduwa Nature Reserve by developing mechanisms to reduce degradation and destruction of coral reefs and marine life and to enhance management of poorly controlled and conflicting uses of the sanctuary.
* Maintaining water quality and controlling waste disposal by reducing the deterioration of coastal water quality through addressing improper disposal of sewage and grey water into ground and coastal waters, and mitigating the problems related to inadequate solid waste disposal and insufficient fresh water supply.
* Maintaining the shoreline by controlling illegal constructions on beaches and unsustainable use of the beach and sanctuary.
* Maintaining community character by mitigating loss of public access to the beach and harbour, and by reducing excessive traffic speed, noise and congestion on the roads.
* Addressing impacts of/on tourism through better coordination for informal tourism facilities and reducing intimidation of visitors by touts and socially undesirable activities.
* Enhancing livelihood opportunities by providing alternative forms of income generation, and finding solutions to inadequate anchorage and landing sites for fishing boats and poor access to the fishery harbour.

Benefits gained . . .*

* Enhancing the efficacy of managing the marine reserve by:
  * establishing a temporary sanctuary office and education facility, enabling increased presence of DWLC personnel and for their training. This has helped provide facilities for awareness creation among sanctuary users and enforcing sanctuary regulations (note: a permanent DWLC office is now being set up with the assistance of the present CRMP project).
  * installing road signs advertising the Hikkaduwa Nature Reserve area.
  * Involving local schools in reserve activities by organising school contests to select a sanctuary logo and t-shirt design.
  * organising awareness programmes for reef users.

- upgrading the Sanctuary to a Nature Reserve with the gazetting of new boundaries and regulations.
- preparing a new zoning plan and demarcation of the relevant zones through the CRMP.
- initiating the establishment of a visitor centre and education facility and development of an education programme.
- relocating fishing boats anchored in the Protected Area in a rehabilitated fishery harbour outside.
- strengthening the Fisheries Cooperative Societies in the area, expansion of the harbour and related facilities such as harbour channels.
- regulating the operation of glass bottom boats in the sanctuary through enhanced cooperation between the Glass-bottom Boat Owners Association (GBBOA), the DWLC and *Pradeshiya Sabhas*.
- developing and implementing a research and monitoring plan for the sanctuary, including water quality monitoring and studies on coral settlement and artificial reef placement.

* Improving water quality and controlling waste disposal by:
  - facilitating projects by hoteliers and the *Pradeshiya Sabhas* for integration of composting and recycling waste, waste disposal and establishment of a landfill site; and community programmes for beach cleaning.
  - developing a wastewater treatment system to service tourist establishments and improving sanitation in the area.
  - reducing entry of pollutants and sediments into the sanctuary and the surrounding sea by identifying all sources and educating stakeholders.

* Ensuring shoreline development through appropriate infrastructure and environmental improvement by:
  - enforcing building regulations and CCD setback requirements in the SAM area.
  - demolition of illegal structures.
  - encouraging soft shore stabilisation techniques to prevent erosion and taking preventive action against sand mining in the SAM area.
  - updating the 1987 UDA plan for development of the tourist environment at Hikkaduwa and the CZMP guidelines for such development.
  - initiating a study of oceanographic patterns and sediment movement in the study area to assist shoreline management.
  - enforcing traffic laws and identification of a by-pass road and off-street parking to ensure better traffic flow.

* Promoting tourism and creating livelihood opportunities by
  - educating school children (a) about the importance of tourism to the local economy and environment and (b) on mitigating adverse social impacts of the industry, through establishment of education networks between tourism establishments, schools and social services.
  - developing plans for a Tourist Centre and identification of a site.
  - establishing a Tourist Police Unit in the area.

Operational experience of the SAM process at the Rekawa Lagoon

The Rekawa Lagoon SAM Site

The Rekawa Lagoon is situated about 200 km south of Colombo in the Hambantota District of the Southern Province of Sri Lanka. The Lagoon is about 250 ha in extent, with a wide basin and narrow meandering channel leading to its mouth by the sea. The Lagoon, its water supply and flow, the fisheries, the mangroves and other scrub forests with their wildlife, the adjoining agricultural lands and the dynamic beach environment are major resources of the area. The marked trend of misuse and over-exploitation of resources in this area led to the preparation of a SAM plan to address the resultant problems. The main goal of this plan was to protect and manage the coastal resources of Rekawa so that the community can continue to draw benefits from the biodiversity and environmental quality of the area and support the natural resource based economy, while enabling appropriate and sustainable new development in the area.

The SAM activities at Rekawa are implemented by many government agencies. The primary management responsibility rests with the CCD; other government agencies with a role in implementation include the Central Environmental Authority, the Ceylon Tourist Board, the Forest Department, the Irrigation Department, the Ministry of Fisheries and Aquatic Resources, the National Aquatic Resources Agency and the Department of Wildlife. Local government agencies, non-governmental organisations and community-based organisations also have key roles to play in the SAM process and are equal partners in implementing the plan.

Procedures adopted. through collaborative action . . .

* Maintaining adequate water quality in the Lagoon by improving fresh water flow (i.e. now reduced due to irrigation uses) and seawater exchange in the Lagoon; controlling sedimentation and pollution.

* Enhancing Lagoon and marine resources through controlling over-fishing of shrimp and fish in the Lagoon, preventing coral mining, halting collection of turtle eggs and slaughter of turtles, and controlling damage to mangroves and scrub forests.

* Minimising land use problems caused by abandoning land affected by high salinity, lack of guidelines and zoning for aquaculture and tourism development.

* Reducing incidence of poverty compounded by over-dependence on social welfare programs, weak Community Based Organisations (CBOs) with poor leadership, lack of training and education for alternative livelihoods and unsustainable aquaculture and tourism.

Benefits gained . . .

* Improving water quality by:
  * modifying the Kapuhenwala causeway and construction of a bridge to ensure free flow of fresh water in to the Lagoon.
  * monitoring water quality to educate the farming community and modify user practices.

* Enhancing the efficacy of managing resources by:
  * establishing a Centre for Coastal and Lagoon Environmental Education and Research.
  * declaring the mangrove area as a forest reserve, developing a zonation scheme and a plan for Sustainable Use of mangroves, and community management of mangroves.
  * strengthening and expanding the Rekawa Lagoon Fisheries Management Committee (RLFMC) which is the reconstituted RLFCS (Rekawa Lagoon Fisheries Cooperative Society) set up in 1995.
  * establishing a Cooperative Fisheries shop and procurement of equipment.
  * replenishing the depleted Lagoon shrimp resources by introducing shrimp postlarvae.
  * forming a community based organisation for sea turtle conservation by the Turtle Conservation Project (TCP).
  * strengthening and expanding the Sea Fishery Cooperative Society.

* Initiating activities for poverty alleviation by:
  * establishing a nature-based tourist hotel.
  * implementing income-generating projects using community organisation techniques.
  * stimulating local economic development and self-reliance through education, training and community organisation.
  * rehabilitating saline land at *Yarawela Yaya* and *Patha Pallama Welyaya*.

Lessons learnt through interim evaluation of the Hikkaduwa and Rekawa SAM process

This evaluation was carried out in the first year of the SAM pilot projects implemented at Hikkaduwa and Rekawa. The assessment has focused on quality of planning, design and preliminary implementation of the two projects and key issues of institutional design. The outcome indicated that:

* boundary designation of SAM sites should be based on explicit criteria.
* the planning of SAM projects should be based on high quality technical analysis which needs considerable financial assistance; if funds are limited an alternative mode for determining basic planning and management is essential.
* making coastal user groups a primary focus for community organisation and mobilisation is an effective strategy for SAM.
* the identification of coastal resource users with usufructural rights, including those living outside the project site, should receive greater emphasis in future SAM plans.
* motivated and effective project facilitators are instrumental to obtain the required community mobilisation and for coordination with NGO personnel and government officials,
* future plans should contain prioritised strategies and actions and an implementation schedule.
* improved livelihood for economically marginal people living in coastal areas is a necessary part of the SAM projects, requiring a mechanism to obtain technical assistance for project development at each site based on local environmental, economic, and social conditions.
* the active role of government is a key features for the success of SAM projects in Sri Lanka, requiring innovative mechanisms to ensure that there is adequate support by way of government resources at the local level and legal/ administrative assistance.
* establishing ground rules for government participation at the beginning of project design, and creating better understanding about the role of state institutions in the SAM process will help avoid confusion and ambiguity about state inputs into SAM plans.
* CCD and CRMP staff are instrumental in providing the required liaison services, technical and political support; and expanding staff capacity to meet this requirement is a critical need.
* co-management systems need time to evolve and impacts of the SAM process are not likely to be visible in the short term; but user groups should perceive tangible benefits to ensure their continued support for collaborative resource management.
* satisfactory working relationships between user groups and local government agencies are essential to ensure success of collaborative actions.

Source: Lowry et al 1997[4]

Lessons learnt from the Rekawa SAM planning process in 2002

A survey carried out in August 2002 in connection with a broader study on analysis of factors influencing the sustainability

of livelihoods in rural coastal communities of Sri Lanka offered several lessons for enhancing the SAM process:

* mechanisms are required to build capacity among community based organisations to generate their own funds after donor funding ceases; over reliance on external sources of funding/state subsidies provides a false sense of security.
* greater awareness should be built about the role of CBOs in participatory management of natural resources among the community.
* accepted conflict resolution techniques should be employed to mitigate conflicts over resource use, and members of CBOs trained to use these techniques.
* financial transparency is essential as a management norm.

* effective communication to inculcate an understanding of the natural resource being managed is vital to ensure success of sustainable management of resources by local people.
* satisfactory working relationships between user groups and local government agencies are essential to resolve conflicts and to ensure continued support by communities in the SAM process.
* monitoring and continued enforcement of regulations is important to ensure that prohibited activities do not re-commence at SAM sites.
* alternate income generating activities through the SAM process should not be introduced in an ad hoc manner, and should be based on in-depth feasibility studies and identification of viable markets to ensure long-term sustainability.
* independent monitoring and evaluation of initiatives generated through the SAM process is vital, especially in respect of those connected with livelihood enhancement.
* CBOs should be trained in community mobilisation techniques to raise conservation awareness among the community and to involve all stakeholders in community development.
* the success of the Special Area Management Coordinating Committees depends greatly on the effectiveness and enthusiasm of the Chairperson of the Committee.

Source: S. Senaratna personal communication, 2002

6.2 IMPROVING EFFICACY FOR SPECIAL AREA MANAGEMENT

SAM planning has been carried out for nearly two decades. While this approach is clearly perceived as effective for managing development in complex settings, several constraints have prevented the realization of maximum benefits from this management process. The pilot projects at Rekawa and Hikkaduwa and the SAM planning aspects in the Muthirajawela Marsh and the Negombo Estuary have provided valuable lessons that can be used to enhance SAM planning and implementation at other sites in the future.

Level II SAM sites (Areas of particular Concern)

An important lesson gained through the SAM experience is that while comprehensive and collaborative SAM management plans are required for sites with multiple resource use conflicts there should be another category of collaborative plans called Level II SAM plans for managing geographically smaller, less complex sites characterized by fewer user conflicts that can be more easily resolved. However, Level II SAM plans should also follow the same planning processes and principles as the more comprehensive SAM plans. It is expected that projects for managing Level II SAM sites could be handled without too many complicated administrative constraints and can be achieved through a smaller financial component obtained at the local level.

Improving the efficacy of SAM planning requires addressing several key issues based on an understanding of the basic requirements for SAM planning:

1. There is no blue print for SAM. Each site should be considered unique, requiring application of specific integrated methodology; planning should be based on site-specific issues, extent of area to be covered etc. They need to be supported by issue related situation reports.

2. The size of project area is a key consideration. There is a greater possibility of success when the area is smaller.

3. Large areas may be considered for SAM Planning. However regulations have to be made under amendments to the Coast Conservation Act designed to bring in the entirety of a declared SAMP area within the definition of the Coastal Zone. Therefore all development activities in such an area should be implemented under the CCA from the date of the CCA amendment. The size of the area so declared will have to be kept to a minimum.

4. All decisions made during planning and implementation should be clear and well documented; binding decisions must be clearly communicated to all involved in the process and abided by all to prevent mistrust which will jeopardise the SAM process.

5. Agencies having an implementation role in SAM plans should be obliged to include activities in fulfillment of that role, in their annual work programmes.

6. Full and active participation of representative stakeholder groups at all stages directly underpins success of SAM planning and implementation, and is critical to counteract adverse influences

7. The entire SAM process must be transparent and participatory with consensus among all stakeholders.

8. Local communities should have opportunities to derive tangible benefits from the initial stages of the SAM process if they are to be motivated to manage natural resources.

9. Communities should be supported at the initial stages of the SAM process with financial and technical assistance to strengthen their organizational capacity for plan implementation; they may also require long-term financial assistance for socio-economic development of the area.

10. Mechanisms should be built into SAM plans for promoting self reliance to minimize the dependency on external support

11. Wherever possible SAM processes should be incorporated into district and provincial development plans or regional projects of the government to be in harmony and in compliance with National and Regional Development Plans.

12. All SAM plans should have a mechanism for participatory monitoring and feedback systems, based on indicators identified at the outset of project planning for continued improvement of the implementation process and to make the results tangible.

13. Documenting changes over time, enables better understanding of the management process by all concerned, and positive results will motivate participation and further management efforts.

6.3 MECHANISMS FOR SAM PLANNING AND IMPLEMENTATION

6.3.1 Identification and agreement on SAM sites

The revised CZMP 1997 identified 23 sites as potential SAM sites with specific complex issues to be resolved (including Hikkaduwa, Rekawa and Negombo). Although SAM projects were already in progress at Hikkaduwa, Rekawa and Negombo, they were included in the list of potential SAM sites in the 1997 Plan as well in order to obtain financial assistance to continue the SAM process. All 23 potential sites had been ranked in respect of a set of criteria which included (a) severity of resource management issues, (b) biodiversity, (c) viability of SAM at the site and (d) economic significance. Based on the rating obtained nine out of these 23 sites were identified as high priority sites. These are Arugam Bay, Batticaloa Estuary, Bar Reef, Chilaw Estuary, Beruwala/Bentota, Hikkaduwa town and Sanctuary, Negombo Estuary, Rekawa Lagoon and Unawatuna Bay.

A major drawback of the list of the 1997 SAM sites was that it included very few sites from the northern and eastern regions. This stemmed from the difficult ground situation on account of the armed conflict which prevented access to these areas for public consultations and site identification. It was further compounded by the scarcity of information on possible sites within this region. The CRMP coastal habitat survey (January – June 2002) confirmed that the 1997 ranking of sites is no longer valid due to drastic changes that have taken place over the last five years. In this context under the 2002 Survey the entire coastal zone of the country was covered over a period of six months (January – June 2002) in order to identify any additional sites which required special area management.

Stakeholder workshops were held at district levels to identify sites for special area management. Potential sites and their boundaries were initially identified by stakeholders, based on specific socio-economic and ecological significance and the severity of issues. This was followed by categorization of the sites into two groups viz. (a) geographically larger sites with multiple resource use conflicts termed Special Area Management (SAM) sites, and (b) geographically smaller sites with fewer user conflicts termed areas of particular concern and called level II SAM sites. The level II SAM sites were ranked through stakeholder consultation in terms of priority for implementation, and further confirmed by an expert evaluation (Annex 6.1). Ranking was based on a set of social, economic and ecological criteria (Annex 6.2). The SAM sites were not ranked for implementation in this document as it was felt that this process should be institutionalized and carried out by an advisory committee comprising of representatives from the concerned agencies and experts with experience in the SAM process. However, the stakeholder evaluations for SAM sites are included in Annex 6.3, excluding sites where SAM planning is in progress.

The sites at which the SAM process is ongoing are given in Table 6.1. Out of the balance 50 sites listed for management in this document, 27 are identified as potential SAM sites and the remaining 23 sites are identified as potential level II SAM sites (Table 6.2). Annex 6.4 provides information on the present status and proposed boundaries of the selected sites.

Table 6.1: Sites at which the SAM process is ongoing

District	Site
Colombo	Lunawa Lagoon
Galle	Madu Ganga Estuary Hikkaduwa Nature Reserve and environs Unawatuna Bay and Koggala Estuary
Hambantota	Coastal stretch in Hamabantota Mawella lagoon Kalametiya lagoon
Gampaha	Negombo Estuary/Muthurajawela marsh
Puttalam	Bar Reef

Table 6.2: List of potential special area management sites in the coastal area

	Special Area Management Site - Level I	SAM Sites - Level II
Ampara	* Periya Kalapu and Korai Kalapu (Lagoons) * Panama dunes, Arugam Bay and Arugam Kalapu (Lagoon)	* Kalmunai fishing area * Konawatte Lagoon and Oluvil fishing area * Komari Lagoon
Batticoloa	* Batticoloa Estuary * Uppar Panichchankerni Estuary (Vakarai) * Kalkudah- Passikudah bays, Vandaloos and Thenadi bays, Valachchinai Estuary	* Punnaikuddah, Kaluwankerni Bays * Kaththankudi Thona coastal area * Verugal aru
Colombo		* Dehiwala - Mt. Lavinia beach
Galle	* Beruwala coastal stretch – and Bentota Estuary * Dodanduwa Lagoon (Ratgama Lake)	* Kosgoda Lagoon & beach * Madampe Lake
Hambantota	* Rekawa , Ussangoda and Kalmatiye cluster	* Rekawa Lagoon, Kalamatiye & Lunawa Lagoon Cpmplex * Ussangoda headlands * Rekawa Kalamatiye Beach
Jaffna	* Manalkadu Dunes * Jaffna Estuary (town area) * Thondaimanaru Lagoon * Kankesanthurai and Keeramalai coastal area * Mandativu, Delft, Nainativu Islands * Karainagar (including Casuarina beach) coastal area * Navali coastal area	* Vadamarachchi coast * Thiruvadinilai – Sankanai coastal area * Palaitivu Island
Kalutara		* Kalu Ganga Estuary
Mannar	* Gulf of Mannar * Thalaimannar coastal area * Sillavathurai , Arippu and Aruvi Aru coastal area and Bay of Kondachchi,	* Periya Kadai coastla area * South Bar coastal area * Erukulampiddi coastal area * Manthai West coastal area * Pesalai coastal area * Vankalai coastal area
Matara	* Weligam Bay	* Polhena beach
Mullaitivu	* Nanthikadal Lagoon * Nai Aru Estuary	
Puttalam	* Puttlam Estuary * Chilaw Estuary * Mundal Lake & Puttlam Corridor Channel	
Trincomalee	* Trincomalee Bay * Nilaweli beach, Pigeon Island, Periyakarachcchi and Sinnakarachchi Estuaries * Clappenberg bay	* Kuchchiveli- Puduvakattu (includ ing Pirate Coves) coastal area * Thambalagam Bay * Pulmudai coastal area

6.3.2 Guidelines for the SAM process

The following general guidelines have been developed taking into consideration the lessons learnt in the past. However, they have to be adapted to meet the needs of the specific sites or even omitted depending on the circumstances.

I. Selection of a site

SAM sites listed in the CZMP (Table 6.2) can be selected by an implementing agency for SAM planning. A site specific plan should be prepared by the implementing agency for the selected site with active community participation enabled by a professional facilitator/ manager.

II. Preparing the site plan

In preparing the site plan, following guidelines may be followed.

a) Identification of issues through community consultation
The facilitator/manager of a SAM site is responsible for identification and prioritising the site specific issues through stakeholder consultations using an appropriate tool such as Participatory Rural Appraisal (PRA),Logical Framework Approach or SWOT analysis (note: identification of the magnitude of issues is not possible at this stage).

b) Establishment of a Community Coordinating Committee (CCC):
* A Community Coordinating Committee (CCC) has to be established at the site to function as the SAM planning and implementation body.
* The CCC should comprise:
  * representatives of all resource user groups of the area,
  * 'resource guardians' (e.g. NGOs, CBOs), and
  * resource managers (e.g. government, semi-government and local government authorities).
* The facilitator/manger has to ensure that all resource user groups and their representatives are included in the CCC.

c) Prioritization of identified issues and preparation of an environmental profile or situation/site reports:
* The implementing agency as the case depending on the magnitude of the issues to be addressed and the urgency of implementing the plan will prepare the environmental profile/ or situation/site report. This is done with the help of the facilitator and CCC.
* Prioritisation of issues identified is a basic requirement for the preparation of an environmental profile or situation/ site report. In addition the data gaps have to be filled through analysis of secondary data and collection of primary data.
* The data collection can be carried out by the facilitator/ manager in collaboration with the CCC, using data collectors mobilised for the purpose.

d) Preparation of the draft SAM Plan
* The implementing agency should prepare a SAMPlan based on the environmental profile or situation/site report through a transparent and flexible process with the co-operation of stakeholders
* The Plan should:
  * clearly identify objectives for management and policies to be adopted with action plans.
  * clearly define the rights and obligations of stakeholders in the utilisation of the resources at the site.
  * clearly define and specify legal authority and regulations pertaining to the SAM site following its declaration.
  * Identify and include indicators for monitoring plan implementation.
  * Identify and include indicators to monitor the changes desired in the plan
  * have provision for public awareness and education programmes and communicationamong the stake holders.
  * Clearly define the role to be played by the communities in managing the resources
  * Explain short, medium and long term interventions enabling the implementing agency to take up the short term interventions as a priority which can run parallel to long term planning
* The draft SAM Plan should be scrutinised by the CCC and any shortcomings corrected before finalisation.

III. Declaration of Special Area Management Sites:

The final SAM plan should be submitted to the Coast Conservation Advisory Committee for approval. It is envisaged that the revised Coast Conservation Act will have provision to declare the sites specified in the CZMP as Special Area Management Sites clearly defining their boundaries. This will confer legal status to the sites and regulations specified in the SAM Plans.

IV. Implementation of selected activities simultaneously with planning process:

Small scale selected activities that can bring about tangible benefits to the local people should commence in parallel with planning to provide impetus for participation in the SAM process. For example an action plan prepared to improve the management of a small Lagoon fishery in a SAM site will show results within a relatively short period, and demonstrate local benefits through SAM.

V. Monitoring and evaluating of plan implementation

Monitoring and evaluating the impacts of the plan during its implementation should be carried out using specified indicators identified during plan preparation.

6.4 MANAGEMENT OBJECTIVES, POLICIES AND ACTIONS

OBJECTIVE 1
Coastal Zone management is enhanced by extending the SAM process to all areas requiring site specific and integrated sustainable resource management.

Policy 1.1
The Special Area Management (SAM) process will be implemented at the Divisional/District/local level with identified stakeholder collaboration.

Strategy 1.1.1
Prepare comprehensive SAM plans for identified priority sites with the collaboration and effective participation of local communities, non-governmental and governmental agencies.

Proposed action

1. Select sites that should be managed as SAM sites.
2. Establish a mechanism to obtain donor assistance.
3. Follow guidelines provided in the CZMP 2004 in the planning of the SAM process with local collaboration and facilitate the implementation at local/district/divisional levels.
4. Develop participatory monitoring plans to assess the progress and impacts of the SAM process.

Strategy 1.1.2
Develop a mechanism to enhance local collaboration and participation in SAM.

Proposed action

1. Develop a communication plan to ensure better collaboration and participation of all stakeholders in SAM.
2. Develop an incentive scheme to encourage local collaboration and participation by ensuring tangible benefits to communities.

Strategy 1.1.3
Strengthen the ongoing SAM projects by rectifying the weaknesses experienced during implementation.

Proposed action

1. Identify main constraints, analyse lessons learnt, carryout a situation analysis and find solutions to rectify the shortcomings experienced in the implementation of ongoing SAM plans, and facilitate continuity of the process.
2. Institutionalise a programme to monitor and evaluate SAM projects, and establish a feedback mechanism to assist enhance the management efficiency.

Policy 1.2
The capacity of local authorities and concerned state agencies will be strengthened to enhance implementation of SAM Plans.

Strategy 1.2.1
Enhance the SAM implementation capacity of Local Authorities and concerned state agencies through training and awareness programmes and effective legislation.

Proposed action

1. Promote training and awareness programmes on SAM processes.
2. Strengthen the legal framework for SAM planning.
3. Promote collaborative management through SAM Committees.
4. Include guidelines for and responsibilities of communities, government/semi-government organisations, District Secretariats and CCCs for implementation of the SAM Plans.
5. Strengthen capacity of local level officials for SAM planning.

Policy 1.3
The special area management process will be harmonised with national and regional development efforts.

Strategy 1.3.1
Incorporate and integrate planning and management of SAM sites into development plans of regional/integrated national development projects where appropriate.

Proposed action

1. Coordinate with the Ministry of Plan Implementation to identify a mechanism to incorporate SAM Plans in regional projects/ integrated national projects.
2. Establish a mechanism to facilitate private sector participation in activities of SAM processes.

Policy 1.4
The long-term sustainability of the SAM projects will be ensured.

Strategy 1.4.1
Ensure the long term sustainability of the SAM process at each site through introduction of strategic actions for self-sustenance of the process.

Proposed action

1. Develop an in-built self sustenance mechanism with experience gained during implementation of the plan that will enable the project to become financially independent

References:

1. De Cosse, P.J., and Jayawickrama, S.S. 1996. *Co-management of resources in Sri Lanka: Status, Issues and pportunities*. USAID/Sri Lanka Natural Resources and Environmental Policy Project, Colombo.

2. CCD. 1997. *Revised Coastal Zone Management Pan, Sri Lanka, 1997*. Colombo: Coast Conservation Department. Ministry of Fisheries and Aquatic Resources Development.

3. Jayatilake, A.,; Pallewatta.,' N.,; and Wickramanayake, J. 1998. The practice of community based conservation in Sri Lanka. In *Community and Conservation: Natural Resource Management in South and Central Asia*. Ed. A. Kothari,, N. Pathak, R.B. Anuradha, and B. Taneja, New Delhi: Sage Publication.

4. Lowry, K.,; Pallewatte, N.,; and Dainis.A.P. 1997. *Special Area Management Projects at Hikkaduwa and Rekawa. A Preliminary Assessment.* CRMP. Colombo.

5. Lowry, K.,; Pallewatte, N.,; and Dainis, A.P.,; 1999. Policy-relevant assessment of community-level coastal management projects in Sri Lanka. *Ocean and Coastal Management* 42 (8): 717 – 745.

6. Wickramaratne, H.J.M. and A.T.White. 1992. *Concept paper on Special Area Management for Sri Lankan Coasts.* Working Paper No.10, 1992. CRMP Colombo.

7. Senaratna, S. 2003. Factors influencing the sustainability of livelihoods in rural coastal communities in Sri Lanka. PhD Upgrade Report. Imperial College London.

8. Sorensen J. C., and McCreary , S.T. 1990. *Institutional arrangements for managing coastal resources and environment.* Renewable Resources Information Series No. 2, US Department of the Interior National Park Service,Washington DC.

9. CEA/Euroconsult. 1994. *Conservation Management Plan-Muthurajawela Marsh and Negombo Lagoon.* Wetland Conservation Project. Central Environmental Authority (Sri Lanka)/ Euroconsult (Netherlands)

10. HSAMCC/CCD/NARA/Department of Wildlife Conservation/ DWLC/CRMP/, 1996. *Special Area Management Plan for Hikkaduwa Marine Sanctuary and Environs. Sri Lanka.* Hikkaduwa Special Area Management and Marine Sanctuary Coordinating Committee, Coast Conservation Department, National Aquatic Resources Agency, Department of Wildlife Conservation, and Coastal Resources Management Project..

11. RSAMCC/CCD/NARA/CRMP. 1996. *Special Area Management Plan for Rekawa Lagoon, Sri Lanka.* Rekawa Special Area Management Coordinating Committee/ Coast Conservation Department/ National Aquatic Resources Agency/ and Coastal Resources Management Project.

7. MANAGEMENT OF SITES OF SPECIAL SIGNIFICANCE AND PUBLIC ACCESS

7.1 INTRODUCTION

7.1.1 Nature and significance of archaeological, historical, religious and cultural sites

Sri Lanka has had a distinctive island civilization with a long history of more than 2500 years. Ports, forts and sites of cultural and historical importance came to be developed within the Coastal Zone as a result of the migrations from neighbouring countries as well as European nations. Commercial and trade activities during the monarchical and colonial times, too, have played a singular role in building up the coastal heritage of the island.

Monuments and sites located along the coastal zone are of a diverse nature and of great significance. Archaeological sites of the coastal zone constitute Pre-historic (Mesolithic) and Proto-historic (Early Iron Age), together with a large number of sites of the historic period, which include religious (Buddhist, Christian, Hindu and Muslim) sites and secular sites such as forts, ports, lighthouses, residences, etc. In the case of religious and historic sites, often a line of demarcation cannot be drawn. At the same time, some of the sites such as forts, ports and lighthouses stand by themselves as distinct entities confined to the coastal zone alone. A few shipwrecks within the 2 km limit from the shore are significant ruins that call for attention. Maritime underwater archaeological projects under way play an important role in this sphere.

There are numerous coastal sites that are of considerable importance for the preservation of the cultural heritage of Sri Lanka. They are acutely prone to despoliation than the monuments in the hinterland due to natural causes like coastal erosion and human intervention including building activities and pollution. Hence the necessity for steps to be taken to preserve this heritage of the island's civilization. The nature and significance of such coastal sites are briefly discussed below.

Identification and prioritization of sites

Important archaeological, historical, religious and cultural sites, and scenic and recreational areas within the Coastal Zone (Table 7.1) were identified through a survey in 1989 and updated in 2002. The sites of the coastal area of the western and the southern regions between Kalpitiya and Kirinda were identified by a field survey, while due to the existing war situation in these areas at the time, sites in the eastern and the northern regions were identified through a literature survey only. The field survey of 2002 on the other hand covered the entire Coastal Zone of the country, enabling the updating of the existing information. This resulted in the identification of many new sites of high priority.

For purposes of prioritization for management, all identified sites have been categorized as follows:

A - High Priority Sites: of notable antiquity earlier than 1815, historical association, aesthetic value and/or those which are the focal points of religious activities (see Table 7.1).

B - Medium Priority Sites: dated later than 1815 but older than 100 years and also of some historical, aesthetic and /or popularity value.

C - Low Priority Sites: religious monuments of recent origin, without any special aesthetic or popularity value.

The revised CZMP 2004 includes the sites in the "high priority" category (including the improved sites). It should be noted that in updating the list of sites, some of those sites identified as "Medium Priority" in the survey of 1989 are in the present list recognized as falling under "high priority" based on the additional information obtained through the survey of 2002.

Table 7.1: High priority archaeological, historical, religious and cultural sites within the Coastal Zone

No.	Place	Type	GN Division	GND
	Puttalam District			
1	Kudiramalai pre-historic site	A/H/C	Pukulam	634
2	Kollan Kanatta pre-historic site	A/H/C	Pukulam	634
3	Dutch Church*	H/C	Sinnakudirippu	631
4	Dutch Fort*	H/C	Sinnakudirippu	631
5	Dutch House	A/H	Sinnakudirippu	631
6	St. Anne's Church	H/R/C	Mudalaipali	625/626
7	Sri Mariamman Kovil	H/R/C	Udappuwa	594
8	Kali Amman Kovil	H/R/C	Udappuwa	594
9	Mohideen Jumma Mosque	H/R/C	Udappuwa	594
10	Sri Pathasrdhi Draupadi Kovil	H/R/C	Udappuwa	594
11	Ayyanar Kovil	H/R/C	Karukkaponai	582
12	Wanawasa st.Anthony's Church	H/R/C	Karukkaponai	582
13	St.Anthony's Church, Thoduwawa S.	H/R/C	Thoduwawa S.	531
14	St. Anthony's Chruch	H/C/R	Ulhitiyawa North	294
	Gampaha District			
15	Kudapaduwa Church	H/C/R	Ettukala	73
16	St. Sebastian Church	H/C/R	Wellaweediya	158
17	Main Street Church	H/C/R	Munnakkare	156
18	District Court Building	A/H	Munnakkare	156
19	Negombo Fort	A/H	Munnakkare	156
20	Church of Our Lady of Sindrathri	H/C/R	Duwa	162A
21	Shipwreck	A(M)	Duwa	162A
22	St. Anne's Church	H/C/R	Pitipana	162
23	St. Mary Magdalena Church	H/C/R	Talahena	163
24	St. Babara's Church	H/C/R	Talahena	163
25	St. Anthony's Church	H/C/R	Kepungoda	163A
26	St. Joseph's Church	H/C/R	Pamunugama	164
27	Shipwrecks	A(M)	Uswetakeyyawa	167
28	Church of Our Lady of Mount Carmel	H/C/R	Palliyawatta	168
	Colombo District			
29	Whist Bungalow	A/H/C	Modara	2
30	Siva Kovil	H/C/R	Modara	2
31	St. James' Church	H/C/R	Aluth Mawatha	4
32	Jumma Mosque	H/C/R	Aluth Mawatha	4
33	Sri Ponnambalameswar Kovil	H/C/R	Kochchikade	9
34	St. Thomas' Church	H/C/R	Kochchikade	9
35	St. Anthony's Church	H/C/R	Kochchikade	9
36	Colombo Fort	A/H/C	Fort	20
37	Colombo Harbour	A/H/C	Fort	20
38	Jami Ul-Alfar Mosque	H/C/R	Fort	20
39	Gordon Gardens	H/C	Fort	20
40	St. Peter's Church	H/C	Fort	20
41	Hotel Taprobane	H/C	Fort	20
42	Khan Clock Tower	H/C	Fort	20
43	Naval Head Quarters	H/C	Fort	20
44	Galbokke Lighthouse	H/C	Fort	20
45	Cargills, Department Stores	H/C	Fort	20
46	President's House	H/C	Fort	20
47	Former General Post Office Building	H/C	Fort	20
48	Chatham Street Clock Tower	H/C	Fort	20
49	Dutch Hospital	H/C	Fort	20
50	Prison Cell of Sri Wickrama	H/C	Fort	20
51	RajasingheOld Parliament Building	H/C	Fort	20
52	Old Secretariat	H/C	Fort	20
53	Galle Face Green	H/C	Slave Island	21
54	Beira Lake	H/C	Slave Island	21
55	Taj Samudra Hotel	H/C	Slave Island	21
56	Galle Face Court	H/C	Kollupitiya	37
57	Galle Face Hotel	H/C	Kollupitiya	37
58	Temple Trees	H/C	Kollupitiya	37
59	St. Andrew's Scots Kirk	R/H/C	Kollupitiya	37
60	Sri Darmakirtiyaramaya	R/H/C	Kollupitiya	37
61	Dutch Reformed Church	R/H/C	Bambalapitiya	38
62	Borah Mosque	R/H/C	Wellawatta	38
63	Ramakrishna mission	R/H/C	Mountlaviniya	47
64	Dutch Church	R/H/C	Mountlaviniya	541
65	St. Thomas Collage	H/C	Mountlaviniya	541
66	Grand Hotel	H/C	Mountlaviniya	541
67	St. Francis Xavier's Church	H/C	Angulana	547
68	Duwe Dewale Church	H/C	Angulana	547
69	Lunawa devale	R/H/C	Uyana	552
70	Methodist Church	R/H/C	Uyana	552
71	St. Joseph's Church	R/H/C	Uyana	552
72	Talarukkharamaya	R/H/C	Katukurunda	555
73	Bodhirajaramaya	R/H/C	Egoda Uyana	556
	Kalutara District			
74	Rankot Viharaya	R/H/C	Pattiya North	685
75	Sri Sudharmaramaya	R/H/C	Nalluruwa	692
76	Samudraramaya	R/H/C	Talpitiya	697
77	Parana Walawwa	H/C	Molligoda	704
78	Sri Sudharma Dharma Salawa	R/H/C	Mahawaskaduwa	714
79	Asokaramaya	R/H/C	Kalutara North	717
80	Pulinatalaramaya	R/H/C	Kalutara North	717
81	Kalutara Fort	R/H	Kalutara South	725
82	Kalutara Bodhiya (Gangatilaka Vihara)	R/H/C	Kalutara South	725
83	Church of the Infant Christ	R/H/C	Kalamulla	731
84	St. Joseph's Church	R/H/C	Kuda Paiyagala	734
85	Rajeswari Church	R/H/C	Kuda Paiyagala	734
86	St. Joseph's Church	R/H/C	Maha Paiyagala	735
87	Francis Xavier's Church	R/H/C	Maha Paiyagala	735
88	Purana Chetiyaramaya	R/H/C	Magalkanda	746
89	Kechchimale Mosque	R/H/C	Paranakade	753/757
90	Beruwala Lighthouse	H/C	Paranakade	753/757
91	Maradana Mosque	R/H/C	Maradana	754
92	Duwe Viharaya	R/H/C	Moragalla	760/761
	Galle District			
93	Bentota Rest House	H/C	Pahurumulla	1
94	Bentota Rajamahavihara	R/H/C	Pahurumulla	1
95	Village Council Building	H/C	Angagoda	2
96	Sri Gnanawimala Purana Vihara	R/H/C	Ahungalla	18
97	Samudraramaya	R/H/C	Ahungalla	18
98	Sumanaramaya	R/H/C	Ahungalla	89
99	Jumma Muslim Mosque	R/H/C	Balapitiya	89
100	Sri Subhadraramaya	R/H/C	Balapitiya	89
101	Ambalangoda Rest House and Dutch Church School	H/C	Balapitiya	82
102	Modara Devale	R/H/C	Maha Ambalangoda	82
103	Chetiyagiri Purana Viharaya	R/H/C	Maha Ambalangoda	80
104	Shipwreck	A(M)	Akurala	76
105	Sinigama Devalaya	R/H/C	Sinigama	64
106	Subhadraramaya	R/H/C	Totagamuwa	61
107	Sailabimbaramaya	R/H/C	Dadanduwa	51
108	Nashir Mohamed Mosque	R/H/C	Gintota	103
119	Miran Mosque	R/H/C	Gintota	103
110	Hussain Mosque	R/H/C	Gintota	103
111	Devol Devalaya	R/H/C	Gintota	103
112	Shipwreck	A(M)	Gintota	103
113	Veheragala	R/H/C	Gintota	103
114	Galle Fort	H/C	Galle Fort	96
115	Ahangama Maha Viharaya	R/H/C	Ahangama Central East	157,156
116	St. Mary's Church	R/H/C	Dangedara South, Kaluwella	97A, 98C
117	Sri Minachchi Sundanesvar Temple	R/H/C	Dangedara South, Kaluwella	97A,98C
118	Sri Kadira Velayudha Swamy Kovil	R/H/C	Dangedara South, Kaluwella	97A,98C
119	The Closenberg	H/C	Magalla	99
120	Shipwreck	M.A	Magalla	99
121	Welle Devalaya	R/H/C	Unawatuna West	137
122	Ariyakara Viharaya	R/H/C	Talpe South	132
123	Sri Subhadraramaya	R/H/C	Koggala	144 A
124	Birth Place of Martin Wickramasinghe and Folk Museum	H/C	Koggala	144 A

No.	Place	Type	GN Division	GND
125	Devagiri Vihara (Hirugal Devale)	R/H/C	Koggala	144 A
126	Air Base	H	Koggala	144 A
127	Aluth Walawwa	H/C	Kataluwa West	162
	Matara District			
128	Rajakulawadana Raja Maha Viharaya	R/H/C	Mahawediya	382
129	Theruvila Kovil	R/H/C	Mahawediya	382
130	Veluvanaramaya	R/H/C	Mirissa South	406
131	Bodhi Tree and Devalaya	R/H/C	Mirissa South	406
132	Sri Subhadraramaya	R/H/C	Mirissa South	406
133	Samudragiri Viharaya	R/H/C	Mirissa South	406
134	Sri Subhadraramaya	R/H/C	Kamburugamuwa	408
135	Samudrateera Viharaya	R/H/C	Kamburugamuwa	408
136	Kompannawatta Kovil	R/H/C	Madihe	411
137	Pujita Nivasa	H/C	Madihe	411
138	Jaya Maha Viharaya	R/H/C	Polhena	412
139	Galagediyawa Viharaya	R/H/C	Polhena	412
140	Matara Fort	R/H/C	Kadaweediya	417B, C
141	Church of Our lady of Matara	R/H/C	Ganigasmulla	416
142	Wellamadama Ambalama	H/C	Medawatta	425
143	Kihireli Viharaya	R/H/C	Devinuwara West	433A
144	Vishnu Devalaya	R/H/C	Devinuwara West	433A
145	Muhandiram Walawwa	H/C	Devinuwara West	433A
146	Lighthouse	H/C	Devinuwara West	433A
147	Sinhasana Kovila	R/H/C	Devinuwara West	433A
148	Wanawasa Raja Maha Viharaya	R/H/C	Devinuwara West	433A
149	Talgashena Viharaya	A/R/H/C	Gandara E &.W.	473/473A
150	Siri Sumanarama	R/H/C	Kottegoda	440
151	Abhayadeera Walawwa	H/C	Kottegoda	440
152	Gurukanda Viharaya	R/H/C	Batigama	451
153	Maligatenna Raja Maha Viharaya	R/H/C	Dodampahala E.	453A
154	Veherahena Minikirule Raja Maha Viharaya	R/H/C	Dodampahala E.	453A
	Hambantota District			
155	Walukaramaya	R/H/C	Kudawella W.&.E	464A, B
156	Tangalla Fort	H/C	Kotuwegoda	458
157	Tangalla Bodhiya	R/H/C	Kotuwegoda	458
158	Giribandu Viharaya	R/H/C	Kotuwegoda	458
159	Burial Ground	H/C	Kotuwegoda	458
160	Rest House (Old wing)	H/C	Kotuwegoda	458
161	Vehera Navaya	R/H/C	Bata Ata	562
162	Ussangoda	A	Lunama	555
163	Gothapabbata Viharaya	A/R/H/C	Walawa	586
164	Godavaya Port	A/H	Walawa	586
165	Martello Tower	H/C	Hambantota	584
166	New Mosque	R/H/C	Hambantota	584
167	Bundala Archaeological Reserve	A	Bundala	604
168	Telulla Buddhist Ruins	A/H	Bundala	604
169	Kirinda Viharaya	R/H/C	Kirinda	601
170	Palatupana Fort	H/C	Kirinda	601
171	Shipwreck Egypt (1922)	A(M)	Kirinda	601
172	Shipwreck (1961)	A(M)	Kirinda	601
173	Patanagala	A/H/C	Magama	602
174	Minihagalkanda	A/H	Magama	602
	Ampara District			
175	Megalithic Site, Kumana	A	Kumana	1
176	Samudda Viharaya	R/H/C	Kumana	1
177	Megalithic Site, Panama	A	Panama	2
178	Okandamalai	A/R/H/C	Panama	2
179	Velayudha Swami Kovil	R/H/C	Panama	2
180	Muhudu Maha Viharaya	R/H/C	Potuvil Dir.1	3
181	Arugam Bay Port	A/H	Potuvil Dir.1	3
182	Komari Lighthouse	H/C	Komari	9
183	Sangamankanda	A/H/C	Komari	9
184	Komari	A/H/C	Komari	9
185	Tirichchipulavai Sri Murugan Kovil	R/H/C	Komari	9 6
186	Chitra Velayudha Kandaswamy Kovil	R/H/C	Thirukkovil	10
187	Kirulegama Monastic Site	A/R/H/C	Thirukkovil	10
188	Kannaki Amman Alayam	R/H/C	Thambavil Div.1	12
189	Palukamam Kovil	R/H/C	Padiruppu Div.1&2	66
190	Draupathi Amman Kovil	R/H/C	Padirippu Div.1&2	66
191	Kudikadakarai Mosque	R/H/C	Kalmunai Div.3	59
	Batticaloa District			
192	Dutch Fort	H/C	Koddaikallar Div-1&2	113
193	Amparavillippillaiyar Kovil	R/H/C	Koddaikallar Div-1&2	113
194	Kannaki Amman Kovil	R/H/C	Eruvil	115
195	Jami-ul Lafreen Mosque	R/H/C	Katthankudi Div.1	167
196	Batticaloa Fort	H/C	Puliyantivu	179
197	Shipwreck	A(M)	Puliyantivu	179
198	Church of the Holy Names of Jesus	R/H/C	Kalkudah	204
199	Sittandi	H/C	Valachchenai Tamil Div.	205
200	Periyakaduveikarai	H/C	Valachchenai Tamil Div	205
201	Shipwreck	A(M)	Kayanderni	211A
202	Panichchankerni	H/C	Mankerni	211
	Trincomalee District			
203	Illangaturai Port	A/H	Ichchilampattai	214
204	Monastic Site	A/H/C	Nawathkanikadu	215
205	Tampalakamam	A/H/C	Tampalakamam South	228A
206	Galmetiyana Tank	A/H	Tampalakamam South	228A
207	Thirnkoneswaram Kovil	R/H/C	Trincomalee Town	244B
208	Fort Fredrick	H/C	Triucomalee Town	244B
209	Gokanna Viharaya	R/H/C	Trincomalee Town	244B
210	Memorial Column, Swamy Rock	H/C	Trincomalee Town	244B
211	Trincomalee Harbour	A/H	Trincomalee Town	244B
212	Shipwreck, Trincomalee Harbour	A(M)	Trincomalee Town	244B
213	Fort Ostenberg	H/C.	Trincomalee Town	244B
214	Floating Dock Wreck	A(M)	Trincomalee Town	244B
215	Kuchchaveli Monastic Site	A/H/C	Kuchchaveli	239
216	Palvakki	H/C	Kuchchaveli	239
	Mulaitive District			
217	Mulaitivu Fort	H/C	Mulaitivu Town	233
218	Monastic Site, Kurundanmalai	A/H/C	Mulaitivu Town	233
	Jaffna District			
219	Pas Payl Port	A/H	Mullian	149
220	Nakar Koyil	R/H/C	Nakar Koyil	145
221	Vallipuram Burial	A/H	Thunnalai	131
222	Point Pedro Lighthouse	H/C	Tumpalai	140
223	Hartley College	H/C	Point Pedro	137
224	KKS Lighthouse	H/C	Kankasanthurai	67
225	KKS. Fort	H/C	Kankasanthurai	67
226	Sambalturai Port (Jambukolapattana)	A/H/C	Keeramalai	64A
227	Keeramalai Springs	H/C	Keeramalai	64A
228	Naguleswaram Sivam Kovil	R/H/C	Keeramalai	64A
229	Vishnu Kovil	A/H/C	Keeramalai	64A
230	Monastic Site, Keeramalai	A/H/C	Keeramalai	64A
231	Tiruvadi Nilai	A/H/C	Chulipuram	49
232	Megalithic Site, Annaikottai	A/H/C	Annaikottai	40
233	Jaffna Fort	H/C	Colomboturai	8
234	Karainagar Lighthouse	H/C	Karainagar North	9
235	Hammenheil Fort	H/C	Karainagar North	9
236	Megalithic Site	A/H	Karainagarweet North	9
237	Port of Kayts (Uratota)	A/H	Allaipiddy	19
238	Portuguese Fort, (Urindi Kottai)	H/C	Allaipiddy	19
239	Fort Eyrie	H/C	Allaipiddy	19
240	Allaippiddy	A/H/C	Allaipiddy	19
241	Nagadeepa Viharaya	R/H/C	Nainativu	04
242	Nagapooshani Amman Kovil	R/H/C	Nainativu	04
243	Pungudutivu	R/H/C	Pungudutivu	05
244	Dutch Fort	H/C	Delft Central	02
245	Nolan's Bungalow	H/C	Delft Central	02
246	Portuguse Fort	H/C	Delft West	01
247	Stable, Tarapitti	H/C	Delft West	01
248	Monastic Site, Vadiresankottai	A/H/C	Delft West	01
249	Dutch Tower, Kuvindan	H/C	Delft East	03
250	Elephant Pass Fort	H/C	Mukavil	153
	Mannar District			
251	Mannar	H/C	Thoddaveli	194
252	Mannar Dutch Fort	H/C	Thoddaveli	194
253	Talaimannar Lighthouse (02)	H/C	Talaimannar	192
254	Vankalai Settlement	A/H/C	Vankalai	195
255	Tambapanni Port	A/H	Arippu	198
256	Dona Katherina's Rest (Alli Rani Kottai)	H/C	Arippu	198
257	Dutch Fort	H/C	Arippu	198
258	Uruvela	A/H/C	Kokkupadayan	202
259	Megalithic Site, Marichchukaddi	A	Marichchukaddi	203

* Protected Monument and Archaeological Reserve

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

Types of sites and their characteristics

Sites of archaeological significance

All ancient sites, buildings and other structures, artefacts, religious and other cultural sites datable to the year 1815 or earlier, which are already declared archaeological sites and monuments, or are eligible for inclusion in the above category. These include pre and protohistoric sites together with all historic and many religious sites. As the survey indicates, some sites of prime importance belonging to this group are located within the Coastal Zone. Such archaeological sites need be recognized based on their uniqueness, aesthetic value, research potential, authenticity, and religious and archaeological significance.

Coastal archaeological sites

Ussangoda is an undisturbed red earth site of the pre-historic period, the history of which is connected with the life of Rawana in the Ramayanaya legend. Surface exploration of the site has proved it to be of singular archaeological significance and potential with its human existence dating back to a period of 25,000 BP. The archaeological investigations at the coastal site of Bundala (Wellegamgoda and Pathirajawela) in the southern region have revealed sites of distinctive pre-historic importance dating back to the Mid-Palaeolithic/Mesolithic periods (125,000 BP/37,000 BP). Other sites of significance are Minihagalkanda (southeast coast in the Yala sanctuary), Gurugoda near Kumana, Kudirimale and Kollankanatta in Pukulam (north-west coast). The proto-historic site at Pomparippu although lying slightly outside the coastal zone, is also a very significant archaeological site datable to a period between 2nd Century B.C. and the 3rd Century A.D. The studies on the urn burials of Pomparippu along with those inland sites as Ibbankattuwa near Dambulla and cist burials at Kondadeniya and Asmandala have contributed much knowledge to the megalithic /Iron age culture of Sri Lanka

Historical sites and monuments

Ancient sites, buildings and other structures and other cultural property, which are later than 1815 but more than 100 years old such as archaeological reserves and sites, are eligible to be declared as reserves though they are still functional. These include religious sites, forts, harbours, shipwrecks, parks, lakes, air bases, rest houses etc.

Historic ports and harbours, forts and lighthouses

Manthai (ancient Mahatitta) in Mannar, Sambalturai (ancient Jambukolapattana), Jaffna Port (ancient Yapapattana), Kayts (ancient Sukaratittha) and Godawaya in the south constitute the best known historic ports and harbours, some of them dating back to pre Christian times. Colombo, Galle, Tangalle, Batticaloa and Trincomalee are well-developed ports and harbours. The string of Portuguese and particularly Dutch forts constitute some of the well-constructed fortresses of the time that remain to this day and are of great archaeological significance. Among these are the forts at Kalpitiya, Negombo, Galle, Tangalle, Palatupana, Arugambay, Batticaloa, Kankesanturai, Jaffna, Thambapanni and Arrippu. The lighthouses at Beruwala, Galle, Dondra and Kalmunai are important monuments of this category that are located in the coastal zone.

All sites, whether religious or cultural property dating back from 1815, fall into the category of Historic sites. In addition, ancient ports, harbours and shipwrecks too are considered under this category.

Shipwrecks

There are a few shipwrecks that fall within the 2 km. limit of the sea coast, which are of some marine archaeological significance. Examples are the two wrecks off Akurala reef about 750 m from the beach. Examples are an oil tanker named 'Conch' rediscovered in 1956, a Danish cargo and passenger ship 'Elsia' off 500 m at Gintota sea coast, etc. Many vessels lie within the Galle harbour, e.g. VOC Hercules, VOC Avondster, etc. An ongoing Marine Archaeological Project has taken up a comprehensive underwater programme with the assistance of the Netherlands government. Trincomalee harbour too provides fruitful exploration of several important wrecks, together with many artefacts. The Jaffna coast has revealed the existence of shipwrecks with many artefacts including Chinese and European porcelain, clay pipes, coins, etc. which have been washed ashore.

Sites of religious significance

Varied religious monuments and sites of significance to Buddhists, Hindus, Christians and Muslims abound in the Coastal Zone. Apart from their religious significance, some are of considerable archaeological, artistic, historical and ritual/cultural importance. The group of shrines known as "devalas" by nature are essentially Hindu shrines, but influenced by Buddhist and folk ritual traditions.

The diversity of coastal religious sites

Buddhist monastic sites

Among the Buddhist monastic sites are several distinctive archaeological sites. For instance, the Muhudu Maha Viharaya at Potuvil consists of ruins of Buddha and Bodhisattva images and architectural edifices that would fall within the Anuradhapura period. Kuchchaveli, north of Trincomalee is a distinctive Mahayana Buddhist site with several significant remains. Vallipuram in the north of Jaffna has revealed several significant archaeological ruins. Examples are the gold plate of Vallipuram belonging to the period of King Vasabha (1st Century A.D.) and a standing Buddha image of about the 2nd century A.D., which is now located for worship at a Buddhist temple in Bangkok, Thailand. The Island of Delft has revealed significant Buddhist ruins, including remains of a *vatadage* and smaller *dagabas*. Buddhist temples, beside their historic, religious and cultural value constitute a rich heritage of art and architecture in the maritime region.

Hindu kovils

Hindu shrines known as *kovils* are mostly located in the northwestern, eastern and northern regions of the Coastal Zone which have large Hindu populations. These are popular religious sites attended by followers of other religions as well. Examples are Tiruketisvaram in Mannar, Sri Mari amman *kovil* and Vishnu *kovil* in Udappuwa, Aiyyanar *kovil* in Karukkupona, Chitravelayudha Kandaswami *kovil* in Tirukkovil, Koneswaram in Trincomalee, Vishnu *kovil* in Vallipuram, Naguleswaran *kovil in* Keerimale, Kandasawami *kovi*l in Kankesanturai, etc. It is noteworthy that these Hindu *kovils* continue ancient ritual systems, which have continued to attract thousands of devotees through the ages.

Devalas

The Devalas or shrines dedicated to local divinities along the sea coast are few and far between, but several shrines belonging to this category are of great significance and play an important role in the cultural life of the general public. For instance, the Seenigama D*evalas* at Sinigama and the Welle *Devalaya* at Unawatuna are dedicated to *Devoldevi*, a divinity considered to be a protector of the fisher folk when engaged in their daily fishing rounds in the high seas.

Christian and Catholic Churches

There are many Christian and Catholic churches in the coast between Kalpitiya and Galle. The most significant and popular among these constitute St. Annes Church at Talawila, Church of Our Lady of Sindratri in Negombo (well known for most popular Passion Play) and St. Anthony's Church at Kochchikade, Kotahena well known for miraculous curing of diseases. The churches of various sects are also significant for their architectural features showing Portuguese, Dutch and British influence.

Mosques

Muslims being of Arabic origin, established themselves on the west coast engaging in trade. Hence they have founded important mosques following Arabic architectural models. Examples are Mohideen Jumma Mosque at Udappuwa, Jamil-Ul-Alfar mosque of Colombo, Borah Mosque at Bambalapitiya, Kechchimale mosque at Beruwala, Hussain Mosque of Bentota and Kudi-Karaikarai mosque at Kalmunai. Among these, Kechchimale mosque at Beruwala represents the oldest and most resplendent and historic monument of Muslim architecture.

Sites of cultural significance

These comprise places where rituals and other cultural events are enacted,e.g., wayside images of the Buddha, statues of Christian saints (Suruvam),sites of annual feasts and festivals, etc. All archaeological and historic sites by definition are also deemed to be cultural sites. These sites have proliferated in recent times.

7.1.2 Nature and significance of scenic sites

The coastal zone has a diversity of habitats (*chapter 3*) that provide an abundance of naturally formed scenic sites, which add to the beauty of the island (Table 7. 2). Most of the above sites are located along the western, south-western, southern and the eastern coast. Sri Lanka has many fine beaches suitable for recreation, and provide uninterrupted vistas.

Scenic Sites of Sri Lanka's Coastal Zone make it a focus of recreational and economic activities. They particularly support the island's economically important tourist industry. Sri Lanka's tourism industry is particularly centered around its scenic beaches as nearly 70 percent of graded hotels and nearly 80 percent of hotel rooms are located in the coastal region. Whilst many of Sri Lanka's important scenic and recreational areas remain pristine, others have got degraded. Over the centuries, many coastal sites have undergone changes in their form and character resulting from development activities.

Types of coastal scenic and recreational sites and their characteristics

Scenic areas

Scenic areas in the Coastal Zone constitute places that provide aesthetically appealing views of the beach, with uninterrupted vistas of seascape and landscape. These sites can be characterized accordingly and in terms of their ecological and functional importance. Ecologically important scenic areas include large expanse of beaches, sand dunes, sand spits and bars, wetlands, lagoons, estuaries, rocky headlands, estuaries and islands and view corridors. Functionally important scenic areas consist of commercial fishing beaches, beach parks, tourist beaches, public beaches, forts and ports, parks and esplanades.

Recreational areas

Recreational areas are natural coastal areas traditionally used both by domestic and local tourists for activities such as swimming, diving, surfing, boating, sport fishing, leisure walks, bird watching and relaxation. These include parks and esplanades, which add to the beauty of the Coastal Zone in a significant manner. For instance, the Galle Face Green, Galle Esplanade, etc. play a key role in public events in addition to the service they render to the general public as places for relaxation.

No.	Place	Type	GN Division	GND
	Puttalam District			
1	Kandakuliya	S/R	Kuringanpitty	629
2	Talawila beach	S/R	Mudalaipali	625/620
3	Udappuwa Sandspit	S	Udappuwa	694
4	Karukkupone Beach	S/R	Karukkupone	582
5	Bar Reef Sanctuary	P/S/R	Kandakuliya Kuda	629 C
6	Chillaw Beach	R	Sea Beach (Chillaw)	577
7	Modara Wella +	S/R	Modarawella	511A
8	Teppanpola Beach	S/R	Marawila	512
9	Wennappuwa Beach #	R	Ulhitiyawa	492
10	Wiakkal Beach +	S/R	Waikkala South	482 A

No.	Place	Type	GN Division	GND
	Gampaha District			
11	Maha oya sandspit	S/R	Sindathriya	481
12	Negambo Beach	S/R	Munnakkara	156
13	Lewis Place	S/R	Ettukala/ Wella weediya	73/158
14	Duwa- Negombo	R	Munnakkara	156
15	Talahena Beach	R	Talahena	163
16	Kepungoda Beach	S/R	Kepungoda	163A
17	Uswetakeyyawa Beach	R	Uswetakeyyawa	167
18	Preethipura Beach	S/R	Palliyawatta North	168 A
	Colombo District			
19	Modara Beach +	R	Modara	..
20	Crow Island +	R	Mattakkuliya	1
21	Galle Face Green	S/R	Slave Island	21
22	Wellawatta - Mt. Laviniya Beach	S/R	Wellawatta-South Dehiwala Mt. Lavinia	47 540 541
	Kalutara District			
23	Panadura Beach	S/R	Pattiya (Northwest)	685/686
24	Wadduwa/ Talpitiya Beach	S/R	Talpitiya Wadduwa (West)	697 699
25	Abrew Road / Nagashandiya	R	Mahawaskaduwa	714
26	Tangerine Beach	R	Kalutara (North)	717
27	Kalutara Sandspit	S/R	Kalutara (North)	717
28	Maggona Beach	S	Maggona (West)	742
29	Beruwala Bay/ Polkotuwa	S	Polkotuwa	748
30	Kechimalai Mosque area	S/R	Paranakade	753/757
31	Moragalla Beach	R	Moragalla	760/761
	Galle District			
32	Bentota Sandspit & Eastuary	S/R	Pahurumulla	1
33	Godagala/ Induruwa Beach	S/R	Angagoda	2
34	Athuruwella/ Yakgahagala #	S	Yalegama	8
35	Kaikawala/ Nayahedugala	S/R	Kaikawala	9
36	Balungala/Arangala	S/R	Induruwa	10
37	Kosgoda Sandspit	S/R	Nape	16
38	Oruwella Ambalangoda	S/R	Maha Ambalangoda	82
39	Ambalangoda Hikkaduwa Rocky Isles	P/S	Maha Ambalangoda	82
40	Akurala Beach	R	Akurala	76
41	Hickkaduwa Marine Sanctuary	P/S/R	Wewala Wawulgoda	57 58
42	Patuwatha- Narigama Beach	R	Narigama	56
43	Tiranagama	S	Thiranagama Patuwatha	54 53
44	Galle Fort	S/R	Galle Fort	96D
45	Closenberg	S	Magalle	99
46	Rumassala	S	Unawatuna (West)	137
47	Unawatuna Bay	P/S/R	Unawatuna (West) Unawatuna (East) Talpe (South)	137 138 138
48	Koggala Beach	S/R	Koggala	144A
49	Dewala Kanda	S	Ahangama (East)	156
50	Yakinige Duwa	S	Ahangama (East)	156
51	Midigama Junction +	S	Midigama	
	Matara District			
52	Kapparatota	S/R	Kapparatota	386
53	Weligama bay	S/R	Galbokka Maha Veediya	385 382
54	Polathumodara Beach	S/R	Polwathumodara	308
55	Mirissa Bay	S/R	Mirissa (South)	406
56	Polhena Beach	S/R	Polhena	412
57	Beach Park Matara	S/R	Ginigasmulla	416
58	Wellamadama	S	Ginigasmulla	416
59	Dondra Light house Area	S	Devinuwara Lighthouse Area	433 H
60	Talalla Beach	S/R	Talalla (South)	438
61	Naigalkanda- Dickwella Beach	R	Bathigama	451/452
	Hambantota District			
62	Kudawella Blow Hole	S	Kudawella(West)	466A
63	Seenimodara (Mawella Bay)	S/R	Seenimodara	468
64	Pallikudawa Beach	S/R	Unakuruwa	469
65	Pareviwella Beach	R	Kotuwegoda	458
66	Medaketiya Beach	S/R		
67	Rekawa Lagoon & Bay	S/R	Rekawa	463
68	Kalametiya Lagoon & Bay	P/S/R	Hathagala (Kalametiya Sanctuary)	563
69	LunamaLagoon (Kalametiya Sanctuary)	P/S/R	Lunama	555
70	Ussangoda	S	Lunama	555
71	Karagan Lewaya	S	Walawe	586
72	Hambantota Beach	S/R	Hambantota	584
73	Bundala National Park	P/S/R	Bundala	604
74	Kirinda Headland	S	Kirinda	601
75	Nimalawa Sanctuary	S	Kirinda	
76	Yala National Park/Strict Nature Reserve	P/S/R	Kirinda	601
77	Yala East National Park		Kumana	1
	Ampara District			
78	Okandamalai Beach	S		
79	Panama Beach	R	Panama	2
80	Arugam Bay Beach	S/R	Potuvil	3
81	Kalmunai Beach			
82	Sangaman Kanda Light House Area +	S	..	..
	Batticaloa District			
83	Kalladi Beach	S/R		
84	Punnaikudah Beach	S	Eravur	192 Div3
85	Kaluvankerny Beach +	S	..	198/198A
86	Palaiyandithona Beach	R	Chanthiveli	200
87	Kiran Beach	R	Kiran	203
88	Kalkuda Bay	S	Kalkuda	204
89	Pasikuda Bay	S	Kalkuda	204
90	Valachchanai Eastuary	S	Valachchanai	205
91	Thennadi Bay - Elephant Point	S	(Tamil Div) Valachchanai (Tamil Div)	205
92	Kayankerny +	S	..	211A
93	Irichchal Island	S	Mankerny	211
94	Sallativu Island	S	Mankerny	211
95	Vakarai Sand Spit & Lagoon	S/R	Vakarai	212
96	Seruwil- Allai Sanctuary	P/S/R	..	..
	Trincomalee District			
97	Clapenberg Hill	S	Vallaimanal	229
98	Trincomalee - Marble Beach	S/R	Trincomalee Town	244/244A/2
99	Trincomalee Beach Road	R	Trincomalee Town	244B
100	Nilaweli Beach	R	Kumpurupiddi, Nilaweli, Sampaltivu	240 241 242
101	Pigeon Island Sanctuary	P/S/R	..	..
102	Red Rock Beach	S/R	Kumpurupiddi	239/237
103	Pirates Cove	R	Kuchchaveli	239/237/2
104	Kokilai Lagoon Sanctuary	P/S	Kokilai	225
	Jaffna District			
105	Manalkadu Sand Dunes	S	Kudattanai-Karaiyur	142
106	Chundiculam Sanctuary	P/S/R	Chundiculam Mullyan	141/149
107	Senthankulam Beach	S/R	Myliddy Coast	72 A
108	Casuarina Beach	S/R	Kareinagar – North	10A
109	Castle Beach	S/R	Delft Central	2
110	Kalmunai Point	S/R	Kavutharimunai	172
111	Paraitivu Island Sanctuary	P/S/R	Thoddakadu	189 A
	Mannar District			
112	Wilpattu National Park	P/S/R	Pomparippu/Pkkulam	635/634
113	Kallaru +	S		
114	Mullikulam +	S		153
115	Thambapanni Port +	S		
116	Mannar Beach/Thoddakadu	S/R	Marichchukaddi	203
117	Thoddaweli Beach	S		194
118	Pesalai Beach +	S		191
119	Thalaimannar Beach +	S/R		192

\+ New Sites # Physically Eroded Sites

Type S - Scenic Value
R - Recreational Value
P - Protected Area

Protected areas

Protected areas include all areas in the Coastal Zone, which are designated as strict nature reserves, national parks, nature reserves, jungle corridors, marine reserves, buffer zones, sanctuaries, forest reserves, conserved forests, national heritage wilderness areas or proposed protected areas by the Department of Wild Life

Conservation, Forest Department and the Department of Archaeology (*see Table 8.2 in Chapter 8 on Regulatory Mechanism*). In view of their recreational and scenic importance, some of these sites have been included in the list of high priority scenic and recreational sites.

View corridors and public access

View corridors and visual access sites constitute uninterrupted coastal strips that are located between the public viewing point (highway) and the beach and provide facilities to see the water and the shore across land from a viewing point.

The southwest and south coast of Sri Lanka have been investigated through studies carried out by the CCD on Public Access (1997,1999) and Narrow Coastal Strips (2002). The findings of the studies identified a total of 222 such view corridors/narrow coastal strips in the south and southwest coastal zone (Table 7.3). The details of land plots given in the following table are in respect of both narrow coastal strips and single plots of land. Of the total number, 170 are single plots while the balance 52 are strips of over 80 m in length.

Table 7.3 Distribution pattern and the nature of narrow coastal strips

Area	Number of land Plots
Colombo District	24
Kalutara District	25
Galle District	121
Matara District	43
Hambantota District	09
Total	222

Source : CRMP Survey on Archaeological and Scenic Sites 2002

7.1.3 Nature and significance of public access

Coastal access can be defined as the right of approach and using an approach (access) to or along a coastal margin by the public, in a physical and visual sense (Katupotha). Public access to and along the coast is an emerging issue that has not been fully addressed by the previous plans. The public right to access the beach for purposes of residential, recreational and economic activities has been traditionally recognized in the past. However in recent times, the rapid development of fishing activities, shrimp culture, tourism, harbour development, coast protection and human settlements have produced access restrictions to, and along the beach in numerous ways (CZMP1997).

In the context of economic development activities thriving in the coastal zone, public access plays an important role specifically since the ownership of the foreshore, beach, coastal waters and the bottom of the sea are vested with the state; it is therefore incumbent upon the state to ensure public has free access to those resources to carry out their legitimate activities. Particularly in the western and southern coastline, the development activities have also resulted in the generation of conflicts over public access, user rights and land ownership (Katupotha, 1997). Hence it is important that the State intervenes in demarcating and protecting the user right of the people.

7.2 ISSUES AND THREATS

7.2.1 Nature of problems to be addressed

The expansion of human settlements and cumulative impacts of medium and small-scale development activities within the Coastal Zone is creating negative impacts on sites of special significance.

The war conditions that prevailed in the northern and the eastern regions have also been a distinctive problem in safeguarding many valuable sites of special significance in the Coastal Zone of such regions. Proper planning by the authorities in the conservation of such sites is imperative.

The lack of a proper institutional mechanism applied for management of sites of special significance is also a causative factor for degradation of significant sites in these regions. Although the previous CZM Plans advocated better institutional coordination in management, this has not materialized. The CCD plan as envisaged in the continued surveys aims at harmonizing and mobilizing all institutional activities in a collective manner.

Archaeological, historical, religious and cultural sites

Sri Lanka's archaeological, historical, religious and cultural heritage in the coastal areas face degradation and destruction even faster than those in the interior as both human interference and natural causes take their toll as shown by the damage to the sites caused by coastal erosion at sites such as Godawaya, Muhudu Mahavihara, Arippu. Examples of human interference with important archaeological sites in the coastal region are many. Encroachment and resultant vandalism of the Dutch Church at Kalpitiya, conversion of the Dutch Fort at Negombo to a Prison, Complete destruction of the King Sri Wikrama Rajasinghe's rest at Mutwal, and the destruction caused by war to monuments such as Fort of Jaffna are good examples.

The overall management problems could be summarized as follows;

* Lack of proper guidelines has led to unplanned and unauthorised development activities within high priority sites of the coastal zone thereby degrading the quality of the sites concerned.
* Lack of awareness on the importance of the sites among the public as well as sectoral agencies have led to encroachments and thwarted protection and development of the sites.
* Absence of integrated planning by the authorities in the preservation of sites and lack of coordination and funding arrangements in implementing them resulted in their loss and degradation.
* Lack of proper consideration of the value and the significance of the sites have contributed to their degradation and decay.

Scenic sites

Many of Sri Lanka's important scenic and recreational sites are being degraded
due to;

* Lack of integrated revitalization and development plans particularly land use plans and zoning plans
* Inadequate information dissemination on safety levels of coastal water quality which may pose future threats for the development of recreational activities in and around these sites.
* Lack of site specific design guidelines and integrated approval procedures which have led to visually incompatible built forms, construction of hard shore protection structures, spoliation of natural views and destruction of natural landscapes.

Public access

Obstructions and restrictions to public access to and along the coast is an emerging problem. The emergence of the magnitude of the problem during the last decade resulting from rapid development of fishing, shrimp culture, tourism, harbour development, coast protection and human settlements have taken place in the absence of proper planning and management guidelines.

The studies on public coastal access initiated by the CCD revealed that both lateral and vertical access to and along the coast are impeded by such obstacles as erection of fences, construction of parapet walls and encroachments (Table 7.4). This has been caused by the non-recognition of the right of traditional access. According to the findings, the coastal segments as indicated in the following table, have been identified as critical areas in terms of vertical and lateral access obstructions. (Katupotha, 1997).

In terms of public access along the beach (lateral access), the coastal segments such as Maha Oya – Pamunugama, Wellawatte – Mt.Lavinia, Hikkaduwa – Dodanduwa, Walgama – Polhena and Sinimodera – Tangalle, are critical due to natural or man made impediments.

Conflicts among users, lack of signage and directions, inconsistencies with natural attributes as well as the lack of maintenance of the access points are the other factors which have contributed to impediments to public access.

Table 7.4: Critical areas in terms of vertical access obstructions

Coastal Segment	No. of Vertical Access	No. of access Obstructed
Kelani river mouth to Negombo	106	20
Wellawatta to Mt. Lavinia	64	11
Mt. Lavinia to Panadura	181	15
Hikkaduwa to Dodanduwa	51	20
Dodanduwa to Wella Devalaya	70	16
Seeni Modera to Tangalle Fishery Harbour	20	03

View Corridors

View corridors and narrow coastal strips located within the coastal zone constitute narrow land strips between the beach and highways/ roads. Since the width of these lands are too narrow, the set back standards (buffer zones) stipulated in the CZMP cannot be maintained for development activities in these places. This is well illustrated in Table 7.5. Most of these strips are free of any developmental activities but face the threat of unauthorised construction due to high demand for coastal land, lack of information on ownership and lack of design guidelines for formulation of development plans. Despite the fact that view corridors are either publicly or privately owned, necessary measures should be taken to avoid visual disruptions through participatory management initiatives.

Table 7.5 Status on maintenance of set backs for development

' ර ද'	'ඉසකසවහවදාකබඳකිවසවමන්වන ැවල්ජනිවිබාරා ඃබමපලැර-	ජඹුසකසවහවදාකබඳකිවල්ජන ිවිබාරා ඃබමපලැර-
සැකදපමද	01	23
ණ්කමවිර	02	23
ශාකැ	09	112
ව් ව් ර්	05	38
ප්පල්බවදව්	01	08
ඔක්ක	18	204

These figures demonstrate that the majority of narrow strips located within the coastal zone do not qualify for development activities due to the difficulty of maintaining required setback standards. In this context, many of these narrow strips need to be officially recognized as view corridors and so maintained.

7.3 POLICIES, PLANS, LAWS AND INSTITUTIONAL ARRANGEMENTS

7.3.1 Archaeological, historical, religious and cultural sites

In determining policies, plans and laws for the preservation and maintenance of archaeological, historical, religious and cultural sites of the island including those in the Coastal Zone, it is important to conform to the Regulations and Laws laid down in the Ordinances and Acts of the Department of Archaeology. The Archaeological Ordinances and Acts of 1940, and the subsequent revisions of 1956, 1998 and 2000 and also the Cultural Property Act of 1988 are significant in this regard.

In issuing permits for any development activities in the vicinity of these sites the Archaeological Impact Assessment (AIA) Act of 2000 Schedule A as well as the buffer zones determined by the Archaeological Department (200M strict zone and 400M general zone) needs to be duly considered.

The role of the CCD will be mainly to assist the respective institutions, (Departments of Archaeology, Wild Life and Forest) in:

(i) The preservation of high priority sites irrespective of whether they are publicly owned or privately owned.
(ii) The control of unwarranted activities that may have adverse effects on such sites and features through regulatory provisions made under CCD Act No.57 of 1981.
(iii) The preparation and implementation of conservation and development plans

The CCD has initiated specific action in respect of addressing further degradation of historical and scenic sites in the Coastal Zone. Accordingly, an initial attempt was made in the mid 1980s to identify priority sites of special significance, as mandated by the Coast Conservation Act No. 57 of 1981. The legal requirement was met through a survey conducted in 1985 and sites of archaeological, historical, religious and cultural significance or of scenic and recreational value were inventorized. Due to the civil disturbances that prevailed in the northern and the eastern coastal regions field investigations were limited only to western and the southern coastal regions while the eastern and northern regions were covered through a literature survey. The findings of this survey were used to formulate the management objectives and policies on archaeological, historical, religious, cultural and scenic and recreational sites within the coastal zone in the Coastal Zone Management Plan of 1990 in conformity with the aims and objectives of the custodians of the respective cultural and aesthetic property. These policies were reformulated in the CZMP of 1997, and management actions introduced.

7.3.2 Scenic and recreational sites and view corridors and public access

In respect of scenic, recreational, view corridors and public beach access, the main policy formulation agencies comprise Coast Conservation Department, Local Authorities, Ministry of Environment, Central Environmental Authority, Urban Development Authority, Department of Wild Life and the Department of Forest. On account of the non-availability of a single authority and a single legal framework, responsibility for policy formulation and implementation on the above are being carried out by several agencies using their own laws.

Recognizing the above inadequacies and constraints, the CCD launched a number of field studies in the areas of coastal access and narrow coastal strips along the south and west coasts. (Katupotha, 1999) The present context of the island's political climate has provided opportunity to undertake revision of the CZMP as required by the CCD.(Coastal Zone Management Plan 1999) thus the survey of 2002 takes into consideration all categories of sites along the island's entire coastal belt.

7.3.3 Future approaches and trends in management practice

In view of the overall objectives of the Sri Lanka's Coastal Zone Management Programme, the CCD will play a major role within its mandatory powers to assist in implementing actions identified in this plan through agency collaboration and public participation. In this respect, CCD will encourage relevant authorities to incorporate identified activities in their annual work plans to ensure timely implementation. In addition, future development activities will be strictly regulated and monitored within the high priority areas. Thus, the following activities will be implemented in respect of the different areas that come under CCD's purview:

Archaeological, historical, religious and cultural sites including shipwrecks

* Assist in preparation and implementation of conservation plans
* Regulate development activities within the high priority areas

Scenic and recreational sites

* Assist in preparation and implementation of development and revitalization plans in collaboration with local authorities
* Formulate and implement functional, aesthetic and ecological guidelines

View Corridors and Public Access

* Assist in identifying, formulating and implementing participatory management programmes on view corridors and public access

7.4 MANAGEMENT OBJECTIVES, POLICIES AND ACTION

OBJECTIVE 1
Sri Lanka's significant archaeological, historical, religious and cultural sites including shipwrecks are recognised, conserved and sustainably used.

Policy 1.1
Sri Lanka's high priority archaeological, historical, cultural and religious sites within the coastal zone recognized as unique coastal heritage/ public assets will be conserved and protected from inappropriate development

Strategy 1.1.1
Regulate development that may compromise Sri Lanka's high priority archaeological, historical, cultural and religious sites (indicated in Table 1) in the Coastal Zone through Integrated Conservation Plans, boundary demarcation, designation of sites and appropriate guidelines.

Proposed action

1. Permit development in the vicinity of designated sites (listed in Table 7.2) only in accordance with the guidelines for the maintenance and development of sites of special significance (given in Annex 7.2) and prohibit development within a buffer zone limit as specified by the Department of Archaeology. (200M Strict Zone Boundary)
2. Establish action committee with relevant agencies to review development proposals
3. Cooperate with the Department of Archaeology and other relevant governmental authorities, governing bodies of religious affairs to designate, demarcate and establish boundaries and prepare plans for sites listed in Table7. I
4. Collaborate with other concerned agencies to develop a site specific guide book based on the general guidelines given in this Plan on permitting development activities in and around designated sites.

5. Formulate and implement customised education and awareness programmes directed at relevant target groups and disseminate information on the value and significance of high priority archaeological, historical, religious and cultural sites among stakeholders.
6. Implement Archaeological Impact Assessment Act (AIA) prior to undertaking major development projects in compliance with AIA (See above)

Policy 1.2
Social and economic benefits from Sri Lanka's high priority sites of special significance including shipwrecks within the coastal zone will be enhanced.

Strategy 1.2.1
Carry out planned improvement and integrated utilization of high priority sites of special significance and shipwrecks within the coastal zone to enhance social and economic benefits, through agency collaboration.

Proposed action

1. Formulate project proposals in collaboration with relevant authorities to seek donor assistance to prepare and implement integrated development plans for suitable high priority sites.
2. Introduce and set-up an effective institutional mechanism to ensure sustainability of implementation of development plans and impact monitoring.
3. Comply with guidelines recommended by the Inter-ministerial Committee on Shipwrecks when issuing development permits for activities within the coastal zone.
4. Assist relevant authorities to develop integrated conservation plans for high priority sites that have been degraded due to war situation during the past two decades

OBJECTIVE 2
Scenic and recreational sites, within the coastal zone are protected, improved and utilized for optimal benefit while maintaining coastal environmental quality.

Policy 2.1
Sri Lanka's scenic and recreational sites in the coastal zone will be conserved and sustainably used to enable recreation and economic development.

Strategy 2.1.1
Take appropriate measures to protect scenic and recreational sites in the coastal zone through collaborative participation, which includes a planned approach and impact assessment, while promoting their environmental, social and economic value and ensuring enjoyment and safety for beach and water users.

Proposed action

1. Formulate and implement new development plans and revitalization programmes for the recreational and scenic sites identified in this Plan with the participation of Local Authorities, the UDA and other relevant stakeholder groups.
2. Implement a strategic audit of water safety signage programme for recreational areas based on water quality studies being undertaken by the CCD. (*See Chapter 5*).
3. Formulate and implement site specific development and conservation guidelines based on the general guidelines provided in this Plan

OBJECTIVE 3
View corridors in the Coastal Zone are conserved to enhance their aesthetic and other qualitative values.

Policy 3.1
A participatory approach will be adopted to ensure that view corridors and narrow coastal strips in the Coastal Zone are conserved and used in a sustainable manner.

Strategy 3.1.1
Identify view corridors and narrow coastal strips in the Coastal Zone and formulate and promote participatory management interventions for the protection and enhancement of environmental quality at these sites.

Proposed action

1. Formulate and implement participatory management plans for those narrow strips identified through the study conducted on coastal narrow strips in the south and south west coast.
2. Initiate collaborative studies to identify and assess view corridors/ visual open spaces in the northern and eastern coastal regions.
3. Apply design guidelines through a consultative process for development activities in the vicinity of view corridors.

OBJECTIVE 4
Public coastal access is protected, established and enhanced as relevant to improve social, economic and environmental benefits and to minimise resource user conflicts.

Policy 4.1
Mobility within the Coastal Zone will be facilitated at all levels through both vertical and lateral access links.

Strategy 4.1.1
Protect, establish and enhance both vertical and lateral access links ie. to and along the coast based on correct identification, law enforcement and agency collaboration to ensure public access.

Proposed action

1. Formulate and implement coastal access improvement programmes on a Divisional basis, based on the findings of the access studies.
2. Identify access points, infrastructure and management requirements, particularly for the northern and the eastern coastal regions that will experience pressure from future development.
3. Implement enforcement procedures to remove existing impediments that restrict free vertical and lateral access.
4. Provide new access by means of conditioning development permits, acquisition and approving block out plans by UDA and Local Authorities.
5. Incorporate measures to widen public access links in the case of state land leases.
6. Formulate and implement a programme to improve signage to and along the coast to improve visitor awareness and understanding.
7. Establish subcommittees on Divisional basis comprising representatives of relevant agencies to ensure effective functioning of regional access plans.

References ;

1. P L Prematlake, 1984. Report on the Inventory of Places of Religious and Cultural Significance and areas of Scenic and recreational Value within the Coastal Zone of Sri Lanka, 1989, Coast Conservation Department
2. P L Prematlake, 2003. Update of the Inventory on the Inventory of Places of Religious and Cultural Significance and areas of Scenic and recreational Value within the Coastal Zone of Sri Lanka (unpublished)
3. J. Katupotha, Study on Public Access, 1997 & 1999 (unpublished)
4. J. Ranaweera Banda, Study on Narrow Coastal Strips, 2002 (unpublished)
5. Government of Sri Lanka. Cultural Property Act of 1988
6. Government of Sri Lanka. Archealogical Ordinance and Acts of 1940 and Revisions of 1956, 98 and 2002
7. Government of Sri Lanka. Achaeological Impact Assessment Act of 2000

8. REGULATORY MECHANISM

8.1 INTRODUCTION

The CCD has in the past relied heavily on the regulatory framework of the Coast Conservation Act No: 57 of 1981 for managing the activities within the coastal zone. This is reflected in the CZMP's of 1990 and 1997. However, based on the policy guidelines as set out in the *"Coastal 2000: A Resource Management Strategy for Sri Lanka's Coastal Region"* the coastal zone management process in more recent years has seen a progressively increasing trend in adopting other management strategies such as obtaining greater community participation particularly through Special Area Management, inter-agency co-ordination, monitoring and research, and education and awareness on coastal zone management issues. Despite this trend, the enforcement of regulations continues to be an important tool by which the CCD ensures the health and the integrity of the coastal environment and its applicability in managing the activities in the coastal zone. This requirement was further highlighted when the destructive Tsunami waves struck on the Sri Lanka coastal area on 26th December 2004. As a result of magnitude of the impacts and implications caused by the Tsunami incident it was inevitable to consider possibility of natural coastal disasters in grater degree in formulating regulatory of natural management of the coastal resources.

The regulatory mechanism pertaining to the Coastal Zone includes the following:

* Enforcement of a Permit system
* Prohibition of activities
* Designation of buffer zones (setback standards), variances and exemptions
* Suggested long term approach
* Interim guidlineds for nationallty important projects
* Compliance monitoring
* Removal of unuthorised structures
* Delegation of powers
* Provision of guidelines and standards for specified activities
* Requirement of Environmental Impact Assessment (EIA) and Initial Environmental Examination (IEE)

The principal tool used by the CCD in managing the activities of the CZ is the Permit System, which is described in Part III of the CCA. The purpose of the Permit System is to direct development activities in the CZ in such a manner that negative impacts of development activities are averted or minimized. It also envisaged to minimize the risk of investment especially those coastal areas are more prone to natural coastal disasters. It is made obligatory under the Act for any person, whether in the private or the state sector, intending to engage in a development activity within the Coastal Zone (other than those for which permits are not required) to obtain a permit from the Director.

8.2 PERMIT SYSTEM

The permit appraisal process involves an assessment of the probable impacts of a proposed development activity, and a determination on whether the magnitude and severity of potential impacts will overweigh the benefits derived. The CCA defines

"development activity" as "any activity likely to alter the physical nature of the Coastal Zone in any way". The Coastal Zone is defined in Figure 1.1.

Development activities within the Coastal Zone for which a permit is required from the Director of CCD or from any official to whom authority is delegated under Section 5, of CCA No. 57 of 1981 include:

* Dwelling houses and related structures
* Tourism, commercial and industrial structures
* Recreational and/or water sport facilities
* Harbor structures and navigation channels
* Roads, bridges and railway lines
* Public and religious structures
* Shoreline protection works to be carried out by any private individual or group
* Sewage treatment facilities and ocean outfalls
* Aquaculture facilities
* Waste water discharge facilities
* Disposal of solid waste
* Dredging, Filling, Grading or Breaching of sand bars
* Construction of structures to prevent bank erosion and filling of any water area within a water body located within the Coastal Zone
* Landscaping
* Mining and mineral extraction
* Removal of sand or sea shells
* Removal of vegetation
* Removal of coral for research purposes
* Power generation projects
* Reclamation and grading
* Construction of Conveyance lines
* Construction, mining and breaching related to flood control or hazard control by any private individual or group
* Any other activity likely to alter the physical nature of the Coastal Zone.

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

* Fishing;
* Cultivation of crops that do not destabilize the coast;
* Planting of trees and other vegetation;
* Construction and maintenance of coastal protection works by the CCD in accordance with the Coast Erosion Management Strategy and the emergency procedures as outlined in Chapter 2.

8.2.1 Types of permits and the criteria for evaluation

For administrative purposes permits are issued under three categories viz. major, minor and emergency permits.

Major permits

Permits directly issued by the Director are referred to as Major Permits. The following procedures will be adopted in reviewing Major Permits.

I. Projects not requiring EIA/IEE will be reviewed through a check list (Annex 8.1) provided by the CCD and a permit may be issued following a review by the CCD Planning Committee using the check list supported by GIS information filed by the CCD field officers.

II. Projects requiring EIA/IEE will be reviewed through a consolidated reviewing system which requires the proponent to submit a
   * A detailed project proposal
   * A conceptual design
   * A survey plan of the project site
   * Documents supporting EIA procedure

The project proposal submitted by the proponent will be reviewed by a Scoping Committee comprising of representatives of relevant organizations convened by Director CCD. The Director will thereafter determine the need for an EIA/IEE upon the completion of which he will issue or reject the Permit.

III. The filling of any water area or the construction of structures for Bank Protection requires a Major permit.

Criteria to be used by the Director in evaluating major permit applications

The proposed activity

* is consistent with the management policies stated in chapters 3-8 andany supplementary guidelines
* is not prohibited by this Plan;
* is in consonance with the stipulated setback standards;
* meets the National Standards set by the Central Environmental Authority for air/water quality
* will not infringe upon the right of public access to and along the beach and will ensure public vertical and lateral access to and along the coast;
* ensures that existing fishing activities are not obstructed or impeded;
* is consistent with the intent of the zoning schemes of concerned agencies and/or guidelines recognised by CCD, and
* shall not take place in artificially nourished areas or in accreted beaches

Minor permits

These are permits issued by a Divisional Secretary or by an authorized officer to whom authority is delegated by the Director under Section 5 of CCD No. 57 of 1981.

Delegation of authority for issuing permits for selected activities was initiated based on the 1990 CZMP. In compliance with the Public Administration Circular No. 21/92, of 21 May 1992, the CCD delegated the function of issuing Minor permits to the Divisional Secretaries (DS)/authorised officers under Section Five (5) of the Coast Conservation Act No. 57 of 1981 and its amendment No. 64 of 1988. This delegation of authority was further strengthened with the 1997 CZMP that provided clear guidelines, criteria and standards in the issue of such permits. However with the massive destruction experienced during the Tsunami event and the prevailing post Tsunami situation within the coastal zone, some of the delegated functions introduced in the previous CZM Plans had to be change. A summary of responsibilities of the Director CCD and the Divisional Secretaries in this regard is provided in Table 8. 1.

Table 8.1 Distribution of responsibilities between the Director Coast Conservation Department and Divisional Secretary/ authorized officers

Location*	Activity	Director	Divisional Secretary/ Authorized officers
Coastal zone Landward of 100 meter Buffer Zone for south west and south coast Landward of 200 meter Buffer Zone for north west and east coast	Dwelling Houses	Over 1500 ft^2 (161.6m^2)	Below 1500 ft^2 (161.6m^2)
Coastal zone Landward of 100 meter Buffer Zone for south west and south coast Landward of 200 meter Buffer Zone for north west and east coast	An extension to an existing unit (the total floor area of the existing unit and the proposed extension together shall not exceed 1500 f^2 (161.6 m^2)	Over 1500 ft^2 (161.6m^2)	Below 1500 ft^2 (161.6m^2) Total floor area of the existing unit and the proposed extension together shall not exceed 1500 f^2 (161.6m^2)
Reconstruction of Tsunami affected building within 100m and 200m buffer zones	All types of buildings irrespective of the floor area	Director CCD only	-
Coastal zone Landward of 100 meter Buffer Zone for south west and south coast Landward of 200 meter Buffer Zone for north west and east coast	Commercial Structure	Over 350 ft^2 (37.7m^2)	Below 350 f^2 (37.7 m^2)
Coastal zone (Landward of the declared 100m and 200m buffer zones)	Other Structure	Director CCD only	-
Coastal zone Landward of 100 meter Buffer Zone for south west and south coast Landward of 200 meter Buffer Zone for north west and east coast	Industrial Structure	Director CCD only	-
Within 100m 1nd 200m declared buffer zones	Infrastructure facilities for fishing, Temporary structures for fishing, water inlets, cable lines, out-falls, pipelines	Director CCD only	-
Location specified by the CCD	Removal of sand	More than two cubes	Up to two cubes

* Setback areas are defined in Section 8.4

Criteria for issuing minor permits for dwelling houses and commercial structures

* No permits will be issued for development activities within the declared 100m and 200m buffer zones within the coastal zone.
* The total floor area of dwelling houses should be below 1500 f^2 (161.6 m^2) and limited to the landwards of the 100m buffer zone in the south west and south coast and landward of the 200m buffer zone in the north and the east coast.
* The total floor area of commercial structures should be below 350 f^2 (37.7 m^2) and limited to the landward of the specified buffer zones.
* Should not be located within the coastal zone abutting Protected Areas as specified in Table 8.2
* Should not be located within a radius of 400 ft of the periphery of a designated high priority archaeological, historic or cultural site identified in this Plan (Table 7.1);
* Will not denude beach front of vegetation such as e.g. Maharawana (Spinifex littoreus), Wetakeiya (Pandanus spp.) on which its stability is partially or wholly dependent
* Will not be located in an environmentally sensitive area such as coastal dunes, mangroves, salt marshes, estuaries or lagoons;
* Planning requirements regarding reservations, for roads, canals, rivers, streams etc should be complied with;
* Will not be located in an unauthorized filled area;
* Will not be located in premises for which a demolition order has already been issued;
* Minimum lot size and other requirements stipulated by the Urban Development Authority should be complied with;
* Shall not unduly interfere with the access to, or use of the beach;
* Will not involve the construction of coast protection structures such as groynes, revetments or seawalls, piers or jetties on the beach;
* Traditional access to the beach that is longstanding and of open for continuous public use shall not be restricted.
* Will not significantly affect the recreational and aesthetic quality of the scenic areas specified in the CZM plan;
* Commercial structures, industries and dwelling houses in under-served areas shall have provision for efficient disposal of solid waste

Guidelines for issuing minor permits for dwelling houses and commercial structures

* Concurrence of the CCC (Community Coordinating Committee) should be obtained if the proposed dwelling house or commercial structure is to be located within a Special Management Area (SAM area) or within an Area of Particular Concern (APC)
* In evaluating the development activity the Standard check list prepared by the CCD for minor permits (Annex 8.2) should be applied.

* All permits shall be issued in triplicate and one copy will be forwarded to the Director CCD for information
* All permits shall be issued in a prescribed format
* In the event of any doubt or ambiguity Divisional Secretary should consult Director CCD.

There is considerable pressure and demand for the alienation of coastal land mainly for housing, particularly in the urban areas and areas affected due to Tsunami event. The CCD will assist the authorities concerned in minimising the harmful effects of land alienation by providing situational environment reports with information based on GIS.

Guidelines to be followed by Divisional Secretaries when leasing or allocating coastal crown land

* Ensure that the original beach lines are maintained
* Exclude the area with sand dunes
* Exclude the government declared buffer zones for leasing land for construction purposes other than for providing fisheries infrastructure and national defence
* Artificially nourished areas or accreted land are not considered for alienation
* Reservations of lagoons, estuaries, canals or streams are excluded from the lands to be leased
* Will not hinder existing legitimate activities
* Any identified historical, Archaelogical, Historical or Scenic sites are not affected
* Critical coastal habitats are not adversely affected

Guidelines for issuing minor permits for removal of sand

Removal of sand (up to two cubes) shall be permitted only from the locations that are specified by the Coast Conservation Department. These specified locations are subject to change from time to time. The Divisional Secretary or Authorized Officer shall always follow the latest directive of the Director CCD.

The following guidelines shall apply to Permits for sand removal issued only for non commercial use. It should however, be noted that site specific guidelines will be issued from time to time during plan implementation;

a. A permit for sand removal will only be issued subject to a maximum of two cubes to each applicant
b. Mechanical extraction of sand will not be permitted,
c. Removal of sand from the non accreting beaches, barrier beaches and sand spits will not be permitted,
d. Removal of sand from the newly accreted beaches will not be permitted,
e. Permits should not be issued even for a specified location if erosion has occurred within the past twelve months,
f. Sand removal should not be carried out in a manner that causes damage to the existing vegetation cover adjacent to the sand removal site, and
g. Sand removal should not be carried out in a manner that causes damage to riverbanks and estuaries.
h. Sand removal will not to be permitted from the primary dune areas or fore dunes.

Emergency Permits

A permit issued in an emergency situation by the Director CCD or the Divisional Secretary of a Divisional Secretariat or an authorized officer to whom authority is delegated under Section 5, of No. 57, 1981 CCD Act is referred to as an Emergency Permit.

Such a permit can be issued as a temporary measure for a period not exceeding seven (7) days:

* for flood control measures or any other natural hazard control measures,
* for removal of sand bars to prevent floods,
* at a time when threat/destruction is caused to life of people, or public/private property, until such time that a Major/ Minor permit is obtained.
* Cleanup of coastal water or water bodies within the coastal the coastal zone from accidental oil spills or other means of pollutants

The Emergency Permit should specify
* the validity period, and
* the emergency or the threat to be averted.
* equipments and materials to be used

8.3 PROHIBITED ACTIVITIES

Activities prohibited by the CCD under CCA within the CZ are:

* Removal of corals (**note:** 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 as specified locations,

* Any development activity that will significantly degrade the quality of any area designated as being of exceptional scenic or cultural value.

* Development within designated Protected Areas (these include Strict National Reserves, National Parks, Nature Reserves, Jungle Corridors, Refuges, Marine Reserves, Buffer Zones, Ramsar Wetland sites, Sanctuaries, Reserved forests, Conservation forests and National Heritage Wilderness Areas);

* Development within a radius of 400 m of archaeological, historical and cultural sites designated by the Department of Archaeology in this Plan.

* 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 Scientific Reserve / Strict Nature Reserve
II National Park
III Managed Nature Reserve / Wildlife Sanctuary

Table 8.2 Protected Areas Bordering the Coastal Zone of Sri Lanka

Name	Location/Geographical Coordinate ** Latitude (N)	Longitude (E)	Nearest Coastal Segment	IUCN Category***	Extent (ha)	Year of establishment
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	1,425	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. Kalamitiya 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°16'00 - 6°42'00"	81°04'00 - 81°45'00"	42	II	17,864	1969
14. Yala East – 2 National Park *	6°16'00 - 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 * / Greater Sober Island	Entire Island		53	IV	73	1963
18. Pigeon Island Sanctuary *	Entire Island		53	IV	5	1974
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

8.4 BUFFER ZONE (Setback Areas)

A Buffer zone or the Setback Area is a geographical strip or band within the Coastal Zone or within which certain development activities are prohibited or significantly restricted.

In considering the social demand for using beach fronted land for economic benefits, the 1997 CZM Plan has divided the entire setback area into two segment tire viz. the Reservation Area and the Restricted Area lying between the Seaward Reference Line and the Landward Reference Line of the particular coastal segment. However with the experiences gained from the 2004 Tsunami event, application and validity of such guidelines were questionable. Hence instead of previous guidelines, CCD was compelled to introduce a new set of interim guide lines to minimize the potential damages and risk of investment from coastal hazards such as tsunami, tidal waves. It also envisaged to o protect life and properties from coastal hazards.

8.4.1 Need for Revision of Setback Standards

The 1997 Coastal Zone Management Plan has formulated the setback areas(buffer zones) based on the following criteria;

Criteria used by the CCD in the demarcation of setbacks for 1997 CZM Plan :

* Coastal erosion rate
* Significance of cultural and archaeological sites
* Level of user conflicts
* Legal status
* Special Area Management sites
* * Extent of coast protection measures carried out
* * Protected areas
* Exposure to extreme natural attributes such as cyclones, storm surges
* Geomorphological characteristics
* * Vulnerability of coastal habitats
* Significance of other natural components such as scenic beauty, naturalistic and recreational values.
* Level of development

However massive destruction caused by the tsunami on coastal properties, the government has placed careful attention on imposing wider buffer zones for coastal development. In this process the magnitude of the 2004 tsunami has to be considered besides the above factors in stipulating buffer zones. As a result the government has declared the 100m and 200 m buffer zones respectively for the west south west, south; east and the north coast.

When development activities are carried out within the coastal zone, it is necessary to consider the tsunami event occurred on 26th December as well as special attention has to be placed on the future coastal hazards such as cyclone, storm surges and spring tides. It is also required to protect the public lives and properties as well as steps have to be taken to minimize the damages and risk of the investment within the coastal zone from the coastal hazards.

The field investigations conducted in the coastal areas affected by the tsunami, it was revealed that the spatial distribution of its impact from the beach to the interior area is varies from high to

moderate and low levels. Accordingly the mean distance from the coast towards the land of the high impact area where loss of lives and damages to the properties within the south and the west coast is approximately 100 meters while naturally flat land containing in the north and the east coast could be considered approximately as 200 meters.

After the tsunami disruption, the bathymetry of the bottom of the sea around Sri Lanka had been reach to a significantly unstable condition and number of earthquakes in different scales has been reported from other ocean areas where impact could be reached to Sri Lankan coastal areas.

According to the field information, it was revealed that the damages from the tsunami waves in the areas where sand dunes, coral reefs and abundance of natural coastal vegetation as well as high ground areas with hard soil types such as laterite are comparatively low.

Following tsunami disaster, the soil condition of the affected areas has been changed and the unstability is increasing closer to the coast and decreasing towards the interior area.

The development density of the majority of the land in the coastal reaches of the north and east that devastated due to tsunami is on a lower level while the development density in affected areas in the south and the west coast is on a higher level. The infrastructure facilities also concentrated in large portion of the affected areas in the south and the west coast.

8.5 SUGGESTED LONG TERM APPROACH

In considering the need for minimizing the potential damages of the coastal hazards as well as to minimize the impact created by the tsunami disruption it is vital to initiate a long term coastal hazard management approach. In principal it is difficult to stop natural hazards such as tsunami but it is possible to minimize loss of lives and mammoth destructions by adopting proper management guidelines together with an early warning system for coastal hazards. In considering necessity to expedite the rehabilitation of affeccted areas, interim guidelines for coastal development are presented in this plan while recommending the implementation of following studies and investigations on priority basis for the purpose of formulating more practical and realistic management guidelines for future use.

a) Preparation of contour maps with three meter intervals from Mean Sea level (MSL) towards 300 meters inland to determine the protected areas from coastal hazards.
b) A detail technical study covering near shore coastal bathymetry, coastal processes, sediment transportation to determine the suitable areas for creating additional buffers.
c) Assessment of vulnerable areas for coastal hazards such as tsunami, tidal waves, spring tides and cyclones.
d) Assessment of socioeconomic impacts of set-back standards.
e) Formulation of design criteria that should be used in designing buildings located in unstable coastal areas which are more prone to coastal hazards.

8.6 INTERIM GUIDELINES AND BUFFER ZONES (Setback Standards)

The following interim guidelines and Buffer Zones (set-back standards) shall apply for the development activities and rehabilitation work within the coastal zone, until proper set-back standards (buffer zones) and guidelines are formulated based on the findings of the above research and investigations.;

a) A 300 meter structure free buffer zone (setback area) should be maintained from the Mean High Water line towards landward for the coastal areas of Wilpattu, Yala-Kumana National Parks/ Santuries declared and managed by the DWLC.

b) Excluding the above coastal areas, the relevant buffer zones (setbacks) for other coastal areas including small islands around Sri Lanka are as follows;

i. 100 meter structure free set-back (buffer zone) from the perment vegetation line should be delineated for the development activities that are carried out in the West and the South coast from Kala Oya river mouth (Gange Wadiya) to Kirindi Oya river mouth.
ii. A 200 meter structure free set-back (buffer zone) from the perment vegetation line should be delineated for the development activities within the coastal zone from Kirindi Oya river mouth covering east and the north coast.

iii. Approval should be given subject to Coast Conservation Advisory Council approval with a twenty five meter structure free set-back (buffer zone) from the edge of the cliff when development activities carried out in the areas above five meter contour line from the Mean Sea Level in the following high ground areas characterized with rock outcrops or hard soil such as laterite in the west and the south coast from Kala Oya to Kirindi Oya river mouth and the Trincomalee Bay in the east coast. Such approval will be given on case by case basis and the GPS points of the boundaries of these specific coastal segments will be determined by the CCD.

1. Kala Oya - Serakuliya coastal segment
2. Maggona headland
3. Beruwala -Maradana high ground
4. High ground area proximity to the Ambalangoda Police Station
5. Closenberg at Galle
6. Rumassala headland
7. Kapparatota headland
8. Weligama-Mirissa Cliff
9. Matara Brown's hill area
10. Devinuwara lighthouse -Wauwa
11. Nilwella high ground
12. Goyam Bokka - Tangalle Navy Camp
13. Trincomalee Bay including Dutch Bay, Marble Bay, Koneswaram

c) A 100 meter structure free set-back (Reservation) should be delineated from the either banks of the rivers, streams and lagoons that are permanently or temporarily connected to the ocean within the coastal zone for the west and the south coast and 200 meters for the north and the east coast respectively.

d) A structure free set-back (buffer zone) should be maintained from the seaward side of the fore dunes up to the landward toe of the back dunes, where the total width of the fore dunes (primary dunes) and the back dunes (secondary dunes) is more than 100 meters at Kalpitiya, Talavila, Udappuwa, Hambantota, Koholankala, Kirinda in the west and the south coast and 200 meters at Panama, Potuvil, Thirukkovil, Manalkadu, Kashurina beach and the Mannar peninsular in the east and the north coast.

8.6.1 Permissible uses within the Buffer Zones

Director CCD may issue permits to persons engaged in the following activities if it can be substantiated that the activity concerned 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.

i. Storage facilities for fishing gear and other equipments
ii. Construction of temporary huts for storage of beach scene nets and crafts
iii. Facilities for ice production, storage and distribution
iv. Facilities for sea water intakes and purification systems for aquaculture
v. Facilities for fish auctions
vi. Non- residential facilities for fisheries habours, anchorages and landing sites
vii. Structures and buildings for national security
viii. Coast protection structures

When buildings are constructed for the above facilities, an adequate set-back (buffer zone) should be delineated and appropriate design criteria should be used.

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

The Landward Reference Line will generally be the landward boundary line of the specified buffer zone(Setback Area), if not stated otherwise.

8.7 INTERIM GUIDELINES FOR NATIONALLY IMPORTANCE PROJECTS

When the projects which demonstrates wider public benefits such as housing development , industries, tourism are intended to be located within the declared 100 meter and 200 meter buffer zone respectively for western and the southern coastal segment and northern and the eastern coastal segment. A detailed proposal should be forwarded through their respective ministries for the approval of the Coast Conservation Advisory Council. Under this provision, approval will be considered for the nationally important projects. The following details should be included in the project proposal for consideration;

i. A contour map showing three meter intervals for the site chosen for the proposed development activity
ii. A brief description of the soil and geomorphological conditions of the proposed site
iii. A set of building plans with a capacity to minimize the damages from coastal hazards
iv. An evacuation plan that enables to relocate residence to a safer location within a short period of time during an unexpected event.
v. A justification and clear description on why the proposed project is nationally important.

Criteria for granting nationally importance projects

* The proposed activity serves a compelling public purpose which provides benefits to the public os a whole as opposed to individual or private interests. The activity must be one or more of the following: associated with public infrastructure such as utility, energy, communications, housing development and transportation facilities; water dependent, generating substantial economic gain to the community, or provides better public access to the shore, associated with the national security.
* All reasonable steps will be taken to minimise negative environmental impacts and/or use conflicts, public safety and
* There are no reasonable, alternative locations for serving the compelling public purpose stated.

8.8 GUIDELINES AND APPROVAL PROCEDURE FOR REHABILITATION OF TSUNAMI AFFECTED TOURISM ESTABLISHMENTS

Approval should be given only in accordance with the guidelines formulated and declared by TAFREN (Task Force For Rebuilding the Nation) for the buildings that are used for hospitality business located within the coastal districts affected by the Tsunami event occurred in 2004.

a) Hospitality Business Premises Not Damage by the Tsunami

* Such buildings will be allowed to remain within the coastal set-back area (buffer zone) provided that they had approval from all relevant regulatory authorities including the Sri Lanka Tourist Board prior to 26th December 2004.

b) Hospitality Business Premises partially damaged by the Tsunami A building is deemed to be partially damaged if the cost of repair is below 40% of the replacement value of the building

* Such buildings will be allowed to be re-constructed within the setback area (buffer zone) provided they had approval from all relevant regulatory authorities including the Sri Lanka Tourist Board prior to 26th December 2004
* Prior to commencement of the reconstruction, developer should obtain a permit issued by the Director Coast Conservation under the provisions of the Coast conservation Act No.57 of 1981.
* A permit will be issued only in compliance with the TAFREN criteria as specified.
* No expansions will be allowed deviate from the originally approved building plans

c) Hospitality Business Premises Completely destroyed buy the Tsunami

* A building is deemed to be completely destroyed if the cost of repair exceeds 40% of the replacement value of the building.
* If such buildings are not located within the tourism zones to be declared, permission will not be granted to construct within the setback area (buffer zone). The government together with the Tourist Board will establish Tourism Zones in the future. Businesses that are prevented from rebuilding within the set-back area (buffer zone) will be given preference in allotment of land with similar or better facilities within the tourism zones to rebuild their businesses. The land will be provided free of charge.
* However if such a building is located within a tourism zone to be declared by the government under the recommendation of the Sri Lanka Tourist Board, the approval for reconstruction or decision to providing an alternative land will be taken by the Coast Conservation Advisory Council based on the recommendations of all other relevant institutions by project by project basis.

d) Hospitality Business premises under construction as at 25th December 2004

* Building under construction that were not damaged by the Tsunami will be allowed to be completed provided they had approval from all relevant regulatory authorities including Sri Lanka Tourist board prior to 26th December 2004.
* Buildings under construction (with all relevant approvals) that were damaged by the Tsunami will be allowed to be completed provided the cost of completing the buildings does not exceed 60% of the value of the building when completed.
* Establishments that are not entitled to complete the buildings will be entitled to land in the tourism zones described above.
* The same privilege (land in tourism zones etc.) will be afforded to those who have already obtained government approvals to construct new buildings but had not commenced construction before 26th December 2004.
* Buildings under construction with all relevant approval that were damaged by the Tsunami and if it is located in the tourism zone, the approval for reconstruction or decision to providing an alternative land will be taken by the Coast Conservation advisory Council based on the recommendations of other institutions including the Tourist Board

e) For those buildings that are prevented from completing will be entitled to land in the special tourism zones

8.9 SETBACK DISTANCES FOR PROTECTED AREAS

The government declared 100m and 200m buffer zones will not applicable in respect of Protected Areas. Where any protected area falls within any coastal segment, it will be considered a “no build zone”.

Protected Areas include

* Strict Nature Reserves
* National Parks
* Nature Reserves
* Jungle Corridors
* Refuges
* Marine Reserves
* Ramsar Wetland sites
* Buffer Zones
* Sanctuaries
* Reserved Forests
* Conservation Forests
* National Heritage Wilderness Areas

* A 300 m setback shall be applied to Fisheries Management Areas, Fisheries Reserves or any other designated area or site declared by the Government of Sri Lanka.
* A total of 400 m setback shall be applied to all coastal archaeological sites

8.10 MONITORING OF COMPLIANCE

Particularly in the context of the current arrangements for delegation of powers to the peripheries as well as the feasibility of extending such delegation, monitoring of compliance is critical for the management of the Coastal Zone. Improved guidelines have been provided in this CZMP in order to facilitate compliance monitoring.

The main objectives of compliance monitoring carried out by the CCD are to:

* determine whether approved permits meet the standards stipulated in the Coastal Zone Management Plan,
* determine the adequacy of CZM guidelines and standards in achieving CZM goals,
* detect potential or existing inconsistencies between permit decisions and the goals of the CZM Plan, and

* evaluate the performance of the delegated permitting system particularly in terms of the adequacy of training given by the CCD and the 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:

* periodic inspection by CCD officials during key stages of the implementation of the activity using a standard checklist,
* an information network based on formal and informal complaints for detecting violations in order to initiate enforcement action against violators,
* conduct of permit monitoring compliance surveys on an annual basis,
* Cumulative Impact Assessment Monitoring emphasizing impacts of numerous individual permit decisions spread over time and space in each coastal segment,
* required developer reports, surveys, tests stipulated by CEA or any other agencies, relevant to the development activity; and
* certificates of conformity required from local authority or other designated agency that the permit conditions have been adhered to.

8.11 ENVIRONMENTAL IMPACT ASSESSMENT (EIA) AND INITIAL ENVIRONMENTAL EXAMINATION (IEE)

Upon receipt of an application for a development permit within the Coastal Zone, the Director will determine whether such activity requires an EIA in accordance with section 16.1 of the CCA. In determining the requirements of an EIA or IEE, the CCD will consult the CEA where necessary and due consideration will be given to the list of prescribed projects under the NEA. It shall be the duty of the applicant to comply with the relevant requirements.

Initial Environmental Examination (IEE)

In issuing a permit, the Director is required to ensure that the development activity will not have an adverse effect on the environmental quality of the Coastal Zone. To ensure this, the Director 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" that is considered to have significant impacts on the coastal environment as described in "*Guidance for Implementing the Environmental Impact Assessment Process*". It is the responsibility of the applicant to prepare the IEE. The general guidelines for the preparation of an IEE are given below. 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. For permit applications that do not require an EIA, a decision on the application will usually be made within three weeks of receiving all the required information.

8.6.2 Initial Environmental Examination (IEE)

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

a. Description of proposed activity
   i. Description of the nature, aims and scope of proposed activity;
   ii. Description of the methodology to be adopted during construction operation and maintenance;
   iii. Description of proposed project's socio-economic and ecological benefits/costs; and,
   iv. Description of the long-term monitoring program for the proposed activity.

b. Site description
   i. A description of the area within which the activity, development or operation is proposed to be sited and its environs should include:
      * Location of proposed activity marked on a 1 inch to 1 mile map or 1:50,000 metric sheet;
      * A site map at a scale suitable to show the proposed activity;
      * Delineation of coastal habitats as defined in Chapter 3 and their ecological state;
      * Proximity to water bodies;
      * Existing land use and other human activities;
      * Any high priority archaeological historic and cultural sites within the Coastal Zone as listed in Table 7.1 and any high priority recreational, scenic and protected sites within the Coastal Zone as listed in Table 7.2, and
      * Other relevant information.

c. Description of potential impacts

i. 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:

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

d. Proposed mitigation measures

i. A statement setting out proposed measures to minimise 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

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

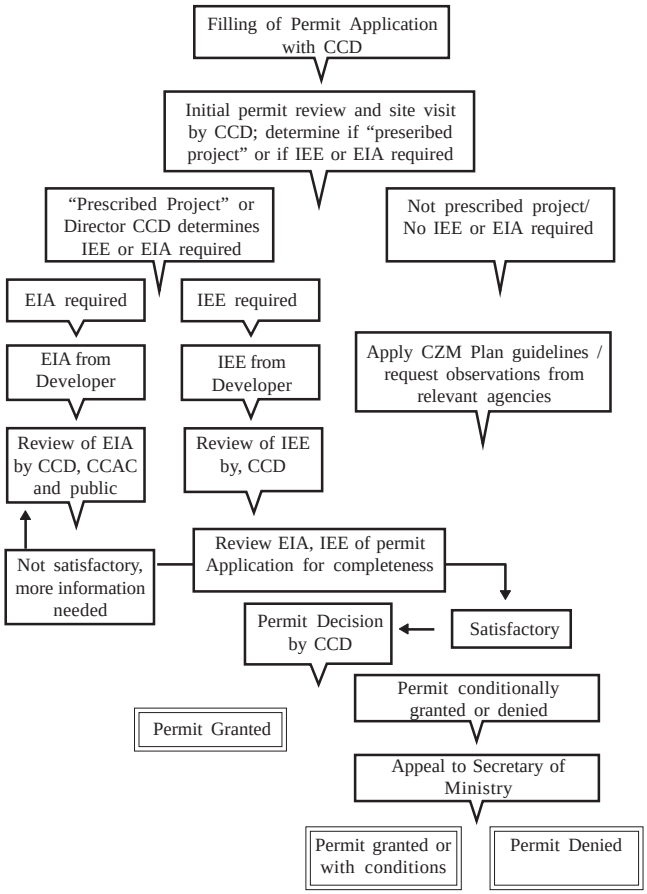
The procedures for obtaining a CCD permit are summarized in Figure 8.2. In the case of development activities that do not require an EIA, a decision on the application will usually be made within three weeks of receiving all the required information. Consultation with the CCD and reading this plan and 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 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."

FIGURE 8.2: PROCEDURE FOR REVIEWING AND ISSUING COAST CONSERVATION DEPARTMENT PERMITS



An EIA will be required in case of a Project that is considered by the Director to have significant impacts on the coastal environment. The terms of reference (TOR) for the EIA will be prepared by the CCD in consultation with the related agencies and will be provided to the proponent of the project and it is the responsibility of the applicant to prepare the EIA in conformity with the TOR and the General guidelines for the preparation of an EIA that are given above.

The developers are advised 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 submit their comments within 30 days. The CCAC will submit its comments to the Director within 60 days. 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 8.2).**

9. IMPLEMENTATION OF CZMP POLICIES, STRATEGIES AND ACTIONS

The foregoing chapters spelled out the policies and the strategies that need to be adopted and pursued to ensure the achievement of the vision, goals and objectives set out in this Plan for the management of Sri Lanka's coastal resources and the environment over the next five years. These policies and strategies necessitate the implementation of a series of actions, which needs to be organized through a well thought out and a logical Plan of Action.The implementation of the Plan of Action is indeed a challenging task that would require innovative practices and procedures and a greater commitment from the stakeholders as well as the civil society.

Firstly, there is a multiplicity of agencies and institutions that have the responsibility for some specific aspects of coastal area management as mandated by their own legal instruments. The Coast Conservation Department the lead agency with the greatest responsibility for the coastal zone can do little by itself and needs to be actively supported by the other concerned agencies. This makes it imperative that there is very close harmony and co-operation among the respective agencies. Achieving such co-operation and collaboration requires an effective coordinating mechanism which would focus on the wider national interest instead of a narrow parochial "agency or sectoral interest".

Secondly, CZMP implementation involves a gamut of actions described under each of the thematic areas incorporated in the Plan. Whilst it is desirable that full implementation is achieved, it is necessary to prioritize them so that if the required funding and increases in implementation capacity cannot be achieved, implementation of at least those most urgent, within the currently available resources is made possible.

Thirdly, acquiring financial resources for implementation of the prioritised actions and programmes remains a formidable challenge. The complexity of the coastal zone requires a long-term approach to solving problems instead of one based on issue-by-issue approach. This calls for a commitment at the national level from the government to make available the requisite financial resources through budgetary allocations to the Coast Conservation Department for implementation of at least the prioritised actions. In addition, concomitant initiatives are also required from the other agencies concerned with various aspects of coastal zone management in incorporating some of the identified coastal zone management related actions in their own annual work plans and budgets. Failure to undertake investments in coastal area management now is bound to result in a degraded coastal environment in the future and in continuing to keep the poor coastal communities in poverty thus limiting the prospects for the general socio-economic advancement of the country.

The Plan of Action set out in this Chapter has been formulated by addressing the above issues. In formulating the Action Plan lessons learnt through the attempts at implementing the past two CZM plans have also been duly considered. Primarily this Action Plan strives to improve co-ordination between different agencies and to strengthen and reinforce the institutional framework. While building on existing structures to the extent possible, the Action Plan also emphasizes the need to introduce new institutional mechanisms for collaborative action and for co-ordination of sector functions.

One noteworthy feature of the implementation arrangements envisaged under this CZMP as reflected in the Plan of Action is that greater reliance is placed on, and more responsibility assigned, to the local level institutions such as the Pradeshiya Sabhas and the Divisional Secretariats similary a greater level of active participation is expected from the fishing and coastal communities and their organizations primarily the Management Committees at Fish Landing Centers and the Special Area Management Committees (SAMP) Co-ordinating Committees. Thus the envisaged implementation arrangements will be largely based on harnessing the co-operation and commitment of the local institutions and community organizations.

The Action Plan thus :

* Identifies the policies to be implemented and the expected outputs;
* Indicates the levels of priority as well as the **time span** over which the outputs are to be achieved;
* Suggests the Lead Agency that should take the responsibility for implementation and the achievement of outputs and the other Supporting Agencies that ought to play a facilitating role.

It needs to be stated that the Plan of Action presented here is by no means an inflexible one. It needs to be kept under constant review. For this purpose an integral segment of the Plan of Action is the development of an appropriate mechanism to objectively monitor its strengths and weakness and the successes and failures. Where needed, changes ought be effected to cater to new needs and situations.

As referred to in section 1.5.1 seven Working Groups representing stakeholder interests were established as a prelude to this revision of the CZMP and assisted in preparing each issue related chapter. This was an effective arrangement and it is recommended that these Working Groups be institutionalized and that they be assigned the responsibility for steering the implementation of the action programmes falling within each chapter.

Area	Activities and Outputs	P	T	Agencies Responsible
1. Coastal Erosion Management	1.1 Study and identify erosion trends and the critical erosion prone areas/sites and recommend appropriate protection measures Outputs: 1.Status Report prepared and periodically updated; 2.Areas requiring protection identified and prioritized; 3.Site specific responses to erosion management formulated	H	L	CCD F&CC
	1.2 Develop a shoreline Management Plan including a monitoring and evaluation programme and Initiate Shoreline Management on a pilot basis Outputs: 1.Shoreline management concepts agreed; 2. sites/areas for shoreline management identified; 3.Guidelines for construction of marine and coastal structures prepared; 4.Pilot projects launched; 5.Implementation monitored.	M	M	CCD UDA/LB
	1.3 Prepare a programme for acquisition of land to support re-location of houses/ establishments-industries where necessary Outputs:1.Alternate land/sites identified; 2.Households & establishments to be relocated identified; 3.Financial incentives/ formulated & implemented.	H	M	CCD UDA/DNP
	1.4 Establish and update a central data base for coastal processes monitoring Outputs: 1.Data collected on relevant parameters; 2.Data exchange/access mechanism designed & implemented.	H	L	CCD Universities NARA / CFHC CTB / DFAR/CEA
	1.5 Provide guidelines for reclaiming coastal frontages by relevant state agencies & private developers. Outputs: 1.Guidelines prepared and disseminated; 2.Mechanism for approval designed; 3.System for Compliance monitoring set up & implemented	M	M	SLRDC CCD/ BOI / CTB UDA / LB
	1.6 Develop and implement a Setback Compliance Monitoring Plan Outputs: 1.Set Back Standards publicized; 2.Coastal Segments demarcated and boundaries/sign boards displayed; 3.Permit system implemented and compliance ensured; 4.Monitoring /surveillance mechanism with community co-operation implemented	H	L	CCD UDA / DS LB
	1.7 Identify activities outside the CZ that have adverse impacts on the CZ and implement programmes for their abatement Outputs: 1.List of activities prepared ; 2. Guidelines prepared for abatements of adverse impacts; 3.Stakeholders sensitized .	M	M	CCD CEA
	1.8 Formulate and implement measures to prevent/reduce sand mining within and outside CZ. Outputs: 1.Locations, intensity, impacts identified; 2.Sustainable limits and site specific sand budgets determined; 3.Monitoring and enforcement strategy agreed upon & implemented	M	M	GSMB CCD Universities CEA M/Cons Universities CCD GSMB
	1.9 Promote the use of alternatives to river sand, particularly offshore sand for use in the construction industry Outputs: 1.Pilot project for dredging and sale of offshore sand implemented; 2.Technical acceptability ensured by continuous monitoring; 3.Awareness created among building industry/users	H	S	
	1.10 Effectively enforce the ban on coral mining & promote the use of alternative materials to coral based lime. Outputs: 1.Measures to promote alternatives implemented; 2.Alternative livelihoods to miners promoted; 3.Inter agency coordination strengthened for enforcement; 4.Ban on coral lime in government building constructions enforced; 5.Awareness programmes conducted.	H	M	PC CCD / DS NGO / CBO
	1.11 Collect and analyse data on climate change parameters to predict impacts of sea level rise on the Coastal Zone. Outputs: 1.Data base on climatic change relevant to CZM and monitoring systems set up. 2. Early warning System re: impending hazards and mitigatory action set up.	M	M	ME&NR CCD Meterological Dept
2. Coastal Habitats	2.1 Identify causes of coral reef damage through research and investigation and implement mitigatory measures to preserve the reefs through inter-agency collaboration. Outputs: 1.Information collected, analysed and disseminated; 2.Sites & measures for coral reef restoration identified; 3.Measures including control and law enforcement implemented with stakeholder participation.	H	S	NARA CCD / IUCN Universities
	2.2 Study the impacts of water diversion /irrigation on estuaries / lagoons and develop mechanisms to integrate lagoon and estuary management with watershed management Outputs: 1.Adverse Impacts on lagoons/estuaries studied and mitigatory measures identified; 2.Coordinating mechanism for management set up.	M	L	Irrigation Dept. CCD
	2.3 Survey and demarcate boundaries of estuaries /lagoons, set up reservations and prevent encroachments /reclamation Outputs: 1.Survey Plans prepared and boundaries marked with signage; 2.Laws enforced with community participation	H	S	DS Survey Dept. CCD / LB / F&CC
	2.4 Formulate and implement suitable management measures with community participation for the conservation and rehabilitation of sensitive mangrove areas, salt marshes and sea grass beds.	H	L	Forest Dept. CCD IUCN / DS F & CC

'රූ'	'ජවසඩසවසිබාධමවවමව	ජ	ඉ	'ටැබජසැ ඩිවදිබිසලුකැ
	Outputs: 1.Sensitive habitat areas mapped; 2.Measures for management/mitigation/ rehabilitation identified; 3.Measures implemented with stakeholder participation; 4.Inter-agency co-operation established; 5.Monitoring mechanism designed and implemented.			
	2.5 Regulate development activities in critical dune areas within the framework of the 2004 Set Back Standards Outputs: 1.Topographic surveys conducted; 2. Dune Protection Lines (DPL) established in critical dune areas and signage used; 3.Community awareness created ; 4.Laws enforced with inter-agency collaboration.	H	M	CCD / UDA LB / DS F & CC
	2.6 Manage/regulate exploration / extraction of minerals and mineral sands from barrier beaches, spits and sand dunes Outputs: 1.Guidelines prepared & developers informed; 2.Laws enforced	H	L	GSMB DS / CCD / LB
	2.7 Form management groups/ protection societies among dwellers in beaches/spits/sand dunes areas and Prevent pollution of beaches, spits and dune areas and ensure conservation of flora and their stability Outputs: 1.Local groups organized for protection; 2.Awareness raised on prevention of pollution & damage to/destruction of flora; 3. Plant indigenous flora; 4.Use signage 5.Enforce regulations.	M	M	DS / CCD LB / F & CC
	2.8 Conserve areas important as nesting sites for sea turtles in collaboration with concerned agencies and communities. Outputs: 1.Studies conducted; 2.Conservation plans prepared; 3.Plans implemented with community/agency collaboration	M	M	DWLC / CCD NARA / IUCN
	2.9 Conduct Awareness programmes focused on coastal habitats targeting on all stakeholder groups. Outputs: 1.Awareness material prepared/updated; 2.Meetings / workshops conducted; 3.Signage used	H	S	CCD NARA / IUCN Educ. Dept NGO / CBO
3. Coastal Pollution	3.1 Establish a Coastal Water Quality Data Base to monitor water quality in coastal waters and capture high incidence of pollution. Outputs: 1.Surveys conducted; 2.Data base set up & periodically updated; 3.Polluting activities & causes/sources identified; 4.Mitigatory action proposed & implemented.	M	M	CCD / CEA MPPA / NARA Universi-ties
	3.2 Promote formulation of effluent disposal standards and ensure compliance by developers Outputs: 1.Standards set up and awareness created; 2. Standards enforced/compliance monitored	M	M	CCD / CEA NARA Universities
	3.3 Prepare a Plan for re-location of polluting industries, abatement of pollution, the introduction of cleaner production technologies and facilitate their implementation Outputs: 1.Industries which require re-location and alternative sites identified; 2. Incentive schemes proposed; 3.Information on pollution abatement / cleaner production disseminated; 4.Plan implemented/laws enforced	M	L	M/Indus. CCD / CEA UDA / LB DS
	3.4 Approval of new development activities will be based on ambient WQ of the sites. Outputs: 1.Water quality studies carried out at specific sites; 2.Zoning plans prepared with agency collaboration; 3.Compliance monitored.	M	M	CEA / CCD NARA Universities
	3.5 Regulate disposal of solid waste encouraging the use of environmentally sound and economical gainful ways of solid waste management such as composting, bio-gas generation Outputs: 1.Sites with solid waste disposal problems identified; environmental degradation monitored; 2.Alternative dumping sites identified; 3.Land acquisition facilitated and implemented.	H	S	M/E & NR CCD / CEA Local Bodies
	3.6 Reduce pollution of ground water in collaboration with the relevant agencies Outputs: 1.Quality of ground water ascertained and sources/cause of pollution identified; 2.Mitigatory action taken on a collaborative basis	H	S	WRB / CCD / NWSDB
	3.7 Conduct Education, Information and Communication programmes to raise awareness on pollution and the necessary abatement measures Outputs: 1.Target groups and specific issues and methods for awareness raising identified; 2.Information material prepared and disseminated; 3.Training/ awareness programmes conducted	M	M	CEA CCD / NARA Universities
4. Archealogical and Scenic Sites	4.1 Prepare and implement a programme for conservation and development of coastal sites of archealogical, historical / religious/cultural significance in the Coastal Zone (including shipwrecks) on a consultative basis in accordance with laws and guidelines and based on AIAs Outputs: 1.Inter-agency Committee appointed; 2.General & site specific guidelines prepared; 3. Specific Plans for sites prepared and reviewed; 4.AIAs carried out; 5.Permits issued for development activities; 6.Compliance monitored.	M	M	D/Arch. D/Cultural Affairs CCD / UDA LB
	4.2 Formulate and implement education and awareness programmes and disseminate information to coastal communities & other stakeholders on significance of high priority archealogical, historic, religious & cultural sites	M	M	D/Arch D/Cultural Affairs CCD

'රූ'	'ජවසඩසවයිබාධමවවමව	ජ	ඉ	'ටැබජසැ ඩඩදබිසලුකැ
	Outputs: 1.Target groups identified; 2.Awareness/educational Materials prepared; 3.Workshops/meetings conducted			
	4.3 Formulate & implement development plans and revitalization programmes for the identified coastal recreational and scenic sites through agency/ stakeholder consultations based on guidelines and EIA/IEEs. Outputs: 1.Coordinating mechanisms set up; 2.Plans/Guidelines prepared and reviewed; 3.Development permits issued; 4.Compliance monitored; 5.Benefits to local communities ensured	M	M	CTB / CCD LB / UDA F&CCs SAMCCs
	4.4 Formulate and implement participatory management plans for identified narrow coastal strips and view corridors/open spaces. Outputs: 1.Study on narrow coastal strips/view corridors/open spaces conducted; 2.Priority sites identified; 3.Design / development guidelines prepared for such sites; 4.Development activities implemented with community involvement 5.Compliance with guidelines/laws monitored.	H	S	DS / CCD LB / F&CC UDA
	4.5 Formulate and implement coastal access maintenance and improvement programmes. Outputs: 1.Critical Coastal Access Points (CAPs) identified; 2.Impediments for access removed with the co-operation of communities and local agencies 3. Enforcement measures (permit/ land use conditions, land acquisition used;) 4.CAP signs displayed; 5.Compliance monitored.	H	S	DS / LB UDA / CCD F&CCs SAMCCs
5. Coastal Fisheries and Aquaculture	5.1 Measures to reduce threats to bio-diversity & damage to habitats and environmental, and resource user conflicts will be introduced. Outputs: 1.Studies conducted to identify harmful practices; 2.Existing laws and regulations reviewed/new laws introduced; 3.Management measures prepared; 4.Measures implemented with community participation.	H	L	DFAR / NARA NAQDA / CCD F&CC / NGO CBO
	5.2 Programmes for providing alternate livelihoods / income enhancing measures to communities affected by management measures will be introduced. Outputs: 1.Alternative livelihoods identified; 2.Programmes to promote identified livelihoods formulated and implemented.	H	L	DFAR / CCD F&CC / PC
	5.3 Adequate infrastructure facilities at fish landing centers to minimize problems of solid waste (fish waste and offal) will be provided. Outputs: 1.Locations identified; 2.Development plans including	H	M	MFOR DFAR / CFHC NARA / LB

'රූ'	'ජවසඩසවයිබාධමවවමව	ජ	ඉ	'ටැබජසැ ඩඩදබිසලුකැ
	waste management prepared; 3. Measures implemented			
	5.4 Illegal/unauthorized structures and activities associated with tourism and other development activities adversely affecting fishermen/fishing activities, particularly madel fishing, will be prevented and regulated. Outputs: 1.Surveys conducted; 2.Measures including demolition /removal of structures or suspension of activities identified; 3.Measures implemented/enforced with community participation	H	M	CCD DFAR LB/DS F % CC
	5.5 An integrated programme to rehabilitate the shrimp farming industry on the NW coast on an environmentally sustainable basis will be prepared and implemented. Outputs: 1.Agency coordination strengthened; 2.Carrying capacity determined ; 3.Farm extents reduced to match carrying capacity; 4.Environment guidelines and good farming/ hatchery practices reviewed and enforced; 5.Technical assistance and incentives provided to farms to comply with guidelines; 6.Monitoring capacity/mechanism strengthened.	H	S	NAQDA CCD / MFOR NARA / NEPC CEA / Shrimp farmers
	5.6 A proposal highlighting the multi-purpose benefits of the Dutch Canal and its rehabilitation will be prepared and implemented Outputs: 1.Prepare proposal; 2. Implement Plan with agency co-operation	H	S	MFOR NAQDA / NARA
	5.7 Prepare and implement a programme to introduce sustainable shrimp farming to new areas. Outputs: 1.Zonal plans prepared and potential sites identified; 2.Manuals/guidelines prepared 3.Traditional community land uses and bio-diversity protected; 4.Guidelines enforced/compliance monitored.	H	L	MFOR NAQDA / NARA CCD/CEA PC
6. Special Area Management	6.1 Plans for SAM sites will be prepared and implemented with local collaboration and participatory monitoring. Outputs: 1.Rank/Prioritize identified sites; 2.Prepare Plans with community participation; 3.Design and implement a participatory monitoring programme.	M	M	CCD/CRMP DS /LB SAMCCS F&CC
	6.2 A mechanism to facilitate the sustainability of the SAM programmes will be established. Outputs: 1. SAM plans will be incorporated in regional project/ integrated national projects; 2. Mechanisms for obtaining stakeholder collaboration prepared with in-built incentives; 3.Tangible benefits to communities ensured. 4.A monitoring and evaluation of plans institutionalized	M	M	CCD / CRMP DER / M/PI DNP

'රූ'	'ජවසඩසවසිඛාධමවවමව	ජ	ඉ	'ටැබජසැ ඩිවදඛිසතැ
	6.3 Training & awareness on SAMP processes will be promoted Outputs: 1.Legal framework strengthened; 2.Collaborative management mechanism introduced; 3.Guidelines on responsibilities for stakeholders introduced.	M	L	CRMP / CCD NARA / IUCN
	6.4 Mechanisms to facilitate private sector participation in activities of SAMP processes in keeping with the SAM concept will be established Outputs: 1.A consultative mechanism to deal with activities suitable for private sector set up 2.Schemes to ensure benefits to local communities prepared; 3.A co-monitoring mechanism set up	M	M	District Chambers CCD / Industry Groups F&CC NGO/CBO
	6.5 A mechanism based on the experience gained during implementation of SAM plans established to enable them to attain financial independence. Outputs: 1.Periodic Review of implementation conducted; 2.Measures for improvements including financial aspects identified; 3.Community SAMCC funds established by channelling part of benefits received from SAMPs.	M	L	CCD / CRMP SAMCCS Develop-ment Banks, Private Organiza-tions

NOTE : Abbreviations used in the table above : –

P	-	Priority Ranking
T	-	Time Span
CCD	-	Coast Conservation Dept:
UDA	-	Urban Development authority
LB	-	Local Bodies
DNP	-	Department of National Planning
DFAR	-	Dept: of Fisheries and Aquatic Resources
CFHC	-	Ceylon Fishery Harbours Corporation
CTB	-	Ceylon Tourist Board
SLDRC	-	Sri Lanka Land Reclamation and Development Board
DS	-	Divisional Secretary
F&CC	-	Fishing and Coastal Communities
M/ENR	-	Ministry of Environment & Natural Resources
M/Cons.I	-	Ministry of Construction Industry
WRB	-	Water Resouces Board

PRINTED AT THE DEPARTMENT OF GOVERNMENT PRINTING, SRI LANKA.